

Work organisation in livestock farms and farm liveability: Research findings from France

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Abstract: *Qualifying the liveability of livestock farms from the work viewpoint is becoming an important issue in the present context of serious questioning regarding the replacement of livestock farmers. We analysed the diversity of work organisation in 640 French livestock farms from varied production sectors (herbivore and monogastric) and we assessed their liveability. For this, we used the Work Assessment method, which quantifies the work duration and evaluates room for manoeuvre time for farmers (called "Calculated Time Available": CTA) which we use as a liveability indicator. We show that the livestock farm's productive orientation, associated with the number of permanent workers, has a profound influence on the structure of work organisation and conditions the room for manoeuvre in terms of time. We built archetypes for work organisation which represent the dominant work organisation form in each sector, and described their specificities. We discussed the contributions of such results for Extension and Development*

Keywords: *livestock farming, work organisation, assessment method, liveability indicator*

Introduction

In France, questions related to work are now critical for the future of livestock farming activities. Expectations in terms of liveability are increasingly expressed by farmers within a context of society and market pressures on production processes and profound changes in farming itself (size of farms, workforce, off-farm activities, Johnsen 2004), meaning that working conditions and the effectiveness of work organisation are critical issues today. Labour issues have become a brake on the setting-up and maintenance of livestock farms. In this context, qualifying the liveability of livestock farms from the work viewpoint is becoming an important issue

Various methods provide approaches to work, depending on the work dimensions questioned (productivity, duration, hardness of the work, representations, expectations ...) and the disciplinary frameworks developed (Madelrieux et al, 2008, Cournut et al, 2006). The Work Assessment (Dedieu et al 2000) is a method for analysing work specific to livestock developed by livestock farming system researchers. The goal is to quantify the work linked to the management of the herds and lands and to evaluate the room for manoeuvre time for farmers (called "Calculated Time Available" : CTA) which we will take as a liveability indicator. This method is used in the context of advice, helping livestock farmers to think about improving the work organisation on their farm. Work time reference systems by type of farm were constructed from Work Assessments carried out in recent years (more than 3000) (Caramelle-Holtz et al, 2004). The different studies showed empirically that the liveability threshold for a French livestock farm was set at between 900 and 1000 hours per year and per permanent worker (Murat C, 2004). Beyond 900 h the situation is considered as being more difficult to endure.

In the framework of the Mixed Technological Network (RMT) Work in Livestock Farming which brings together various partners in research, development and training around the theme of work in

livestock farming (Kling-Eveillard et al, 2010), Work Assessments were carried out in 2008 and 2009 in 640 farms. This article takes account of the inter-sector analysis of these data. The objectives were: 1) to describe the diversity of work organisation in connection with the room for manoeuvre time 2) to characterize the dominant organisation forms of each production sector.

Materials and methods

The Work Assessment method

This method enables work to be taken into account in the analysis of the farm system and the different tasks to be quantified by category of workforce. The various tasks are grouped according to the rhythm at which they are carried out:

- The routine work load (RW) is carried out every day. It is difficult to concentrate and above all it cannot be put off. For livestock, this concerns the daily care of the animals (monitoring, feeding, assistance with calving and lambing, and so on...). It is quantified in hours per day.
- The seasonal work (SW) groups together the tasks that are easier to defer or to concentrate. It focuses on crops (SWC), forage (SWF) and herds (periodic handling for example: SWH for herbivore and SWM for monogastric), as well as land maintenance (hedges, fences: SWLM). It is quantified in days.

Two categories of workforce can be identified:

- The base group (BG) is composed of permanent workers for whom the farming activity is preponderant in time and income and who organise the farm work (the farmer, the farming couple, the associates of a Farming Group (GAEC)...).
- The workforce outside the base group consists of volunteers (retired people and people giving a hand) mutual help, paid workers and the intervention of sub-contracting companies.

