INTERNET OF FOOD & FARM

D7.3 CARDS FOR THE INTERACTIVE SESSION

DEVELOPMENT OF A CARD-METHOD FOR INTERACTIVE WORKSHOPS

WP 7

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PROJECT SUMMARY

The internet of things (IoT) has a revolutionary potential. A smart web of sensors, actuators, cameras, robots, drones and other connected devices allows for an unprecedented level of control and automated decision-making. The project Internet of Food & Farm 2020 (IoF2020) explores the potential of IoT-technologies for the European food and farming industry.

The goal is ambitious: to make precision farming a reality and to take a vital step towards a more sustainable food value chain. With the help of IoT technologies higher yields and better-quality produce are within reach. Pesticide and fertilizer use will drop and overall efficiency is optimized. IoT technologies also enable better traceability of food, leading to increased food safety.

Nineteen use-cases organised around five trials (arable, dairy, fruits, meat and vegetables) develop, test and demonstrate IoT technologies in an operational farm environment all over Europe, with the first results expected in the first quarter of 2018.

IoF2020 uses a lean multi-actor approach focusing on user acceptability, stakeholder engagement and the development of sustainable business models. IoF2020 aims to increase the economic viability and market share of developed technologies, while bringing end-users' and farmers' adoption of these technological solutions to the next stage. The aim of IoF2020 is to build a lasting innovation ecosystem that fosters the uptake of IoT technologies. Therefore, key stakeholders along the food value chain are involved in IoF2020, together with technology service providers, software companies and academic research institutions.

Led by the Wageningen University and Research (WUR), the 70+ members consortium includes partners from agriculture and ICT sectors, and uses open source technology provided by other initiatives (e.g. FIWARE). IoF2020 is part of Horizon2020 Industrial Leadership and is supported by the European Commission with a budget of €30 million.

EXECUTIVE SUMMARY

In this deliverable we present the results of a series of interviews with smart farming stakeholders in the Netherlands and Belgium about ways to govern farm data. These interviews were done to gather input for workshops that we have carried out in 2019 across the EU with farmers and developers of digital technologies for farms. They offered content for three sets of cards that we subsequently used to do workshops with farmers and developers of digital technologies for farms across the EU.

The purpose of these workshops was to make farmers and ICT developers reflect on the ethics of data governance and come to a conclusion as to what the best way to govern farm data is. As a lot of the discussion that has hitherto taken place focuses on limited possibilities for the future and on just a few values, we wanted to broaden and enrich their thinking. One of the ways to do that, is with a card method: three sets of cards offer input to three rounds of reflection and discussion in the workshops: (1) cards with alternative scenarios representing futures of data governance, (2) personal value cards and (3) societal issue cards. These three sets of cards subsequently invite participants to first intuitively reflect on their preference for one of the scenarios, then reflect on the personal values they find important in relation to these scenarios, and then reflect as citizens on the societal issues that farm data governance may raise. Intuitive, evaluative and societal reflection move people to different levels of reflection which allows them to push their thoughts further at every stage.

To fill these cards, we chose to use the literature study as a background (D 7.1), as well as ideas and evaluations about data governance that stakeholders with different roles and professions bring forward. We chose to focus on these stakeholders, as they tend to take different perspectives, which is inspired by their roles and their experiential and professional knowledge about digital farming. As a perspective to farm data governance needs to be acceptable to them, it is important to start from their points of view and make it a topic of reflection. This is the reason to fill the cards, based on their inputs, which we collected during interviews.

In this deliverable we describe how we shaped that card-content and tell about our findings based on the interviews. Based on our analysis of the interviews we shaped four scenarios: (1) the ‘ I choose’ scenario in which farmers are granted maximum freedom (and responsibility) to decide with whom they want to share data, (2) a scenario in which data remain available for several (public and private) actors in a digital library, (3) a ‘laissez-faire’ scenario in which data sharing is organized by the market and (4) a scenario in which data are shared in the value chain. In addition to these scenarios we identified values that played a role in the stakeholders’ reflections, including values such as autonomy, trust, transparency, sustainability, safety and privacy, and we identified societal issues concerning the societal goals data sharing should serve, whether the government should have access to certain types of data and whether other organizations such as banks have the mandate to foster environmentally sustainable behaviour of farmers.

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1. INTRODUCTION

Ethical issues related to smart farming focus to a large extent on data governance.[1] Sometimes these issues are framed as 'data ownership' issues. In commercial environments, commodities, technologies, innovations and information are usually 'owned' by somebody, who has specific rights to it. But in smart farming, the 'ownership' of data is quite difficult to settle: often, farmers presuppose that they own the 'primary data' as they collect them on their farms, yet intermediaries make the algorithms that allow to combine and interpret the data of many farms and use them to generate useful farming recommendations. These intermediaries are considered the owners of the 'computed data'. Furthermore, some authors remark that use of the term 'ownership' is odd and unusual in relation to data because physical things owned can be used by one person at the time, while data are not 'rivals' in this sense: use by one person or entity does not preclude others to use it too.[2]

Authors who consider data ownership, usually seek to protect rights of individual actors, which may be persons or businesses. But there are also authors who abandon talking about data-ownership and instead argue that data are 'social' in nature, and therefore need to be shared openly. In fact, the EU policy has been to foster widening data access for researchers as well as business and innovator companies. Principles that have been gaining importance in discussions about data sharing for research purposes as well as innovation are the FAIR data principles. FAIR stands for Findability, Accessibility, Interoperability and Reusability.[3] These principles were introduced in the life sciences in 2014 as a set of minimal guidelines for research data stewardship. But since then, the principles have also quickly gained attention in other areas of research, as well as in entrepreneurial innovation projects. They are also set to become a cornerstone of research policy and requirements for research data management plans, notably for research under the new EU Framework Program.[4] (European Commission 2016)

Besides both extremes – a protective closed data system and a completely open data platform - there are many in-between options. It is however not so clear how open or how closed data should be. It is for this reason that we wanted to talk to stakeholders such as developers of ICT technologies for the agrifood sector and farmers, to find out about their reasons to seek protection for some data or to aim for open data. We found out, however, that when we started out this research in 2018, that the perspectives of stakeholders were underdeveloped: they frequently did not have a clear perspective on what alternative governance options were to deal with their data, nor had they reflected deeply about the pros and cons of different options. This is a problem that frequently occurs in the case of new technologies: stakeholders lack imagination about the positive impacts it could bring about, as well about its downsides. It is therefore important to first enhance their imagination, before they can use the experience and knowledge that belongs to their professional role to deliberate about the future.

