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The models of work in approaches to livestock farming systems

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Abstract. In France, several work models, which underlie research and tools for "work advice", coexist in approaches to analyse how livestock farming systems (LFS) function. We describe three models: "resource work", "organised work", "work and subjectivity" and specify the way in which LFS research has mobilised social science disciplines to construct them. We illustrate how they complement each other to examine the transformations in livestock farming systems, the ways in which the farming activity is carried out, the conceptions of work, as well as the workforce and technical systems.

Keywords. Livestock farming – Work – Models – Organization – Duration.

Les modèles du travail en élevage

Résumé. *Plusieurs modèles du travail coexistent en France dans les démarches d'analyse du fonctionnement des systèmes d'élevage qui sous-tendent les recherches et les outils de "conseil travail". Nous décrivons ces modèles "travail ressource", "travail organisé", "travail et subjectivité", notamment la façon dont la zootechnie des systèmes d'élevage a mobilisé des disciplines de sciences sociales. Nous illustrons leurs complémentarités pour raisonner les transformations de l'élevage, à la fois transformations des formes d'exercice de l'activité agricole, des conceptions du travail, de la main-d'œuvre et des systèmes techniques.*

Mots-clés. *Elevage – Travail – Modèles – Organisation – Temps de travaux.*

I – Introduction

Integrating the work dimension into the analysis of how livestock farming systems function goes back twenty years or more in France. It has two notable characteristics: the first is that it questioned the livestock farming system concept itself, and the second is that it was based on a virtually permanent to and fro between research and development. The first characteristic arose from an explicit request from farmers who had indicated the partial and insufficient nature of representations of livestock farming systems that focused on the interactions between a decisional sub-model and a sub-model elaborating technical performances as proposed by Landais (1987). These farmers in the Massif Central (Center France) closely related the specificity of certain livestock management choices (whole year lambings, light lambs sales) and the fragility of their mixed systems, associating dairy cows and ewes, with the problems of work (Dedieu *et al.,* 1992). In fact the livestock farming models of the time had hardly any viewpoint on work, except as a structural detail, linked to economic approaches, in the form of quantification of the workforce present [UTA (annual work unit), UTH, (human worker unit) UMO (manpower unit), etc.]. The second characteristic is that of a dynamic closely associating research and extension and particularly the INRA and the Institut de l'Elevage. This partnership is described by Kling *et al.* (2010). We underline here two important features: (i) a common questioning as to the necessity of renewing together not only the research models but also the methods and tools of guidance for advisers; and (ii) a strong interest shown by the farmers interviewed (and there will have been several thousand of them) in tackling their farming system

by shedding light on their work, independently of the evolution of subjects that have mobilised R&E for the past 20 years (extensification, quality, multifunctionality, livestock and environment etc.).

During this period, research into livestock farming systems (LFS) radically renewed its ways of characterising and evaluating its central subject (herd management and resources that are allocated to it, its determinants and its consequences) as well as its relations with social sciences (Gibon *et al*., 1999). In France, the theme of work was one of the fundamental aspects of this renewal. We describe in this article the major models of work with livestock which coexist at the present time in the community of researchers and extension agents who are interested in livestock in the farm enterprise. Our work base is threefold: the scientific publications which have marked different stages of evolution of the work representation framework; a wide knowledge of the methods and tools constructed and used in the framework of advice (Collectif, 2009); our expertise as actors in the research and extension partnership. When talking of "models", the term is used here not in the mathematical or reference system sense, but as a "stylised framework of thought", which generates questionings, distinct issues of collaborations, and which proposes a different look at herd management and more generally the management of transformations which affect this sector. We do not claim to present an exhaustive range of viewpoints, or to take account of all the disciplinary progress on the theme of work. We have extracted here a few polarities in debates on how to tackle "work in livestock farming" in France.

