

Work organization and integrated management of animal health: What connections do they have?

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Abstract: This WOS & ScienceDirect literature review explored connections between work organization in livestock farming systems and integrated management of animal health. Only 18 articles connected the two themes: precision livestock production, includes health monitoring and changes farm and work management, and the impacts of practices (the work organization component) on one disease or practices to reduce antibiotic use.

Keywords: animal health, work organization, livestock system, integrated management, holistic approach

Introduction

Society expects an agroecological transition. One pillar to reach the agroecological transition refers to integrated management of animal health (*i.e.* with more preventive practices, including contributions from feeding or selection practices, rather than only veterinary ones) (Dumont *et al.*, 2013). Changing practices means changing work organization within a farming system (who does what: tasks associated with a given practice, when, and with what skills). However, work organization also depends on factors besides livestock system management (*e.g.* workforce, mechanization, combined activities, dimension) that can put pressure on the tasks (*i.e.* set of adopted practices) to be done. Interactions between livestock farmers' work organization and livestock farming practices need to be studied to understand how to improve animal health management in an integrated way. Because of the lack of studies on this subject, we reviewed the literature to identify what connections exist between these themes.

Method

The approach aimed to identify the literature on three subjects: (i) work organization and (ii) integrated management of animal health in livestock farming systems and (iii) the connections between them. The literature was reviewed using the ScienceDirect and Web of Science platforms. ScienceDirect provided scientific articles on medicine and health issues, while the Web of Science provided articles on agriculture and work studies in livestock farming systems. We selected only research articles from 1992 (beginning of the relevant data collected by the platforms on the subject) to July 2020 (end of the bibliometric research). Two queries (Q1 and Q2; Table 1) were performed using keywords, identified from fine-scale research, that led to work organization and integrated management of animal health, respectively. Combining queries Q1 and Q2 did not identify any articles; thus, we performed a third query (Q3; Table 1) that defined integrated management of animal health as a way to manage health with low inputs (Dumont *et al.*, 2013).

Results

Q1, which focused on work organization, identified 66 articles, of which 43 contained data from surveys of farmers (*i.e.* characterizing the diversity of practices and management, which are components of work organization). It highlighted a French community of researchers of livestock farming systems. Only 6 articles addressed health dimensions, through three main topics: (i) how farmers' practices can prevent a disease or decrease antibiotic use, (ii) farmers' tasks and work organization on farms using new precision technologies (sensors, robotics) and (iii) differences between advisers' or veterinarians' recommendations and farmers' practices, and how to fill the gap between them, because they do not always share the same viewpoint (Duval *et al.*, 2017).

Q2, which focused on integrated management of animal health, identified 83 articles (76 on ScienceDirect). They addressed three main topics: (i) surveys to identify what practices farmers use to cure or prevent a particular disease, (ii) animal health management in specific systems (organic farms or smallholders) in a specific area (tropics, Mediterranean countries) and (iii) conceptual articles defining what integrated management of animal health or the One Health concept mean within the food chain from farmers to consumers. Transversal analysis of these articles led to four definitions of integrated management of animal health: (i) a holistic approach to herd health management (Bouy *et al.*, 2015), (ii) how farmers combine preventive and curative actions without using drugs (if possible) or using specific drugs (Dumont *et al.*, 2013), (iii) a framework of knowledge and practices that livestock farmers use to balance the biological system or restore it after disturbances (Fortun-Lamothe *et al.*, 2017) and (iv) implementation of the ecopathology concept, which is the understanding of the association of disease risk factors (Lacombe *et al.*, 2016).

Q3 identified 18 articles, of which 17 were surveys. They highlighted (i) the influence of advisers and veterinarians on farmers' practices for a given disease or on antibiotic use, (ii) how new technologies change work organization and health monitoring, and (iii) how farmers manage a given disease. In the two last topics, two types of health approaches coexist: focus (i) on a given disease or (ii) on a holistic approach, by studying the influence of precision livestock production on overall management of health issues.

Query	Keywords	Total	Review	Surveys	Modelling
Q1	("work organization" OR "herd management" OR "farmers' practices" OR "farmers' skills" OR "farmers' knowledge" OR "farmers' tasks") AND ("livestock farming system" OR "livestock farm" OR "livestock system" OR "cattle system")	66	16	43	7
Q2	animal health AND ("management" OR "planning" OR "decision making") AND ("preventive medicine" OR "alternative medicine" OR "holistic approach") AND (livestock OR cattle)	83	22	61	0
Q3	"low input" AND "animal health management" AND ("work organization" OR "labor organization") AND (cow OR cattle OR livestock OR dairy) AND (farmer OR advisor)	18	1	17	0

Table 1. The queries used and the number of each type of article obtained from them;

Conclusion

The literature review indicated that work organization and integrated animal health management are related through specific themes, such as (i) precision livestock production and new technologies on

farms and (ii) the gap between health advisers' recommendations and farmers' actions. The other articles focus only on a given disease or problem (*i.e.* parasitism) or practice (antibiotic use) based on farmers' practices during the curative step. We found no framework that connected the two topics directly, such as (i) health within the overall management of farms and (ii) observation and monitoring tasks to prevent or cure disease. Developing this framework will be the goal of the first author's Ph.D. research, based on on-farm monitoring in western France, the most important region of animal production in France, with a high diversity of farming systems.

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