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[1] Van der Burg, Simone, Marc-Jeroen Bogaardt, Sjaak Wolfert (2019), Ethics of smart farming: Current questions and directions for responsible innovation towards the future, NJAS – Wageningen Journal of Life Sciences https://doi.org/10.1016/j.njas.2019.01.001

[2] P. 3 in: De Beer J. Ownership of Open Data: Governance Options for Agriculture and Nutricion. GODAN, Wallingford (2016)

[3] Mons, B., Cameron N., Velterop, J., Dumontierf , M., Olavo Bonino da Silva Santos, L.Wilkinson, M.D. (2017). Cloudy, increasingly FAIR; revisiting the FAIR Data guiding principles for the European Open Science Cloud, Information Services & Use 37: 49–56 49 DOI 10.3233/ISU-170824 IOS Press

[4] European Commission.(2016). Open innovation, open science, open to the world—a vision for Europe. European Commission, DG Research and Innovation, https://bookshop.europa.eu/en/ open-innovation-open-science-open-to-the-world-pbKI0416263/

In order to develop a well-informed vision of data governance which is well attuned to the needs and values of the stakeholders, we wanted to enhance their reflection in workshops, by means of cards. Cards are regularly used in qualitative research, and are appreciated as a way to engage various participants in a discussion, also when they are reluctant to speak or are afraid they may have nothing to say about the subject.[5] Cards provide input to reflection and invite a response, even when topics are experienced as sensitive.[6] Cards are also regularly used to stimulate reflection and debate about topics that people do not usually think about, such as when members of the public are asked to reflect on the design of innovative technologies,[7] or when laymen in science are demanded to explore or assess the value of scientific or technological futures.[8]

Cards can enhance the imagination of workshop participants in a structured and focused way, about the possible impacts of a technology on their own lives and on society. This is done by means of different sets of cards, which each provide input to a round of the conversation. In our own earlier development of the method, we gave the cards three types of content[9]:

- Scenarios about the future
- Personal value-cards
- Societal issue cards

Each type of card gives different input to the reflection of participants in a workshop, which has three rounds each focussing on one set of cards. The scenario cards sketch alternative possibilities for the future and elicit thoughts about what the future could be like in the first round of the conversation. These cards help to broaden imagination and show that there are alternative options to think about. This prevents that people consider only one option, but leave open the possibility to consider alternative options, or make combinations of options in their own view of the preferred future. After that, in the second round of the conversation, the reflection of the participants will be focused on the value of these scenarios. They are asked to select the values that they personally hold dear from the set of cards and use that to evaluate the scenarios, or to elaborate them further. In the third round of the conversation, participants are asked to move beyond their personal perspective and take a societal viewpoint as citizens, reflecting on societal issues that are at stake. In this way, participants are asked to step outside of their immediate preferences and interests as individuals and think for society as a whole. In this way, participants move through three levels of reflection: first they choose intuitively for a preferred scenario, then they reflect on personal values, and in the last phase they reflect as citizens in a society. In this way, they are asked to question their initial preference: while they are free to stick to it if they want, they are also offered various input to deliberate about their first intuitive opinions. In order to shape workshops in this way, we first needed to develop the content of the cards.

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[5] Kitzinger, J. 1994. The methodology of focus groups: the importance of interaction between research participants, Sociology of Health and Illness, 16 (1): 103-121

[6] Chang J.C., Cluss P.A., Ranieri L.A.,Hawker L., Buranosky R., Dado D., McNeil M.,Scholle S.H. 2005, Health care interventions for intimate partner violence: what women want, Women's Health Issues 15: 21-30; Sutton B. 2011. Playful cards, serious talk: a qualitative research technique to elicit women's embodied experiences, 11 (2): 177-196

[7] Searle J., McCreadieb C., Turner-Smitha A.,Tinker A. 2002. Older people as partners in assistive technology research: the use of focus groups in the design process, Technology and Disability 14: 21-29

[8] Boenink, Marianne, Lieke van der Scheer, Elisa Garcia & Simone van der Burg (2018) Giving Voice to Patients: Developing a Discussion Method to Involve Patients in Translational Research Nanoethics, 12 (3): 181–197; Felt, U., Schumann, S., Schwarz, C. G., Strassnig, M. 2014. Technology of imagination: a card-based public engagement method for debating emerging technologies. Qualitative Research 14(2): 233-251; Van der Burg, Simone, Floris H. B. M. Schreuder, Catharina J. M. Klijn, Marcel M. Verbeek (2019), Valuing biomarker diagnostics for dementia care: enhancing the reflection of patients, their care-givers and members of the wider public, Medicine, Health Care and Philosophy, https://doi.org/10.1007/s11019-018-09883-2; or see the following website: https://playdecide.eu

[9] Sometimes we have added also a card set on professional roles. For now we think this is not necessary to include this set of cards, as the people we interviewed already possess different roles and we want to ask them to bring forwards and use the knowledge and experience that belongs to this role in order to think about the future. Also we chose to leave it out, because it would make the workshops last too long.

2. METHODOLOGY

As we wanted participants to use the input available in society to develop their own views, we used both the literature study (see footnote 1) and interviews with stakeholders to develop their content. Based on the literature study we performed we developed an interview guide and selected 23 stakeholders for interviews. Stakeholders were mainly selected from the IoF2020 network and/or from the network of colleagues within Wageningen University and Research. Table 1 gives an overview of the types of stakeholders we interviewed.

Table 1. Stakeholders selected for interviews

Type of stakeholder	**Number interviewed**
Policy makers (Dutch ministry)	2
Controlling body government	1
Large Tech Companies	2
Large farm machinery company	1
Start-up companies	3
Farmers	3
Farmer's organization representatives (LTO, Netherlands and Copa-Cogeca)	2
Sector organization (dairy)	1
Certifying body	1
Bank	1
NGO	2
Researchers	3
Head of data platform for research	1

The purpose of the interviews was to find out what vision these stakeholders have about farm data governance. We wanted to know what benefits they saw for smart farming, what data they were willing to share and what data they considered sensitive and in whose hands they are sensitive. The interview guide can be found in the appendix.

We conducted semi-structured in-depth interviews with these stakeholders, which lasted between 45 minutes and 2 hours. These interviews were voice recorded and subsequently transcribed verbatim, and analysed by three researchers. As we were interested to explore the visions of the data sharing futures of these various stakeholders, as well as the values that play a role in their visions, we conducted the analysis using a grounded theory approach, in which the codes, themes and codebook emerge from the data.[10] Four interviews were analysed by all three authors to align the ways in which analysis was carried out. Whenever there was disagreement about aspects of the analysis, we engaged in discussion until consensus was reached. After that, all other interviews were analysed in the same fashion.

[10] Glaser, B., Strauss, A. 1967. The discovery of grounded theory: Strategies for qualitative research. Chicago: Aldine Publishing Company; Lingard, L., Albert, M., Levinson, W. 2008. Grounded theory, mixed methods, and action research. BMJ 337: https://doi.org/10.1136/bmj.39602.690162.47

3. RESULTS

A. INPUT FOR SCENARIOS

All our interviewees reflect about the future of data sharing and have ideas about that future. Yet, their considerations about whether data should be shared, with whom and for what purposes (or under what conditions) had not finished developing. We identified *beginnings* of scenarios, but none of them were fully developed. Based on the interview transcripts, we however distinguished between four different storylines, which could develop into scenarios:

1. The 'I choose' scenario.
2. The digital 'library' scenario.
3. The 'laissez-faire' or market scenario.
4. The value-chain scenario.

Here we will show what each of these scenarios involves and provide quotes, which show their background in the narratives we encountered in the interviews.

The 'I choose' scenario
First of all, our respondents frequently developed a form of **the 'I choose' scenario**. This scenario proposes to make data transparent to particular stakeholders (such as a tech service provider, the government, a retailer) only when the farmer him or herself consents to it. It requires everyone who wishes to make use of data to inform farmers about what they want to do and ask whether it is OK to do that. It charges farmers with the responsibility to read that information and give consent (or not). Several respondents think it is important that farmers choose for themselves:

> '(..) an emancipated farmer who makes decisions based on autonomy and trust in technology and who has freedom of choice. So, nobody imposes anything on him all the time.' (NGO)

> '(..) one farmer says ' fine' , the other says ' not now' and everyone has freedom to do that. That is important, I think, that you have that choice and the choice is not made for you. (..) (Bank)

> '(..) That counts for everybody: when the data are collected on the property of the farmer, on his land, than they are the farmer's, and they will have to ask the farmer whether they can do something with them. (..) The farmer decides.' (Farmer 1)

The 'I choose' scenario is relatively well developed, as this is also what the EU Code of Conduct supports, which has been developed by members of the farm industry as well as Copa-Cogeca and CEJA.[11] Furthermore, the scenario is supported by endeavours to digitize the consent procedure, such as JoinData, which creates a dashboard that allows stakeholders who want to have access to data to give information to the farmer in a digital way and ask farmers to consent to it by ticking a box. However, while putting the farmer at the steering wheel seems to be a very pragmatic way to deal with the problem of data sharing; many respondents also have doubts about it.