II – Three "livestock management- work" models

The "systemic agronomy" was a precursor of approaches associating technical vision and formalised questions about work (Sebillotte, 1986). The OTELO model, a strong mix of agronomy and management sciences (Attonaty *et al*., 1987), was a very accomplished attempt to analyse and model the interactions between technical choices, days available and work (manpower, mechanisation and worksite output) at peak periods in the cropping calendar. OTELO is a simulator that is still used by agronomists to estimate the room for manœuvre available to farmers to change one practice or another. In LFS approaches, the objective was to reveal the consistencies in decisions, livestock farming practices and work but at the scale of a farm year, and not just at periods of strong competition between tasks. Moreover, livestock farming is marked by considerable activity on a daily basis which cannot be put off (Madelrieux and Dedieu, 2008) which is not found in main crops. To understand and reason the competition between types of tasks according to their rhythm and their capacity for being put off is one of the issues of the study of work in livestock farming. LFS scientists have therefore chosen other conceptual ways and have mobilised other frameworks of social sciences.

We distinguish three models of work in livestock farming that we call: "work as a resource", "work as an organisation", "work and subjectivity". Their order of presentation has only very partially a chronological aspect and the three models coexist today as the foundations of a wide variety of methods and tools for advice (Collectif, 2009 ; Cournut *et al.*, 2010).

1. The "work as a resource" model

When viewing the farm as an enterprise, and the livestock farming system as the "man - herd - resources" triptych (Dedieu *et al.*, 2008), work is a resource which must be optimised in the framework of a farmer project aimed at economic excellence. This approach is of course very much inspired by economics, for which work is an essential production factor whose effectiveness can be followed and evaluated with combined performance indicators, its variation factors identified and its improvement sought.

For economists, the efficiency and/or productivity of work is most often measured by dimension ratios (Livestock Unit, Agricultural Area) brought to times of work. One way of quantifying work

duration is to take as the base the "full time equivalent" Annual Work Unit. Given the very crude and prescriptive nature of the value of the denominator, these types of ratios do not give a precise evaluation of efficiency. In the late 1980s, economists (in particular Jean *et al.*, 1988 ; Brangeon and Jegouzo, 1988) studied the durations and intensity of farming work, paying particular attention to the livestock farm (herbivore, pigs) with the aim of comparing them with other professional categories. The time budget and work budget were then the reference methods. Lacroix and Mollard (1991) made a comparative analysis of declarative approaches, by timing and recording farmers (budgets) on criteria of accuracy and reliability, and also on their selectivity. They proposed a method of "analytical reconstitution" for the estimation of working times. Its pragmatic character (by declaration) and its accuracy (on the basis of temporal markers making it possible to limit risks of inaccurate memory) greatly inspired the Work Assessment method (Dedieu *et al*., 1993) which quantifies working times devoted to implementing livestock and land management practices.

So the approaches developed in the resource work model sought for greater accuracy in the estimation of work duration and the appreciation of work-livestock effectiveness by ratios such as: "work duration over the year/production unit" for example in hours per sow (Salaün, 2008); in hours of routine work per dairy cow or per ewe; in number of days of seasonal work per hectare in herbivores, where non differable (routine) and differable (seasonal) ryhtms of tasks have always been distinguished. The analysis of the indicator value dispersion (Fig. 1) and the identification of its causes constitute the first line of progress.