The "Work Assessment" survey lasts for two to three hours on condition that the investigator already has previous knowledge of how the herd is managed. It is based on structured questionnaires. The farmer divides up the year into periods during which the routine work load is of a constant duration. He can then specify the daily time taken for this work, usually by positioning his hours of work and those of the other workers in relation to meal times. For seasonal work, the time spent is quantified season after season by reconstituting in time the succession either of all the different tasks or of each type of work (herds and land).

At farm level, the data are analysed to characterise and quantify the routine work load and seasonal work of the different contributors and to specify the proportion of work carried out by labour outside the base group. Work organisation in particular is characterized by an indicator called "Calculated Time Available" (CTA) which corresponds to the time remaining for the base group for non-accounted activities (farming or not) after their share of the routine work load and seasonal work has been carried out.

Sampling

The farms surveyed are in the network of livestock farms¹ to which are added 50 pig and poultry farms in the regions of Brittany and the Pays de la Loire. The dairy sheep farms come from the "Roquefort" areas (south Massif Central) and from the Béarn-Basque Country (Pyrenees). In the goat sector, suppliers of milk to cooperatives and farms making their own cheese were surveyed mainly in the Centre West and the South East. For the cattle and sheep meat sectors, the farms were spread

¹ The network of livestock farms is a pluriannual programme monitoring 1400 herbivore farms. It make it possible to work out references on the functioning of systems, on-farm applied research and transfer for the benefit of advice bodies.

over the whole of France. In making up this sample, we did not seek to use farms that were representative or even to balance the farms between sectors.

Data processing

We processed the data in two phases. The first is in response to the first objective of this work (description of diversity) and follows the methodological path of the Work Assessment group analyses (Cournut et al 2008) which describe the different steps of analysis when comparing Work Assessment data coming from several farms. After a description of the sample (structures, systems and workforce), it analyses the work durations according to their nature (routine daily work load or seasonal work load) and the room for manoeuvre time (CTA).

The second phase concentrates on the coherence of the work organisation specific to each sector. It is based on the characterization of archetypes constructed from farms taken from the sample to represent the dominant organisation logics of their sector. This extraction was made by combining the size of the base group (BG) criterion then CTA per person in the BG (pBG).

Diversity of work durations and room for manoeuvre time between sectors

The characteristics of the sample

The largest structures brought to the number of persons in the base group (pBG) are to be found in the cattle and sheep meat farms where the management, in particular of forage systems, is more extensive. On the other hand, the dairy sheep, goat, pig and poultry farms have smaller structures (Table 1).

The forage areas of the herbivore farms (with the exception of those in the goat sector), are larger; there are more hectares of crops in the pig and poultry sectors. Only 30% of farms in the two monogastric sectors are specialised (no other herbivore unit and no crop unit) whilst 75% of herbivore farms are specialised.

Table 1. Structural characteristics of farms according to sectors.

Sector	Dairy cattle	Beef cattle	Goat	Dairy sheep	Meat sheep	Pig	Poultry	All
Number of farms	185	171	51	62	127	23	21	640
Including crop unit *	38	44	8	1	18	13	5	127
Including grass+monog unit	4	5			6	4	9	28
Base group size	53% pBG=2	51% pBG=1	55% pBG=2	47% pBG=2	58% pBG=1	57% pBG=1	76% pBG=1	43% pBG=1 43% pBG=2
AA (ha) average	101	140	59	72	97	67	48	101
MFA (ha) average	69	104	31	58	69	32	29	74
Crops (ha) average	35	42	35	16	32	58	49	37
LU average	96	133	44	72	96			99
Average producing units	55 cows	80 cows	183 goats	398 ewes	486 ewes	160 sows		
AA/pBG average	55	93	30	39	71	49	40	64
LU/pBG average	53	89	26	41	68			60

* Crop unit: area under arable crops greater than 40 ha

pBG: number of persons in the base group

LU: livestock unit (1 LU = 4750 kg of dry matter consumed)

AA: Agricultural Area; MFA: Main Forage Area

Farms run by one or two persons (pBG=1 or 2) each represent 43% of the sample. In the sectors with dairy production (cattle, sheep, goat), farms run by only one person are rare (less than one third) whilst they are in the majority in the other sectors, and even represent nearly $\frac{3}{4}$ of the farms in the poultry sector.