One of the problems is that it is difficult to give the data and then change your mind and ask them back. The choice to share data is therefore irreversible:

[11] https://copa-cogeca.eu/img/user/files/EU%20CODE/EU_Code_2018_web_version.pdf

> '(..) The difficulty is that, in fact, if I share data with you and you get those data and I want to withdraw them tomorrow, then you probably will still have the data for they are still somewhere and they are not destroyed. You can still use them. So those are quite difficult problems. (..).' (Start-up 2)

Consent to the use of data seems to be open-ended and extra (secondary) use is hard to control:

> 'Look, if you give permission to one party to use your data then I expect that party to say what his goal is with the data, what he does with them. (..) If the goal is unclear then this can be a reason to say let's not do it. If someone says, I want to develop an app and when the app is finished I will destroy the data...but if you give the data to another party and you do what you like, yes, than that allows you to spread them around. So it is important to settle the goals. But this does not take away all the risks of course.' (Farmer 1)

It is hard for farmers to keep up to date with what happens to their data and what they themselves could do with data. This requires knowledge and expertise, which not every farmer possesses, or likes to obtain:

> (..) I think many of the younger generation pig farmers, like to deal with data. Well the older generation has difficulties with computers anyway. You notice that (..) So they enjoy it less and they will continue to find it difficult. (..) So, yes, dealing with requests of people who want to use your data will probably be the way, but yes, with some parties you will share data regularly and with others only incidentally.' (Farmer 3)

> 'I always think that when a farmer paid for the tractor, then it is his data. But, ok, I know there's complexity there: many farmers are not going to sit and wait until they get control over their data (..) they will sell them themselves. (..) For that is an interesting system. But this also demands something of the farmer. (..) He needs to know something about data, he has to know what it means, has to have some digital background etc. So there, yes, there you are left with a slightly optimistic perspective that everybody thinks like, ok, maybe you have a problem of awareness there, of digital literacy. You can earn money with it, so that is a driver to get the relevant education. But yes, that is definitely a gap I see there.' (Start-up 1)

If the consent procedure is digitalised, some fear that the farmer will say 'yes' without knowing exactly what he is getting into, much in the way we consent to privacy agreements when we download a new app: information provided with the privacy agreement is seldom read properly. It is therefore questionable whether asking farmers for an agreement to use their data, will actually be successful in putting farmers in charge. If they are not well informed, or say 'yes' or 'no' while they did not take the time to properly form an opinion, then they are not really in control.

The digital library scenario

A significant part of our respondents also considered a different scenario, which we have termed 'the digital library'. The term 'library' is of course an old fashioned metaphor. We chose this metaphor, as it summarizes well the thoughts of various interviewees who considered the possibility that various (public and business) actors would have access to a platform with farm data, which allows them to use these data for different purposes: to develop innovations, for research, for policy-making, for farmers themselves. The idea of a library evokes the image of a reservoir of data that is serving the common good, as anyone can go to a library, become a member, and get access to its resources. Several interviewees brought forward this idea that data should foster the common good:

> '(..) This could also be for the common good (..). That used to be the case with gas, with the electricity network. These all served the common good, and they probably would not have been there if the government would not have taken the lead. And that's what you see here too. If you position it in this way, then it should be realized in a safe and ethical way and it should not be commercial. Yet, the common good, who determines what the general good is? (Large tech company 1)

As there is an important public interest associated with smart farming, some interviewees consider it important to make data accessible. Governments could make this happen:

> '(..) it would be best if companies would share data voluntarily, in order to innovate together. But if this is difficult to realize, the government can play a facilitating role, (..) and if that does not work either to make the data accessible, then in the ultimate case, thinking about the interests of everyone, the government can continue and try to do things differently and request to share certain data.' (Representative farmer's organization 1)

> 'Well, you see [data] flows in, well, the area of health that is a societal interest. Dataflows supporting sustainability or environmental sustainability is also important for society. In fact, we are as of today paying for the funding [subsidies] to quite a lot of farmers and we are not as a society, as Europe we are not requesting to exchange any information regarding environmental protection. So, and I do see in the next future, European authorities will be requesting in return for that funding, which is quite generous, some kind of additional, environmental protection information.'(Start-up 2)

If the government obliges people to share data, this will also make it more difficult for large companies to develop monopolies by keeping data only for themselves:

> 'Well, I would include some kind of extra protections in the regulatory world or in the policy world (..) that would strengthen competition and those kind of rules and laws apply as well to data. Because in many cases we just stay in the area of exchange of products but we don't think, we are not careful enough when talking about data. So, we should ensure that data can flow in a free way to different parts of the supply chain and to the economic ecosystem and avoid some kind of monopolization I think from single players.'(Start-up 2)

An advantage is furthermore, that a government that offers support to realizing data libraries, can also make sure that people process their data in a similar (FAIR) fashion, which is a precondition for connecting them and using them:

> '(..) At this moment so much is left up to the market, which leads to a wild growth of initiatives. In the area in which I am active, dairy farming, this can also lead to a wild growth of measurement methods. This is not being managed in any way. In the case of dairy farming we have the advantage that this is a relatively effective self-organizing sector, also with respect to data (..) But there are also sectors where this is less the case. I think we should look into this: what is efficient and if this does not go well, should anyone take a management role in order to make sure that there's commensurability in the measurements.' (NGO 2)

> 'If you want to analyse and acquire knowledge then you need to bring these data together, for otherwise it doesn't work (..) And if you invest in bringing it all together and control it and check it, that would be really good, because then you can do with it whatever you want (..) Then you have to guarantee that whatever you stored, fulfils some quality criteria.' (Researcher 1)

> 'An advantage is of course that you have it all standardized and that you have all data in one spot, as the risk in the Netherlands is now that data is stored in different locations. Then you know there's uniformity and you can set more requirements on the reliability of the data. (..) The advantage is of course that you can access these data at any moment and get a full picture of the scores of the complete sector and what is the progress. This is very transparent for the consumer and for society and it shows the impact. For right now a lot is based on suppositions, regarding what the progress is with respect to sustainability or production (..). If you would have more data available via a kind of library, then you would get a better picture of actual developments.'(Bank)

The question is of course who should be in charge of such a data platform, or library, that is accessible to everyone. This is what is still an open question in this scenario.