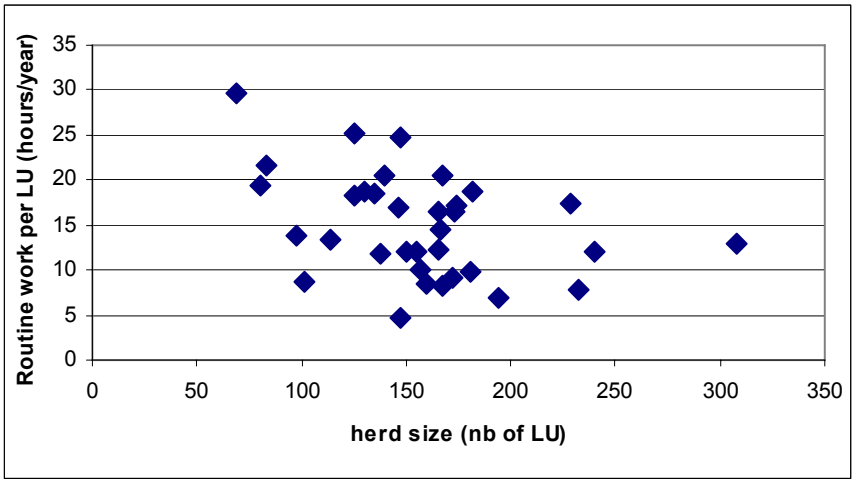


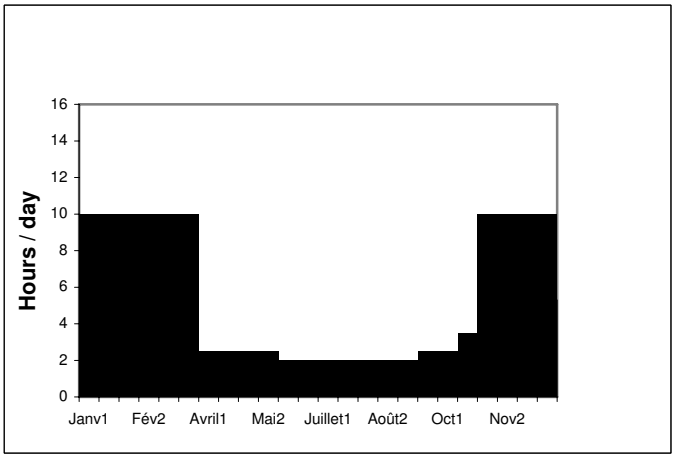
Fig. 1. Herd size and efficiency of the total beef cattle routine work in a sample of large herds (Cournut *et al.*, 2009).

These approaches have two major characteristics. On the one hand, the different elementary tasks which make up the routine work (RW) or the seasonal work in herbivores, and the total work in monogastric farms as well as the various workers (permanent or occasional, paid or voluntary) are considered as being able to be added together. On the other hand, the herd management appears:

(i) either as the expression of a production system (breeder *vs* breeder-fattener in pigs or beef cattle for example) whose definition will make it possible to differentiate the ad hoc system of reference for the comparative analysis and the establishment of margins for progress;

(ii) or as one of the variation factors of annual working times (Fig. 2). The essential part of

the margins for improvement resides in the categorisation and study of specific work posts whose variability is established at grass roots level (milking, the lambing period) and the gains in productivity that are potentially easier to obtain. The analyses then focus on the implementation of practices in their environment (milking parlour, calving barn, etc.).

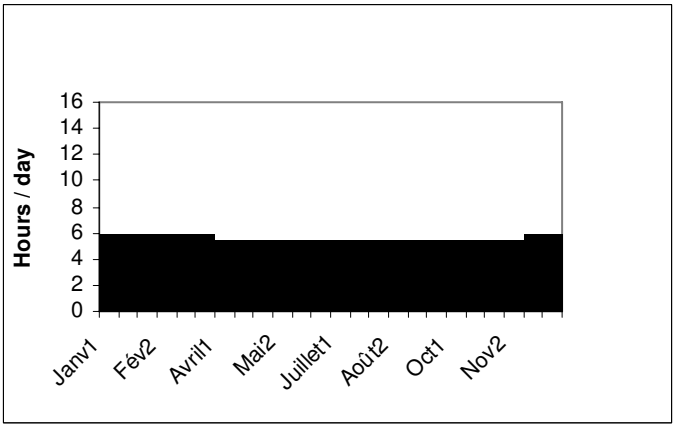


U-shaped profile

Long summer period: 7 to 8 months

Very marked break of RW duration with the winter period which is quite short (4 to 5 months)

This farm in the Limousin is characterised by calvings grouped in the autumn – early winter with a farmer receiving good help from his volunteer retired father in the winter



Flat profile

No significant modification of the RW over the year

This farm in the Pyrénées-Atlantiques is characterised by calving spread out over the whole year with the farmer working alone

Fig. 2. Two evolution profiles of annual routine work, in relation with reproduction management (Cournut *et al.*, 2009).