Routine work load very marked by the productive orientation of farms

The total average annual routine work load (RW) is 2800 h a year and 86% of it is carried out by the base group. Over the whole sample, the autonomy of the base group (proportion of the RW carried out by the BG) increases with the number of people who compose it: 79%, 89% and 94% for respectively 1, 2, and 3 people and more.

Strong disparities between sectors can be seen on the annual volume of routine working hours but also on the distribution of this work between categories of workers.

The farms with the highest routine work load (more than 3500 hours a year) are those of the dairy sheep, pig and goat sectors (Figure 1). For dairy sheep and goat farms this is explained by the milking of a large number of animals to which cheese-making is added for one third of the goat farms. In the pig farms this result is explained because the RW includes tasks like cleaning the buildings and removing the animals (usually included in seasonal work) owing to the fact that these tasks cannot be deferred (flow of animal batches).

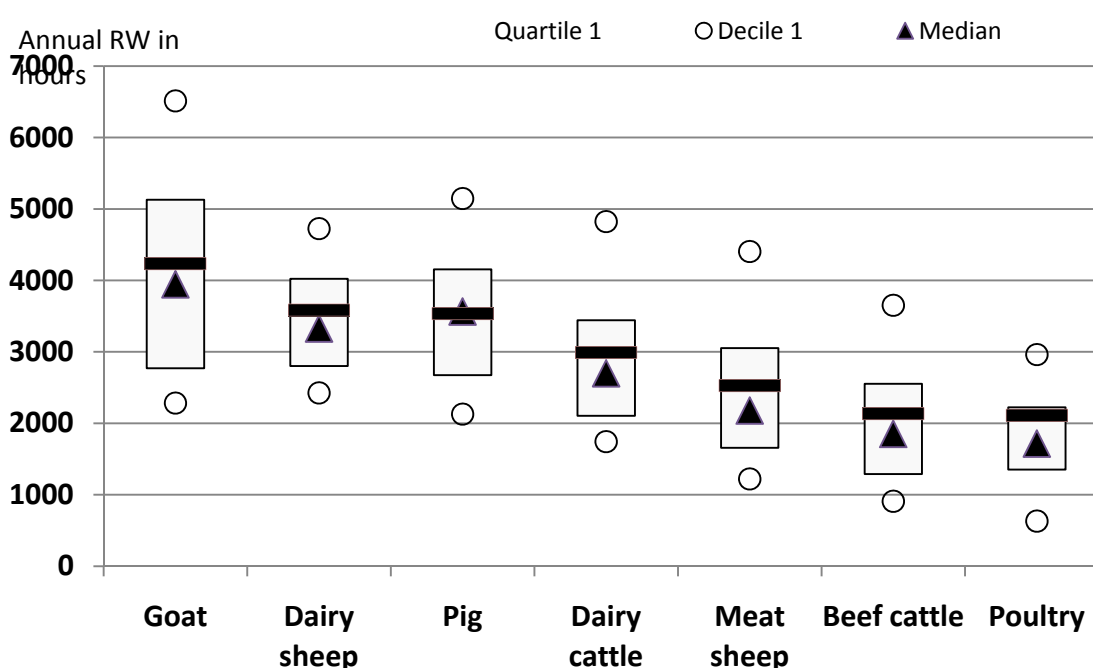


Figure 1. annual routine work load by sector.

The farms of sectors with the highest routine work load are also those which delegate this work most (more than 20%, Table 2). In goat and pig farms, paid workers free the base group from 15 to 25% of its routine work. In dairy sheep farms it is family volunteers who deal with 19% of the RW.

Table 2. routine work load: volume and distribution per category of workforce.

