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The emerging issue of "digitalization" of agriculture

When the IAASTD Report was written, digitalization of the agro-food sector was not yet on the 'transformation' agenda. While some digital and robotic tools were already being applied and tried in agriculture at that time (e.g. automated milking machines[1]), new digital possibilities had just begun to emerge. The fast and far reaching technological advances in the IT and telecom sector allowed the convergence of various business fields which rely on complex algorithms, data collection and storage, pervasive network access and constantly accelerating connection speeds.

Digitalization in conventional agriculture mostly aims to capture the global agro-food production system by radically automating and digitally connecting farming and processing operations and replacing humans, i.e. eliminating farmers. Although the projected increases in efficiency of the typical industrial inputs in conventional agriculture may materialize, the 'disruptive' power of this form of digitalization at all levels (agronomic, scientific, ecological, social, economic, cultural, etc.) remains underestimated and under-recognized. Since the publication of the IAASTD, the sheer unlimited possibilities for capture and disruption have begun to unfold – and with them the dystopian or utopian visions for the transformation of our future global agro-food systems. But as with all technology pushes, their potential risks and benefits depend entirely on the context of their application. Hence, the first and key question in any debate about digitalization of agriculture is: of which form of agriculture: conventional, industrial, ecological, traditional, all or some of these?

If digitalization is seen as a driver of agriculture, farmers become mere sources of raw material, i.e. data.

We do not offer here a systematic analysis of the various risks and consequences of digitalization in conventional, industrial forms of agriculture, but we wish to outline the critical aspects that must be considered in the digitalization of agroecological forms of farming. We believe that digitalization can be compatible with and support agroecological farming, yet it requires an entirely different approach from the one currently applied by the actors in conventional agriculture (see also Ajena 2018 for more details on this issue). In the following paragraphs, we briefly present a framework that delineates how key elements related to digitalization could be conceptualized in order to support agroecology. We align our contribution with five of the ten elements of agroecology identified by the Food and Agriculture Organisation (FAO) of the United Nations (UN). For each of these five elements, we contrast the different modes of digitalization in conventional versus agroecological systems.

1. One-size-fits-all versus integration of diversity

Conventional: Digital tools are marketed under the typical decontextualized top-down and 'one size fits all' formula, which fails to address diversity and context sensitivity, and seeks to enable 'disruptive business models based on data and platforms' (e.g. Bayer 2018 Example Crop Science: Outcome-based business models 'One size fits all'[2])

Agroecology: Avoiding the narrowness of single IT solutions by integrating diverse and appropriate ICT platforms and applications that are either already available or are developed in participatory fashion (see 2. below) and that are relevant in a specific context, favoring adaptation and interoperability.

2. Data mining versus sharing of knowledge

Conventional: Farmers are considered as clients of prepackaged, top-down 'solutions' by unknown 'expert' sources. These sources are often algorithms which mine and process large quantities of data related to and extracted from farming operations, to finally deliver statistical indicators which may or may not agree with a farmer's knowledge or experience and offer single (input) recipe solutions. If digitalization is considered as a driver of agriculture, farmers become mere sources of raw material, i.e. data, as well as algorithmically driven operators, thereby devaluing and endangering the continuity of their local and tacit knowledge.

Agroecology: Harnessing the full interactive potential of digital technologies and networks, by enabling and harmonizing bottom-up (farmers to experts), top-down (experts to farmers), and horizontal (peer to peer) modes of communication, co-production and dissemination of knowledge. Farmers are fully recognized as originators and co-creators of knowledge, which can be fruitfully enhanced through co-development with other actors. Farmers are also considered as co-designers, co-implementers and co-evaluators of technological platforms in the context of agroecology, by including their input and participation at every step of the ICT cycle

3. Vulnerability versus resilience

Conventional: Business models are often based on farmers' dependency on external inputs, including data, energy and ICT devices. Such dependencies may lock farmers within closed solution pathways that fundamentally undermine resilience, while increasing their vulnerability to the effects of possible disruptions.

Agroecology: Designing robust ICT tools and platforms that can adapt to specific environments, as well as resilient solutions that support and encourage farmers' abilities to acquire and share knowledge, carry out autonomous research and strengthen their social networks. Avoiding the creation or intensification of farmers' dependency on prepackaged information, monetized loops and external inputs.

4. Drudgery and hardship versus human and social values

Conventional: Farmers are often regarded as inefficient and unreliable, and farm work as drudgery and hardship. Consequently, replacing their work by algorithms and ICT devices is pitched as desirable. Moreover, farmers and farming

operations are considered as mere sources for data extraction, as well as targets of digital surveillance schemes. Context-based social values are not understood as important elements of agriculture, and therefore not considered in the development of ICTs.
Agroecology: Respecting the integrity of farmers and their communities, as well as their ecosystems, by placing them at the centre, and avoiding socially and ecologically disruptive practices. Promoting farmers' full ownership of tools, methodologies and data, by integrating their views, ideas and values at every step of the ICT cycle. If farmers are compensated properly for their work and investments, they have the means to mechanize and get help for their operations.

5. Startup impact investment versus circular and solidarity economy
Conventional: ICTs are developed typically by following the startup model, and, therefore, tend to contradict circular and solidarity economy principles. ICTs are targets for impact investment with quick and sizable returns.
Agroecology: Embracing the principles of circular and solidarity economy by minimizing the usage of technological resources and waste, and maximizing their potential, as well as emphasizing reciprocal, non-competitive and for-benefit principles.

Endnotes

1 https://www.lely.com/farming-insights/robotic-milking-concept/
2 Baumann 2018. Bayer_CMD_London_2018-12-05_Investor_Handout_Group-1-https://www.investor.bayer.de/de/nc/events/archiv/2018/capital-markets-day-2018-london/

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