2. Work as an organisation: A complex system of activities over time

This work model takes account of the farmer's project in his economic dimension but also his search for "quality of life". It comes within the association, promoted by the professional Livestock Institutes Networks, of the terms "viable" and "liveable", the latter of the two now often amounting to the search for time kept for something other than the farming activity. Work is seen as an organisation and formalised as a system of interactions between herd managements, equipment and buildings, the workforce and the other activities (including private activities which may be the pivot of the organisation) (Madelrieux *et al.*, 2009). This system of interactions is pressurized by the dimensioning of activities, of the composition – and expectations – of the organising kernel of the work and the issues of technical changes.

This model is largely derived from studies by ergonomists. We can quote the studies by Cellier and Marquié (1984) and by Bages and Rieu Gout (1981) in dairy ewe farms in the Roquefort area, which were a strong source of inspiration because these authors had identified the problem of structuring activities which have very varied temporal characteristics (rhythms, possibility of putting off an activity), which will become the routine work (daily, not able to be put off or concentrated) and the seasonal work in a first stage, then a more detailed elaborated categorisation (activities with daily and non daily rhythms), according to Madelrieux *et al.*, 2006 (Table 1).

Table 1. Activity typology according to the temporal characteristic of their task (Madelrieux *et al.*, 2006)

Activity with a daily rhythm	Fixed position in the day → activity with fixed daily routine (e.g. : milking)		
	Position not "fixed" in the day	Linked to the possible deferability of a task whose positioning depends on the farmer → free daily routine activity (e.g.: taking water to the animals in the enclosure)	
		Linked to the unpredictable nature of the positioning of the task, a task which cannot be put off, the activity is under conditions → activity of the "fire fighter" (e.g.: selling direct from the farm, variable according to the presence and number of clients)	
Activity with a non daily rhythm (ANQ)	Of an occasional type	Repeated	Not able to be put off → non daily routine activity (e.g.: work on station 5 days a week, selling on the market 1 day a week)
			Can be put off → activity of the "repeated manipulation" (e.g.: visit to the animals at summer pasture once a week)
		Single → activity of the "manipulation" type (e.g.: prophylaxis)	
	Of the interval type with deadlines	Deadlines at start and end and during this interval: accomplishment of the task to its end; not able to be put off → activity of the "worksite" (e.g.: manure spreading)	
		Deadline defined from which accomplishment of the task to its end; cannot be put off → activity of the "harvest" (e.g.: hay-making, harvest)	
		Accomplishment of the task until its end before a defined end deadline ; cannot be put off → activity of the "preparation" (e.g.: preparation of paddocks, equipment…)	
		Deadline of start and end and, during this interval, the farmer accomplishes what he can of the task; can be put off → activity of the "maintenance" (e.g.: clearing scrub)	

In this work model, the livestock farm management can be adjusted and adapted in an explicit way, like the other levers (workforce, equipment, etc.). The adoption of particular techniques (once-a-day milking, for example) or even the reconfiguration of the livestock system (for example the consequences on reproduction, replacement and feed practices of concentrating calvings to close the milking parlour) (Cournut and Dedieu, 2005; Hostiou and Dedieu, 2011), aim at changing the work organisation. Tasks and workers can no longer be added together, the tasks are considered according to their temporal characteristics, the workers according to their commitment in the farming activity (the base unit), the way in which their work is recompensed (gift, work, money in the Work Assessment) and by their central role or not (the organising kernel) in the choices of work organisation. In these approaches, the task-worker associations (the work activities of the ergonomists) become the elementary bricks of the "work" system still reasoned at year scale. The year becomes a chain of periods with different and evolving issues and characteristics of organisation (Fig. 3). The methods that operationalize this type of model propose quantitative or qualitative indicators (for example the proportion of mutual help in carrying out the seasonal work, description of typical days with and without the temporary employee) to take account of the organisation and appreciate the tensions and margins for manoeuvre.