Sector	total RW (h)	RW base group	RW volunteers	RW paid workers	RWbg/pBG (h)
Goat	4234	79%	6%	15%	1874
Dairy sheep	3586	78%	19%	3%	1496
Pig	3534	72%	4%	24%	1727
Dairy cattle	2992	91%	5%	4%	1439
Meat sheep	2526	85%	11%	4%	1409
Beef cattle	2139	86%	11%	4%	1130
Poultry	2112	90%	6%	4%	1414
Taken together	2819	86%	9%	5%	1400

The farms of the beef cattle and poultry sectors have the lowest RWs of the sample (2100 h), but recourse to voluntary help is higher in beef cattle. Annual RWs are of the same order (2500 and 3000 h) for farms in the dairy cattle and meat sheep sectors, but those in the meat sheep sector benefit more widely from a volunteer workforce, especially when the base group is limited to one person.

Brought to the number of people in the base group, the routine work load remaining for the farmers to carry out (RWbg/pBG) is on average 1400 hours a year (Table 2). Beef cattle farmers have the smallest routine work load since the RWbg/pBG is an average of 1130 hours. On the other hand, the routine work load is high for goat and pig farmers for whom the RWbg/pBG is 1727 and 1874 hours.

Suckler herbivore farms are more efficient for herbivore routine work load

The efficiency of the routine work load is evaluated by the ratio of the annual number of hours of RW per Livestock Unit, to make comparison between herbivore sectors possible. The lower the ratio the better the efficiency. In fact suckler farms prove to be the most effective on this criterion (19 h per LU in cattle and 32 in sheep), by the nature of the work to be carried out (no milking and animals often outside). In dairy farming the time spent per LU is longer: on average 44 h for the cattle, sheep and dairy goat sectors. It is very high for the goat's cheese-making farms because the routine work load includes tasks relating to livestock, processing and marketing. In each production orientation (meat or milk), efficiency is lower in the small ruminant farms than in the cattle farms.

Table 3. The efficiency of routine work load on an herbivore herd (in hours per LU)

Sector	RW/LU	
	average	Standard deviation
Beef cattle (158 EA)	19	13
Meat sheep (86 EA)	32	17
Dairy cattle (155 EA)	36	16
Dairy sheep (42 EA)	55	19
Dairy goats (21 EA)	80	44
Goat's milk for cheese-making (16 EA)	309	116

Delegation of a quarter of the seasonal work load

The seasonal work (SW) is on average 160 days a year and is delegated for a quarter of this volume to labour outside the base group.

Like the routine work load, the strong influence of sectors is to be found on seasonal work: in volume, nature and distribution among workers.

As for farms in the herbivore sectors, seasonal work devoted to animals (SWH) represents from 18 to 37% of the total SW and rises to 60 days on average in meat cattle or sheep, as against 30 in dairy cattle, sheep or goat farms. This can be explained by animal handling (health, weighing, shearing, sorting) in the meat farms that are more frequent and more onerous to implement (no opportunity for individual restraint as during milking) and requiring more workforce.

In the pig farms, the seasonal work devoted to animals (SWM) is low (25 days on average) and is mainly concerned with the departure of slaughter pigs, or even making farm feed. The farms in the poultry sector devote an average of 98 seasonal working days to the animals, for removing the animals and cleaning the buildings between batches.

Work on forage areas (SWF) characterizes the herbivore farms: it is significant (65 to 79 days) in cattle and sheep whose systems favour the use of grass, but lower in goat farming (48 days) where purchases of hay dominate.