> '(..) Such a system falls apart when there are large political changes. Imagine something happens in a country....in twenty years someone grasps political power and says: this is nice, but we're going to re-structure the entire system. And then this person has access to all of our data and can do, I don't know what....' (Start-up 3)

> 'That the data are somewhere and that someone is taking care of it, that is very good. But does it have to be the government? The government is not known to be the most transparent, protective and honest partner. I think we can do it better together, better than the government can do it. The government is not that trustworthy of course.'(Farmer 2)

There are also interviewees who believe in a much more de-centralized system, in which actors have to pay to obtain data:

> '(..) I do not believe in a centralized library, really I don't. Maybe there will be a library for researchers and people can donate their data for research, but I think it is more important to couple the different data clouds or silos, rather than build one large sile that contains everything. (..) It is the same as in the banking sector; there are banks that govern the data of private businesses. This will also generate for the farm data. Some banks or businesses will govern the data of groups of farmers and will get paid for that. They will share these data only according to the wishes of the farmer. Just like you transfer money from one person to another, the farmer will have to consent to giving a particular party access to data at the bank, or at the databank.'(Large farm machinery company)

The 'laissez-faire' or market scenario
Several interviewees thought the market model would be most attractive, because people move quicker when they see it provides them a profit. In this market model, anyone who wants to use data, will have to pay for it. Some can see the attraction of this scenario:

> 'Our data is worth money. When someone, especially commercial parties such as feed producers, wants to have data in order to improve their advice, their strategies, or the content of the feed, then I think they should pay for it. If they use data to improve their products or services for the farming sector...It will never be the case that all pig farmers will share their data. Look, and the people who do share, I think they should be rewarded for it.'(Farmer 3)
> 'I think a model in which you can earn money with this is important to make it work at all (..) For, in the end when someone starts with it and he is going to reduce his costs or realize higher profits...yes then other people want it too, and in the end that is, that is in our genes, we want to grow in some way.' (Large tech company 2)

> '(..) You are asking for some money and you voluntarily, you provide those data on exchange of that money. So, that is fair, it is, that is freedom anyway.'(Start-up 3)

Some interviewees think about value in a slightly broader way and think there could also be a trade between different types of value:

> 'Well it is a returning discussion: what happens to those data? And there are also people for whom this is a financial question. They say: I pay you money and then you come and get my data and then I get something back, but you are becoming richer because of my data. So I pay for something, and it feels a little double. That is what you hear sometimes. (..) In the end, what I do a lot, is start a financial discussion, like, well, in the end what you pay for is that it offers you benefits. So your cows will be healthier, they give more milk. So we offer a service for which you have to pay. But it is right, partially, we do become smarter with your data, and part of the advantage is that the smartness, the intelligence, that we develop, we share it with you. So you get something back that becomes smarter and better.'(Start-up 2)

Many interviewees thought that the market system would allow that innovation and knowledge development goes much faster, then when the government is in charge:

> 'I think that internationally speaking it is more practical, as you stay more flexible (..) And towards the future you can do new things easier, as otherwise you would have to build a new database every time. (..) The future demands flexibility, dynamics and new coalitions that need to be put together. By keeping it de-centralized, you can shift quicker between organizations (..).' (Researcher 1)

> 'Yes, you see that if a government starts to steer things, this is also not immediately accepted. So, the top-down approach will not always work either. But if you work with all different parties together (..) then each of them will also bring about a large cultural change in their culture and behaviour, and then this has a lot more effect to bring about a quick change.'(Bank)

Some also observed that leaving things to the market is more realistic, as it conforms to government policy:

> 'In the Netherlands, the government likes to give the responsibility to businesses: you work this out and they we'll see whether we approve. '(Farmer 1)

Others thought that it would be best to leave it up to the market and let the government interfere in the market only when things go wrong.

> 'But let us leave the free market free and then adapt where needed, and let us not start to shape an image of what we want to realize and then hope it will evolve in the right direction. If it does not, we should interfere. I'm convinced we will have to interfere, I just can't predict where. (..)' (Large farm machinery company)

The value-chain scenario

The last scenario is the value-chain scenario. In this scenario, data are shared between participants in the same value-chain. Different interviewees brought forwards aspects of this scenario. Sometimes they brought this scenario forwards, because they thought it was the most realistic, as many farmers already share data in the value chain:

> 'Well, look, the farmer knows to whom he sells his potatoes. (..) So that's what he knows and he can say: yes they are allowed to see my growth data. (..) He may even be obliged to do that. If he sells to the SuikerUnie (Sugar Union) then he needs to also provide his cultivation plan, so that they can plan the provision of seed. (..) Two years in advance he has to provide this information to COSUN. And if he wants to sell his potatoes to Albert Heijn [a super market, SvdB] then Albert Heijn asks: what is your global Gap certificate? So then he has to deliver data too.' (Controlling body government)

Others bring forward all kinds of advantages of data sharing in the value chain. They think, for example, that it will allow to tailor the production to the demand of the consumer, which will diminish overproduction and waste. This will demand also that the entire chain collaborates to compensate for the loss of revenues in periods in which a farmer has less production:

> 'We have to start thinking differently, of course. If you need more pigs for Christmas and less in January, then you have to make sure there are less pigs in January (..) And it can be that you tell a farmer that he should leave his stable empty for a month; like, it is better now that you do not have any pigs. And as a chain you give him compensation for that, for we understand it undermines you, but it makes the entire chain stronger. There's so much profit to get from that. I'm convinced of that.' (Farmer 2)

> 'I call it 'agriculture on demand'. (..) So in a complete value chain the loss is on the variables. It is because you couple everyone together that you can control the variables. So an exchange of data. But this demands that the farmer will no longer produce what he wants to produce, but

> that he produces what the consumer tells him to produce. That means, he will produce what the large shop-chains will demand. And that is something he does not want to hear. You can only do it when people at the end of the chain, the consumer but also the retailers, share part of the value with the farmer. And that is something that does not always happen.' (Large farm machinery company)

Sharing data along the value chain furthermore allows customers to see where their food comes from and how it is produced. This in turn allows producers to differentiate more between different products: consumers can see that meat with better quality is produced in a different manner, or different types of milk can be differentiated. Some farmers expect this will also help to create a better price:

> 'You can differentiate a lot more: you choose as a consumer for three star meat [stars stand for animal welfare, svdb], then you can log in and see what happened to that three star meat, for you can look into the stables. You can make the customer more aware. And you hope the richer consumer will be willing to pay more for it.(..) So I see that. Data can help us with that.' (Farmer 3)

> '(..) But what you see now is that consumers ask for more and more milk streams: I want – I don't know- mountainmilk, meadowmilk, and those kind of consumer requests. And then dairy entrepreneurs will look: what can I do with those collective data? Can I make a difference within my dairy enterprise, for I promised that to my farmers? And then the dairy processor, with his milk farm, will say: OK we go to the topline dairy, with 25 percent of the best farmers on all core numbers that we gather with those data.'(Sector organization, dairy)

Sharing data can also lead to more collaboration in the value chain, which has various advantages. Some believe it leads to more understanding between partners in the chain:

> 'We are very much focussed on the profits in our part of the value chain, and we should get rid of that. It is about the profit of the entire chain. I think that is the largest struggle. (..) You can go for profit in the entire chain, but the precondition is that you are transparent about what your added value is in the chain and what your margins are, and then you see what Albert Heijn [a Dutch supermarket, SvdB] earns (..) and then you get more mutual understanding . That's where it starts, collaboration starts with understanding (..) I've had a buyer from Albert Heijn here who said: you don't have to pick all the eggs from the farm 7 days a week. Well, yes, that is needed. (Farmer 2)

B. INPUT FOR VALUE CARDS

There were little respondents immediately interested in only one scenario. They played with different options in their responses and weighed their pros and cons. In this weighing, this evaluation, that they carried out, we distinguished the values that played a role sometimes in a more explicit fashion and sometimes more tacit in the background of what they were saying. As we wanted to base on these interviews the content of cards that could give input to the reflection of stakeholders during workshops, we summarized the value that was at stake in a single word or short phrase. In this part of this deliverable we show how the content of the cards relates to the results from the interviews. The heading of the subsections refer to the values we included in the cards, below we explain how they flow from the interviews. The values may of course be interpreted in different ways. By noting only a single word on the card, we leave open the possibility that participants in the workshop will interpret them in their own ways. We here just show how they figured in the evaluations of the respondents of our interviews.