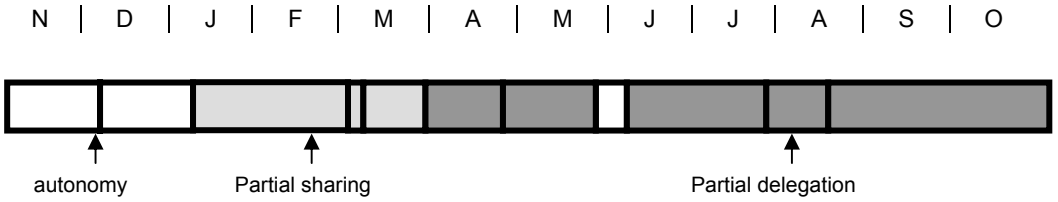


Fig. 3. Profile of chain of organisational sequences over a year: evolution of the degree of involvement of the organising kernel in the non-daily activities (example of a farmer in the North Alps - Madelrieux *et al.*, 2009).

3. Work and subjectivity: the subjective rationalities of the work

This model is centred on the man, his subjectivity, what he brings into play in the work and what the work enables him to be and become. This comes within all the viewpoints of sociologists and psycho-sociologists about work (Dufour and Dedieu, 2011). What interests us here is the original way of questioning the content of the actual work, linked to herd management choices. Inspired by work by Dejours (2003), the approach formalises the subjective reasons for "working", in reference to economic, relational and identity rationalities.

It is in reference to these rationalities that certain livestock farming practices (castration, bottle feeding, herding…) and the consistencies of certain production systems qualified for example as "industrial", "organic", "multiple job holding" (Porcher, 2001; 2008) are looked at again, as to the satisfaction they give or how they harm deep-seated reasons for "being a livestock farmer". Fiorelli *et al.,* (2010) place in relationship the rationalities of the work and its organisation via a qualification grid of the rationalities and the identification of what, for the people, constitutes the pivot or lever in this organisation. It takes into account the need for money, the taste for technology, the search for a professional identity, the way in which the body itself is called upon, and finally the relations with others, and with the animals (Table 2). Work organisation is envisaged at the scale of the year via the characteristics and relations between farming activity and other activities, management of working and non working time, dimensioning of activities, management of the workforce, livestock farming technical choices. The pivot characteristic means that these components are not adjustable unlike the "lever" characteristic.

Table 2. The five subjective rationalities in work. Example of a multiple job holding farmer (sheep-farming and earth-moving work) (Fiorelli *et al.*, 2007) (≠ : in opposition with earth-moving activity ; = as earth-moving activity)

Subjective Rationalities	Farmer's appreciations
Economical	An uncertain, unpredictable income, difficult to obtain ≠ earth-moving An income to repay property loans, not for the family
Identity	The pride of heading such a large property after setting out with nothing The heady feeling of always undertaking more = earth-moving
Technical	Acquiring equipment to spend the least time possible on work : as it doesn't pay too much, better not spend too long on it
Relational	Working alone = earth-moving
Body commitment	Hard work ≠ earth-moving

III - Consequences on the study of livestock farming systems

This very summary presentation of the models emphasises three ways of developing the interactions between the notions of work and livestock farming systems whose differences are focused on numerous points. The first concerns the contour of the system studied, the second the human base of the livestock system and the third the way of considering livestock management itself.

1. The contour of the system studied

The "work as a resource" model is in fact very much focused on the livestock activity and very strongly on its competitiveness. The "work as an organisation" model places the farming activity in relation with all the others (economic and private) which influence this organisation (even including football on Sunday afternoon, which can play a role in the abandonment of Sunday evening milking). The "work and subjectivity" model can take an interest in other activities (agricultural or not) (see above) or ignore their existence (Porcher, 2001).

2. The human base of the livestock system

The differences focus on:

(i) The definition of the objectives assigned to the livestock activity: to produce more efficiently; a system that is viable, liveable and reproducible; to find fulfilment in work.

(ii) Qualification markers, indicators to appreciate the room for manœuvre and regulations of the organisation, indicators of work efficiency, etc.

(iii) What defines "the livestock farmer". He is a technical-economic manager, a work organiser and a sensitive worker by turns in each of the three models. In the first case, he represents "the family" in a simplified form of the family-farm of Osty (1978). In the second case, "the livestock farmer" is a collection of people whose combination of activities and expectations for non-work define the organisation framework of the farming work. In the third case, each person is unique, whatever his professional status (farmer, spouse, farm worker, etc.).