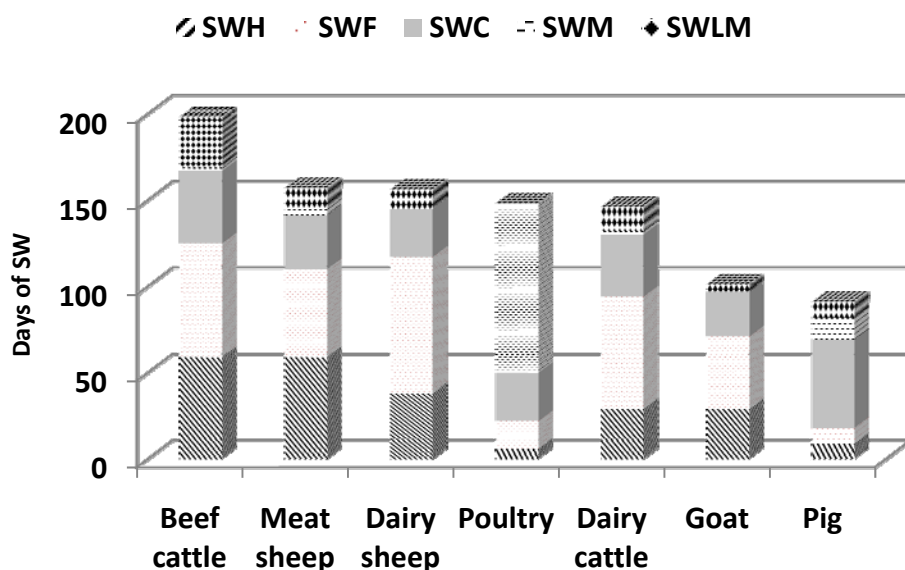


Figure 2. composition of annual seasonal work by sectors.

Out of the 540 farms which have work on field crops, evaluated time is 42 days, with considerable variations according to the size of the cultivated areas. Finally the work on land maintenance (SWLM) represents 21 days on average, and relates primarily to the herbivore sectors.

Table 4. Seasonal work load: volume and distribution by category of workforce.

Sector	total SW (day)	SW base group	SW volunteers	SW mutual help	SW sub-contractor	SW paid workers	(SWbg)/ pBG
Beef cattle	202	72%	13%	5%	3%	8%	91
Meat sheep	162	76%	11%	2%	4%	6%	84
Dairy sheep	156	71%	11%	5%	6%	7%	60
Dairy cattle	148	77%	6%	6%	5%	7%	59
Poultry	148	53%	12%	3%	24%	7%	66
Goats	103	76%	5%	2%	6%	10%	45
Pigs	91	65%	12%	2%	13%	8%	40
Taken together	160	74%	10%	4%	5%	7%	71

The monogastric sectors delegate the seasonal work load SW (approximately 40%) to external labour more than the herbivore sectors (25% on average).

Voluntary help is about 10% for seasonal work, primarily on tasks involving the animals, with two outstanding exceptions: in dairy cattle where the SW devoted to animals is carried out for the most part by the BG (85%) and in goat farming where recourse to paid workers is high on these same tasks.

Recourse to sub-contractors is limited to a few days (5 to 10) for the land areas (harvest) or for the flock in sheep farming (shearing) and is widely used in poultry sector farms (36 days on average especially for the removal of animals).

The efficiency of seasonal work with the herd of herbivore farms

The efficiency of herd seasonal work is calculated as for the RW in relation to the LU numbers.

Table 5. the efficiency of herbivore seasonal work (in days per LU).

Sector	herbivore SW by LU	
	Average	Standard deviation
Dairy cattle	0.29	0.24
Beef cattle	0.48	0.48
Goats	0.86	0.73
Dairy sheep	0.57	0.37
Meat sheep	0.79	0.72
<i>Taken together</i>	<i>0.53</i>	<i>0.54</i>

The average efficiency of seasonal work with the herbivore herd (Table 5) is lower than 0.5 days per LU in cattle farms and between 0.5 and 1 day per LU in small ruminant farms (sheep and goats) confirming the trends observed for the routine work load. Tasks such as treatments, usually calculated in the seasonal work load, are carried out in the milking parlour and explain the good performance of dairy cattle farms on this criterion (0.29 days/LU).