Autonomy

Autonomy plays an important role in the reflections of respondents, especially concerning the first 'I choose' scenario. In the explanation of this scenario we already included some quotes that give rise to this value. Here we include one more, to illustrate that many respondents brought this value forwards:

> ‘You always have to have a choice to share [data,SvdB] or not. And it can be required to share certain data by law, well, of course then you cooperate. But there needs to be a goal for that, such as food safety, if it really endangers people, about other business (..) I think you should be able to decide that for yourself if you share or not.’ (Farmer 3)

Keeping things as they used to be (conservatism)
Sometimes respondents do not want to change a lot, or expect others not to want to change. Some respondents expect that people will just hold on to the past, because they are used to it and simply resist anything that imposes change:

> ‘I think many farmers will leave it at the status quo. So, data streams which are pretty much like they exist now, can continue towards the future.’(NGO 1)

Others hold on to the past, because they think something valuable might be lost if too radical changes are implemented too quickly.

> ‘I think that is also part of ethics; that we do not end up with only numbers and with that...that is something I also say to farmers....you have to continue to look and smell your crops, for you cannot see everything in the data. You often do not get the full picture and this is what you need to see too. (..) (..) Sometimes sensors pick something up before you do, that is possible, but you also have to... your feeling and experience cannot be caught in data (..) That also continues to be necessary.’ (Farmer 1)

Trust
Many respondents talk about trust. Sometimes trust is understood as a capacity of technology itself: it needs to be reliable, meaning that it needs to be functioning (without bugs) and that its results give a straightforward input to decision-making that is based on facts. Beside this technical understanding of trust as reliability, we saw a lot of reflections about trust in other partners in the data network. Trust in these partners is considered to be a precondition for data sharing.

> ‘First of all, I think you have trust in sharing it [data, SvdB]. You have the feeling: I am ready to share it.’ (Representative farmer’s organization)

> ‘Look, I think it is important that the farmer himself can decide what he does and that we can build the whole data sharing business up from trust. You can nail everything down and control it, those are the necessary checks, but in the end you have to build things up from trust.’ (NGO 2)

Data ownership
The topic ‘data ownership’ came forwards a lot in the reflections of respondents. Yet, it is clear that the term ‘ownership’ is a metaphor that does not completely fit data, as data are not like commodities that can be owned exclusively by one person. The sharing of data does not lead to a loss of value to the owner, as would be the case with other things we own, such as money, a house, our clothes etc...

> ‘(..) There’s not something like ownership of data. I just learned all of that. In fact you can only own something if it is a physical thing. A product or something. On the other hand there are a lot of considerations that have to do with data sharing and the decision to do that or not. This has to do with privacy, with the right to make use of data. If you have done a lot of effort to organize data, then there’s a price attached to that and you don’t need to share it with just anyone (..) There have to be some guarantees around that.’ (Representative of farmer’s organization)

> ‘Yes, it’s about a contract we’re signing with a client who says: these data are mine, and we say, no these data are ours. And yes (..) It is about, it is about algorithms and the things you ask a patent for. What you own is the algorithm, not the software, not the data, but the algorithm. (..) But well, If you’ve been doing a lot of effort to do an analysis and another party

starts to do it too, then you prefer not to give the other party a head start by giving him the data to do the same analysis.'(Start-up 2)

Privacy
Farm data do not fall under the GDPR as they do not reveal any information about particular persons, but they concern information about land, crops and animals. Yet, respondents do bring forward privacy considerations. Some respondents mention that it is hard to separate the farm from the private domain of the farmer as a farm is a business, but also very often the farmer's home.

> 'In dairy farming we have a lot of discussion, for yes, livestock farming is a business, but well, all of us know that the business and the person is in 99% of the cases 1 on 1.' (Certifying body)

Others state that information about the land, crop or animals of a farmer, may also reveal sensitive business information, which a farmer considers private. This information may be important competitive information, and may reveal information about yield and income.

> 'Are data about crop parcel private data? Yes, for especially those who know the neighbourhood know exactly, oh that parcel belongs to so-and-so. And then you know the growth plan of that farmer. On the other hand, this is just information that you can gather in the field, so you can see it with your own eyes. But that is the case with a lot of private data. You can collect them easily by yourself, but it has an impact on privacy if you collect them electronically and at a large scale. So there's a limitation somewhere....' (Controlling body government)

> 'I think, yes, the economic numbers about company results, yes, nobody wants to have them lying around on the street (..). Your and my income tax forms; you'd rather keep them for yourself, I think. Those kind of data (..) normal privacy data, yes, nobody wants that, nobody needs to have them out on the streets, so that the neighbour can read how much taxes you pay, or didn't pay.' (Researcher 2)

Safety
Respondents also sometimes brought forward considerations about safety, which most often concerned the technologies or storing methods and how they would be able to protect information that is considered 'private' or 'owned' by a farmer.

> '(..) So, this safety, we want to build it in, at the level of credit cards, I call it for now (..) So that we can guarantee: 'Farmer, you know, we don't have Facebook or whatever...'(Controlling body government)

> 'So you need to have information safety and information management in order, internally as well as externally. To make sure that internally not more people than necessary have access to these data and externally you need to take sufficient measures to prevent that external people have access.' (Certifying body)

Fairness
Many respondents brought forward reflections about fairness. They want to make sure that there's a just distribution of benefits between partners who share data together, such as farmers and people who use their data such as developers of a digital farming technology who need the data to make it but will also earn money with it. Some people solve this discussion by broadening the discussion about value to include money as well as the value of improved knowledge.

> 'Well, it continues to be a returning discussion, like, what happens to the data? And there's always a group of people for whom that is a financial question. They say: I pay you money and you get my data and I get something back, but in the end you become richer of that, based on my data. So I pay for something, but it feels like paying double, that is something you hear

sometimes ....(..). And then you start a financial discussion saying, well, what you pay for is that it offers you something, so your cows become healthier, they give more milk. So we offer you a service for which you have to pay, but yes it is partially true that we become smarter from the data. But the advantage is that the smartness, the intelligence we develop, we will share it with you. So you get something back: a service that becomes smarter and better.'(Start-up 3)

'It becomes easier to make something available, if you also get something back. You could make something available for the common good, if you know it actually leads to something, and that you can share in it. You don't want to give it to a party that becomes rich with it, while you don't share in the benefits.' (Head of data platform for research)

Knowledge

Knowledge is one of the goals pursued with data. Based on raw data, information is gathered, but this information can become knowledge if it is connected to other data and interpreted in the light of a specific research question. Respondents bring forwards the value of the type of knowledge they expect from data, which is expected to be more objective and disinterested than knowledge offered by people.

'We should not have judges of the quality of the meat that get out of bed in the morning with a bad mood, or a good mood. This influences how they judge the meat. It is subjective (..) it has become old fashioned, from the middle ages. You can do that much better with camera's. (..) But then you see that data need to win from human emotions for that can no longer...(..) we need a more rational judgment.' (Farmer 2)

'To make it measurable, concrete (..) objective measurements, you can only do that by looking at the data. So, then you need to possess the data.' (Bank)

Some respondents think that knowledge provided by data is not necessarily more objective, but it helps to learn from farmers who are located in other (weather) conditions. Digital technology therefore does not so much make knowledge more objective; it generalizes knowledge.

'Last summer it was very hot. If that had happened last year then the system would have thought that a lot of cows were ill because they behaved strangely. However, because we included farmers from Utah and Kansas where it has also been warm, the system recognized the pattern and learned from those farms: oh, what I see now is not necessarily a sick cow. It looks at the temperature, couples it to this behaviour and then, oh wait, this is another problem, this means the cows suffer from heat stress (..) And in this way they [the farmers, SvdB] can help each other (..). In this way, the system becomes handy in various locations for different types of farmers. In a certain way you democratize knowledge.' (Start-up 2)

Transparency

During the interviews, respondents reflected on the value of transparency. They could mean transparency of data streams, informing people where data come from and where their own data can be found.