3. Livestock farm management

The expression of farm management varies according to the different models: a production system; a set of practices in the annual calendar, generating tasks with a daily and non-daily rhythm, that can be more or less put off; emblematic practices given to people by working with livestock.

In the majority of applications of the "resource" model, management participates in the prescribed work; it is defined in comparison with economic, regulatory and sector imperatives. The debate about effectiveness then centres on automation and rationalisation of the use of manpower. In the model of organised work, livestock management is one of the elements of the work system, one of the levers of work organisation. It can therefore be adapted according to the evolution of the challenges of this organisation and according to the possibilities or the desire of the farmers to manipulate the other levers. The simplification of livestock managements is often the case of farms with moderate capacities for investment in equipment and buildings or of taking on staff (Cournut *et al.*, 2008) or for whom low indebtedness and autonomy in work are primordial.

With regard to technical innovation, work can be a limiting resource, "a brake" on the adoption of innovative technical systems (for example Mak, 2001). For the organised work model (Madelrieux and Dedieu, 2008) the technical system is at the crossroads between the performance development scheme and the work organisation. The processes designing innovative systems must therefore be able to integrate this essential component of plasticity

(Beguin, 2007 ; Hostiou and Dedieu, 2009) : is there a dedicated work organisation or does the technical system authorise a wide range of work organisations? For the "work and subjectivity" model, the innovations can be analysed as to how they limit or increase suffering at work for certain people, because they materialize the animal, unlike what is at issue in relational rationalities, or because they modify the body itself at work.

IV - Linking these models…

The models even make their mark on methods and operational tools. However, they are often very widely inspired by a single model. For example, "EPI work" (Chauvat and Serviere, 2009) intended to accompany installation projects is very close to the ATELAGE model which is emblematic of the approach of work as an organisation (Madelrieux *et al.,* 2006). The ACTEL approach (improvement of working conditions in a dairy farm) (Collectif, 2009) is based on the work-resource developments of the Work Assessment method.

In a context of mutations of work collectives, of continual enlargement of the dimensions of livestock farms, of evolution of relationships at work, the future of study and research on work in livestock farming rests on our capacities to integrate the three dimensions: economic competitiveness, controlled organisation to make livestock coexist with other activities (week-ends and holidays have become a new standard of "working well") and finally, the sense as to what is still a life-time commitment and a very specific way of relating to the animal. The Work Assessment enriched the work as a resource and as an organisation models (Dedieu and Servière, 1999). These bridges are today reinforced by new methodological proposals (Hostiou and Dedieu 2010). New approaches are attempting to build bridges between the organised work and work and subjectivity models (Fiorelli *et al.*, 2010).

Sociologists emphasise the diversity of conceptions of work (difficult, organised, impassioned) (Dufour *et al.*, 2007), of conceptions of one's job (businessmen/artisans/herdsmen) (Commandeur, 2005) and indicate new ways in the livestock world of looking at the workforce and work statutes in agriculture (association, salaried staff). The contribution of sociology is essential for understanding the dynamics of norms of work, the job and the organisational choices of livestock farmers. Thus for instance, the permanent paid worker often comes within a dynamic and in representations that are "entrepreneurial", corresponding to the resource-work model. But the analysis of the brakes on recourse to this manpower makes it necessary to identify how paid workers fit into an annual organisation of work (weekends, holidays, work entrusted and work reserved) and what personal satisfaction and what recognition are to be found in the occupations of paid farm workers today.

Another line of thought is the joint application of these models in the framework of two archetypes of the conception of livestock systems (Meynard *et al.*, 2006):

(i) Improving the existing situation (stable conception) with expectations of greater efficiency of work, less hard work, more room for manœuvre or the elimination of practices that people judge negatively,

(ii) Changing the system (innovative conception) with the search for new internal consistencies between livestock management, work collectives, combinations of activities and paying attention to the subjectivity and values of the workers (Beguin, 2011).

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