'Google will have part of it, Apple has part of it, the city of Amsterdam has part of it, the Dutch railway has part of it. Well, there are a lot of parties that know something about you, but you have no idea who has what. So you should actually know where your data are. That's a start, I think.'(Head of data platform for research)

'I think it would help if this insight and transparency is enlarged. Like, what do different organizations or stakeholders do with those data? For, whenever I know, oh, but wait they use it for that (..) then that offers an advantage, right?' (Researcher 3)

Others think about transparency of data in a different way. They think data can reveal something about the behaviour of different people and they may reveal who is disrespecting the rules. Some have no trouble with this type of transparency:

> 'Look, last week I was visiting a farmer together with the ministry and he told us that he was annoyed by a neighbour who had let a residue of pesticides leak into the ditch. The ditch was yellow. He knew who it was and he had called him afterwards: "I try to produce as carefully as possible, as sustainable as possible, with respect for the environment and the ecology, and then I see your shit in the ditch." He was really indignant and I understand that, for that man brings down the whole farming sector. Image damage. And he undermines the efforts of his colleagues. He told this example. He thought this was a very bad case. So to come back to it: at the moment that you want to do things right, you are willing to show it and that's why you do effort.' (Representative farmer's organization)

Others find it hard, as they fear they will be penalized more often when their data are accessible to everyone.

Sustainability
An important goal of digital farming is to help make farms produce food in a more sustainable manner. Sustainability also figures as a value in the considerations of our respondents, but it is also coupled to economic sustainability. Farms that produce with less burden for the environment, are considered also more economically sustainable, as businesses.

> '(..) I think there are two strengths, so, one of them is the economic strength and then it makes you become more effective, efficient, that is really strong, but then there's the next one, that is the sustainability and social commitment where that is another strength and I don't see that we can go that far without measuring environmental impact and so on, so we have to measure soil utilization, water utilization, fertilizers and chemicals and so on and you know, the public opinion and consumers they are getting stronger there, and even retailers.'(Start-up 3)

> 'It is about a sustainable production. Quite generally speaking, in all our domains, it is about the value of nature and sustainable production. We work to get more transparency in the value chain to realize that.' (Ministry, policy maker)

Others point out that data sharing is important in order to be able to show to the government that you're complying with environmental law.

> 'That our milk is the most sustainable milk? Data offer arguments for the outside world. We use the data also to show, for example to the government, like: we respect the phosphate limitations.' (Sector organization, dairy)

Fun
Pleasure, and sheer fun is also a consideration that comes forwards in the interviews. According to some respondents, people pay attention to innovative technologies simply because they like it.

> 'For many forerunners this is just --- Fun and for the gadgets.' (NGO 1)

In the reflections of others, keeping satisfaction in your job is also a relevant consideration.

> '...yes, it should translate into profit, and that's what it does, so that is good, but it is also job satisfaction. I don't want to think about my farm becoming like a digital factory, then the fun will be gone quickly....' (Farmer 2)

Efficiency
Many respondents see the value of efficiency. Sharing data with diverse partners could save time and money. Nowadays different parties do their own audits, but they use the exact same data. It would be more efficient if they would share these data.

> 'I have a small business and I had eight audits this year. (..) It leads to nothing. One comes for VOG, which checks whether I do not use genetic modification, the next is IKB, the German Kat, the next comes for a star that stands for better life of the animals. (..) Let me please do an overall control every year and let everyone join in and see the data. That takes less time for everyone and less money, for they send an invoice too every time. By barns need to be measured by three different organizations, and they all measure the same thing, and they don't take over each other's data.' (Farmer 2)

> 'If we want someone's data, this is an endless fuzz. You have to ask everyone independently. (..) And then you have to deal with rights and commercial obstacles, so that is quite troublesome. (..) I think you lose a factor 10 in efficiency because you lose 90 % of your time collecting data.' (Head of data platform used for research)

> 'The promise of precision farming is that you can have a higher yield with less pesticides and less nutrients in the soil. That is efficiency. That is what the data will reveal. And it would be nice if the public has access to those data for then you can say: look, the growers who work without government subsidies on precision agriculture also work on these goals.' (Ministry, policymaker)

Innovation
Just like there are people who like to hold on to what they consider important of the past, there are people interested in innovation. They like to innovate, to try to make things better.

> 'It is interesting to include people from outside, who look with a different perspective, or who are used to deal with daily practice in the field. (..) There are just some of us in the sector who are a step ahead of things (..) I would like the sector to take the chance to use those boys and farmers, the free thinkers, the crazy ones, who think of new things.' (Farmer 1)

Competition
Amongst our respondents there's a lot of reflection about competition. As farms are businesses who need to make a profit and developers of technologies are businesses too, reflection about data sharing raises questions about what effects it has on competition between businesses. We included competition as a value, as businesses will hold on to it. Without it, it is hard to understand what a business is.

> 'I think that there's a clear commercial interest: if you don't know what is in my black box, then you will depend on my advice. I have the capacity to take intelligent advice and action perspectives from my black box and as long as I am the only one who can do that, I have a better market position (..) In the end everyone has the idea that they can protect their position, expand it, if they have unique position. Open source or open algorithms contradict their own business model as it allows everyone to see what they do, and everyone can improve that, so I get that.' (NGO 1)

> '(..) It is much more a matter of transparency and competition so it is sensitive only from the point of view of competition. As you know in the retail world and in the agricultural world and CPG world, so consumer packaged goods world, there is a strong competition in terms of supply chains. So, nobody wants to dismiss or open the data of their supply chain.' (Start-up 3)

There are also concerns about the big players, the large companies, against whom it is hard to compete as they possess a lot of data. If they don't share them with others, they will be able to use them to strengthen their own market positions.

> ‘If that information is somehow monopolized by one or two or three big players and then the others are out of that game.’ (Start-up 4)

And some of the respondents think it is important to look beyond economic value and competition.

> ‘ Well for growers it also has to be an intrinsic motivation to care for a better soil and that pesticides do not end up in the ditch etc. So there has to be an awareness, like, well I don’t do it only for my own wallet, but I also do it to improve nature, the environment, which in the end is also in our economic interest. For it is quite clear that the quality of the soil has gone down in the past years, right. Not only because of the use of pesticides, but also because farmers use heavier machinery. They have noticed this in the yield, so that’s where the economic aspects come in, for people have neglected nature these past years.’ (Ministry, policy maker)

C. INPUT FOR SOCIETAL ISSUE CARDS

Interviewees reflected on various societal issues in the interviews. We chose a selection of questions they asked and included them on our cards. We particularly selected issues that were frequently brought forwards, by different actors. As a background for this selection, we also used the input we gathered from the literature study (D 7.1) Sometimes, however, we formulated a question ourselves, based on the input of various stakeholders, as we thought the question summarized the concerns that various people brought forwards.

The questions we selected are not the only questions that could be asked about it. But these are questions that stakeholders reflect about and think important to provide an answer to.

The questions we selected are:

1. What societal goals should we serve with data?
2. Should the government be allowed access to data to monitor to what extent farmers protect the environment?
3. Several organizations and businesses (banks, insurance) make attractive offers to farmers in exchange for data that reveal how they treat the environment. What do you think of this idea? Whose role is it to foster environmental sustainability?
4. Open access to data does not necessarily lead to benefits for everyone. In practice, only people who possess the relevant technologies and expertise can do something with data. What is the appropriate answer to the social inequality between those who can and those who can’t benefit from data?
5. The EU fosters the development of digital innovation hubs (DIH’s). Who should be in charge of regional DIH’s?

In the following we will illustrate how these questions came forward in the responses that our respondents gave.

a. What societal goals should we serve with data?

During the interviews we heard about a variety of goals including environmental sustainability, business sustainability, food safety and food security, knowledge and innovation. These goals all figured also in the personal values that respondents brought forwards. By asking about the societal goals that digital farming should serve, we want to ask them to think a little broader about their own role as citizens in serving societal goals. It is supposed to invite them to think beyond the limitations of their own lives and businesses or organizations and think a little broader about what accepting these technologies might mean to society.

> ‘You don’t earn a lot of money with it, but you do contribute to societal goals. Well, that is possible. But it depends a lot on the party that is behind it, what is the goal for which the data

will be used? There's a large difference between a commercial interest and a public interest, so this can have different effects.' (Farmer 2)

'How can you manage it in such a way, the development as well as the implementation, to serve certain public values which are actually locked up in different agenda's we have, so the crop protection agenda, the soil agenda, the manure agenda. Of course, the larger question about how we're going to feed 9 million people in the future, that's also where it all starts. But then it is no longer about the amount of food you're producing, but also about the preconditions under which you make them. This has to happen in a way which is sustainable for the environment, the climate etc. And then you see that technology is a way to realize those goals. So you try to work from a public value, and that is more than just taking care of a good competitive position and employment, but you also look at the value of nature and climate affairs, right.' (Ministry, policy maker)

b. Should the government be allowed access to data?

Many respondents see the advantages of sharing data. But they are also concerned about what happens when they do it. One of the concerns we came across had to do with the use governments can make of data. Initially this use of data seems unproblematic, as farmers are already obliged to give insight into data to show that they comply with the law. Generating these data automatically would just mean doing it more effectively. Yet, we saw that respondents also have some concerns about this.

'If you see the pesticide use go up for three years, you could say that the farmers start to use it more, that something is the matter, that this is not right and we need to make better policy to bring it down again. But if you see the story behind it, then you probably learn that these are environmentally friendly products and that you need more of it. (..) You need expertise, experts to explain to you what is going on until you can draw the right conclusions. (..) You can quickly draw the wrong conclusion if you just look at the data or to part of the dataset and you don't know the story that goes with it.' (Farmer 1)

'Yes, there are certain people who are not very happy with this. They are afraid that this information goes to the controlling organizations. There's always a kind of fear that something can happen, that something can change in the law and then... I have an example of that, yes, for example calf mortality. A year ago there was a riot about calf mortality, because we don't do it very well in the Netherlands, with calves. A relatively high percentage dies in the first two weeks. I believe. And then at a certain moment some people said: maybe we should do something about that and we should measure it. And if you have all that information and you know which farms are not doing very well, yes well, those farmers are not very happy with that. He doesn't even have the chance to do it right. If the data are accessible and available to the outside world and the farmer does not get the chance to improve, well yes, farmers are not happy with that. (Start-up 2)

Yet, members of the government see it as a chance to get digital data, which reveals whether farmers comply with the law but also gives insight into whether compliance with the law on pesticides has an effect on yield.

' Less pesticide-use, right. This is all already being registered, how many pesticides are being used and how much of each sort, so those are data. But we should collect these data systematically, so that we can say: look we're sparing pesticides and we have a higher yield, for look at the harvesting machines. They show that the yield is higher.' (Ministry, policy maker)

c. Several organizations and businesses (banks, insurance) make attractive offers to farmers in exchange for data that reveal how they treat the environment. What do you think of this idea? Whose role is it to foster environmental sustainability?

Our selection of respondents included also a bank, which develops a system that incentivizes farmers to share their data to show that they do efforts to serve the environment. The bank provides incentives by giving financial advantages to those who agree to share their data pointing out that they do effort to improve biodiversity, reach a higher level of nutrients in the ground or use less water. Our respondents also told about other companies, like insurance companies, who do similar things: they lower the premium of farmers who do well for the environment and who consent to share their data which give insight in how well they do. Endeavours such as these raise the question whether it is a good idea that various organizations take a role in fostering behaviour that protects the environment by asking for data and offer (financial) advantages in exchange.

> 'Those who are already performing well think, well yes, I get an advantage from this. So that seems reasonable, well, sensible. I don't have experience with that, but I can imagine that clients have to evaluate for themselves whether they are going to share it or not and look at this in the light of the financial advantage they can get with it. And they probably can make an estimation, like, well I am not eligible for that, or actually, it could lead to a disadvantage for me. And then they will probably not share. We have the approach that we give benefits to the businesses who do well, while we do not punish the businesses who don't do well.' (Bank)

d. *Open access to data does not necessarily lead to benefits for everyone. In practice, only people who possess the relevant technologies and expertise can do something with data. What is the appropriate answer to the social inequality between those who can and those who can't benefit from data?*

Many respondents bring forward concerns about new emerging social inequalities. Access to technology plays a large role in this inequality, as some people are able to buy digital technologies, use them and harvest benefits from them, while others cannot do that or live in an area without the necessary connectivity to use them. This makes the benefits they bring inaccessible to some people. Furthermore, there are concerns that some people who have access to large data reservoirs and who have the knowledge and expertise to do something with data, can earn a lot of benefits. But people who lack that knowledge and expertise cannot do that. For them it doesn't matter whether they have access to data or not, for they are unable to use them for their own benefit.

> 'Remotely you can look not just in one business, but into many. Before you had to go to that business to look, but now, if you are a specialist you can look into 10, 20, 100 businesses to whom you can offer your services. So if you specialize in this, it can be very profitable. But not everyone is a specialist.' (Researcher 1)

e. *The EU fosters the development of digital innovation hubs (DIH's). Who should be in charge of regional DIH's?*

Several respondents consider the question who should be in charge of the data, if they are brought together in a digital platform or library. Some think it should be a service for the common good and therefore the government should be in charge. However, there are also a lot of doubts about whether the government can be trusted to do that well.

> '(..) In fact it should be for the common good (..) It was like that with gas, with the electricity network. Those were all services for the common good. (..) But who should be in charge of that? That remains the question, right? You would give consent to the present government, but well, the government is also the most untrustworthy group we have on earth. Every four years we throw them out [after the elections, SvdB]. And then there is a completely new management team. The system works in that sense, we have a parliament and a senate, but how trustworthy is that government?' (Large tech company)

> 'Such a system would fall apart when there are large political changes. So, imagine something happens in a country... (..) Well that would be quite extreme, but (..) someone can come into office who says, well, this is nice, but we're going to do things differently in this country from now on.' (Start-up 3)

4. DISCUSSION AND CONCLUSION

It was our purpose in these interviews to find out what different stakeholders think about the data sharing future, what values play a role in their reflections and what societal issues they think should be solved. We succeeded in providing answers to these questions. Based on our analysis of the interviews we shaped four scenarios: (1) the ‘ I choose’ scenario in which farmers are granted maximum freedom (and responsibility) to decide with whom they want to share data, (2) a scenario in which data remain available for several (public and private) actors in a digital library, (3) a ‘laissez-faire’ scenario in which data sharing is organized by the market and (4) a scenario in which data are shared in the value chain. In addition to these scenarios we identified values that played a role in the stakeholders’ reflections, including values such as autonomy, trust, transparency, sustainability, safety and privacy, and we identified societal issues concerning the societal goals data sharing should serve, whether the government should have access to certain types of data and whether other organizations such as banks have the mandate to foster environmentally sustainable behaviour of farmers.

Based on this information, we have filled the cards. These cards allow to broaden and enrich the reflection of participants in the workshops we are going to do across the EU as they shed light on different possibilities for the future and allow people to use values and societal issues to think about their further development and value.

The study is however also limited. We did only 23 interviews with different stakeholders located in the Netherlands and Belgium. This gave us insight into diverse perspectives of people who have different roles, but does not shed light on whether and to what extent the perspectives of our interviewees are representative for other people with the same role in society. Nor do they provide insight into what people in other countries think about it, who have other socio-cultural and political backgrounds.

We tried to remedy these shortcomings by adding empty cards, which the participants of the workshops can fill. We made clear during the workshops that participants are free to use the cards as they want, combine them, change them, or ignore them all together. The cards offer chunks of input to reflection, that come from a particular context in the EU, which participants can use in the way they see fit. But they can also choose to follow their thinking in a different direction. The empty cards allow participants in the workshops to add their own scenarios, values or societal questions, if they like. The cards are therefore not limiting the course of thinking of participants in the workshop: they are meant to offer input to get the reflection of participants going and enrich it beyond the usual themes like ‘autonomous choice’, ‘ data ownership’ and ‘ privacy’. Participants can still focus on these themes, if they want. But the cards give also other input, therewith obliging participants to tell why they focus on these themes and leave others aside. This motivates people to weigh different values and give arguments for their preferences in the light of alternatives. If there are no alternatives, or people find it hard to imagine them, then it is difficult to do that. Yet, there are choices to be made which need careful reflection and argumentation. While the cards we made do not cover the whole spectrum of possibilities, we do think that they offer a valuable start for reflection.

5. APPENDIX

Interview guide

Interest in smart farming

- Could you explain the present interest in smart farming?
    - What goals does smart farming serve for farms?
    - Do you think smart farming serves societal goals too?
        - What goals?
    - Do you support these goals too?
        - Why?
        - Who else should –according to you- take charge of these societal goals?

Dealing with data at present

- Copa Cogeca developed this code of conduct for dealing with farm data (and LTO took part in shaping it). Could you tell me what the motivations were to make this code of conduct?
    - What goals is the code of conduct intended to serve?
    - What are experiences with the use of the code until now?
    - You involved different parties to shape the code of conduct, how were these selected?

- What data would you regard as 'sensitive' data, that farmers would rather not share? Why?
    - What makes these data sensitive?

- How is the code dealing at present with these 'sensitive data'?
    - Does it help to take protective measures? How? In what ways?
    - What do you think about the measures that you took? (Satisfied? Not satisfied? Why?)
    - What are –in your view- the ups and downs of these measures?

- Do the measures you took to protect sensitive data also impose limitations on possibilities to realize societal goals?
    - What do you think about these limitations? Are they in your opinion fair/just?

The data sharing network

- What actors are at present part of the data sharing network?
- Could you describe why these different actors are interested in the data?
- Are there other actors, beside the ones who are already part of the network, who have an interest in the data?
    - Would you allow them to have access? Why (not)?

- Copa Cogeca (or LTO) is there for farmers in Europe (or the Netherlands). Could Copa Cogeca use farm data to serve its ends?
    - To what ends could Copa Cogeca use farm data?
    - How would this serve farmers?
    - How would it serve the societal goals of farming?

Future possibilities

- Could you describe the ideal future situation of smart farming, say in 5, 10 or 20 years?
- Is this a realistic picture? Why (not)?
    - What do you consider facilitators/obstacles to realizing the ideal picture?

- Will all farms become 'smart'?

- What kind of farms will become 'smart'?
- Should they all become 'smart'?
- Is there a future for non-smart farms in your opinion?

- How will the data sharing network around smart farms evolve in the future?
  - Will there be new/other actors who will have access to data?
  - For what purposes would these actors use the data?
  - Would you think the use of data for these purposes are desirable/undesirable? Why?

Note for the interviewer: In this part, it is important to ask open questions. If the respondent cannot think of other actors who are interested to have access to farm data, the interviewer can go down this list and ask: should farmer's organizations have access to farm data? Why should they (not) have access? Etc....

Actor	**Has access to data Yes/no**	**Should have access to data Yes/no**	**Reason why they should (not) have access to data**
Farmers			
Farmers organizations			
Tech-service providers			
Venture capital firms			
Policy makers			
Universities/research centers (such as FAO, Godan)			
Retailers			
Consumers			
Banks			
Insurance companies			
NGO's (organizations interested in protecton of environment, animal welfare, food security etc.)			
Certifying bodies			

<u>Sensitivity of data</u>
For the interviewer: In the previous, the respondent may have said that some actors should, and others should not have access to data and they have given reasons for that. Here we want to ask a little further about these reasons that they put forwards.

- In the previous you have said that you'd rather not share data with actor.....and.... in the future. How would you characterize the use that these actors make of data? What type of use would you rather prevent?
- Would you consider this mis-use of data? Why?

- Are all data shared within the network equally sensitive to this type of mis-use?
- What type of data is sensitive to mis-use, what data are not?
- What makes data sensitive for mis-use?

Purposes for which data can be used in the future

For the interviewer: please ask further about the types of purposes data can be used for, and the type of purposes they cannot be used for.

- In the previous you have characterized mis-use. Are there also purposes that you consider good, and for which data *can* be accessed and used in your preferred future?
- Can data be used ...
    - to increase production
    - to increase the quality of the products
    - to earn more money
    - to do research?
    - to inform public policy?
    - to inform consumers?
    - to realize sustainable development goals?
    - to check whether farms live up to requirements set by regulation?
    - to judge whether a farm complies with requirements of certification
    - to realize food safety
    - other goals?

- Do the same restrictions on the use of data should count for all possible actors, or are there differences? What are the similarities/differences?
- If you consider the societal goals that smart farming serves, what actors would then need to have access to farm data?
- Are there some actors who in your view should have more rights to access and use farm data than others? Why?
    - Who do you think should have more rights than others? Why?
    - Do you think they have these rights at present? (Would you like to change this in the future? Why?)
    - Are there people whom you would rather not give access to farm data? Do they have access now? Would you like to change this in the future?

Future users of data

- How do you imagine the future of farm data management?
    - Will it continue to be organized by contracts between individual partners? Or is a more encompassing data management needed?

For the interviewer: please let the interviewee imagine for him or herself, but if he or she has no imaginations, you could suggest different images and ask the interviewee whether this would give a good model to think about data management in the future.

Would you imagine it like:

- A library, where different parties can borrow data to serve societal purposes, and which functions according to specific restrictions
- Individual passports in which it is noted what use can be made of the data of individual parties
- Similar to an international banking system, where little banks cooperate and become larger ones
- In a different way?
- What would be pros and cons of these different ways to organize data management for individual farmers?
- And for the realization of the societal goals of smart farming?

Future preconditions for using farm data

- Should there be preconditions for using the data in your future imagination?
    - What kind of preconditions? Why these? Are these the same that Copa Cogeca suggests in the code of conduct?
    - Would you imagine additional preconditions?
- Should actors who have access to data also give something in return?
    - Such as, contribute to the reservoir of data
    - Pay for the data
    - Be transparent about the purposes for which they use data (to whom?)
    - Share results of their research carried out on the basis of data (to whom?)

- Should actors who want to use data (like universities, research centres, companies) ask for consent?
    - To whom should they ask for consent?
    - If data used are old, should consent still be asked? To whom?

- If data are stored and reused, for example after 5 or 10 or 20 years, should the farmer be notified then? And asked for consent for re-use?