Calculated time available affected by the routine work load

By construction, the calculated time available (CTA) depends on the routine work load and the seasonal work carried out by the base group, but the influence of the routine work load is stronger (Table 6). Thus the farms with the heaviest routine work load (goat and pig) are also those for which the CTA is the lowest, and the beef cattle farms for which the routine work load is the lowest have the best room for manoeuvre time.

The CTA per person of the BG is on average 1000 h with strong variations (0 to 2100 h). 40% of the farms have a CTA/pBG lower than 900 h, and 20% of the farms a higher CTA/pBG at 1300 h.

Table 6. The calculated time available and its components according to sectors and by pBG.

Sector	RWbg/pBG	(SWbg)pBG	CTA/pBG			
			All sizes of BG taken together	pBG=1	pBG=2	pBG≥3
Beef cattle	1130	91	1066	971	1142	1231
Dairy cattle	1439	59	1028	792	1115	1133
Dairy sheep	1496	60	1014	721	1107	1220
Poultry	1414	66	988	974	1193	
Meat sheep	1409	84	959	826	1120	1176
Pig	1727	40	899	707	1149	
Goat	1874	45	814	719	865	875
<i>Taken together</i>	<i>1400</i>	<i>71</i>	<i>1000</i>	<i>854</i>	<i>1098</i>	<i>1153</i>

The number of people in the base group is the first variation factor of this indicator of room for manoeuvre time. It increases from 850h to 1150h when going from pBG=1 to pBG=3 and more. Its influence is mixed with the sector influence because these two factors are not independent: more farms are managed by only one person in the sectors whose production orientation is meat. Thus pig farms combine the handicap of a considerable routine work load with the fact that the farms in the sample are mainly managed by only one person.

Coherence of work organisation by sector

In this phase of the study we seek to describe coherences of the work organisation specific to each sector. The farms selected to build the archetypes have a base group whose size is the most representative of their sector (2 pBG for dairy production and 1 for the others) and are situated in the central half of the CTA/pBG distribution. Thus the construction of archetypes centres on 174

farms whose intra-sector diversity (cheese-making goat farms and goat's milk suppliers to cooperatives have been identified separately) has been considerably reduced (Table 7).

Table 7. Description of archetypes by sector.

(averages)	Milk pBG = 2				Meat pBG = 1				Total
	Dairy cattle	Goat's cheese-makers	Goat's milk suppliers	Dairy sheep	Beef cattle	Meat sheep	Pig	Poultry	
Number for archetype	49	6	9	15	44	36	7	8	174
CTA/pBG (h)	1113	733	941	1086	985	816	695	980	972
RWbg/pBG (h)	1350	2017	1578	1387	1217	1458	2017	1394	1424
SWbg/pBG (d)	50	17	56	58	91	91	34	65	69
RWbg/RW (%)	93	90	96	81	79	82	69	88	85
SWbg/SW (%)	79	83	87	72	61	72	68	51	71
AA/pBG (ha)	48	9	37	38	113	84	35	37	68
Producing units	53	47	194	420	70	410	156		
LU/pBG	47	6	25	37	118	80			66
RW herbivore / LU (h)	37	389	80	52	18	31			
RW pig/sow							21		

Dairy cattle farms (pBG = 2, CTA/pBG = 1100 h)

The room for manoeuvre time is comfortable, which confirms the results of Seegers et al. (2006). The base group is very autonomous in carrying out the routine and seasonal work loads on the herd. Efficiency on the RW/LU is best for milked animals (37 h/LU). Forage intensification involves considerable seasonal work with its usual share of mutual help for harvests.

Dairy sheep farms (pBG = 2, CTA/pBG = 1090 h)

The CTA/pBG is comfortable thanks to the presence of two people and with the significant intervention (~15%) of voluntary help in the routine work load. This type of workforce which "does not count its time" partly explains a RW/LU of 52 h. The seasonal work on the forage area represents half of the total SW because of the size of the MFA in the cropping plan.

Goat farms supplying milk to cooperatives (pBG = 2, CTA/pBG = 940 h)

In spite of a virtual absence of delegation (only 4% for the RW, 13% for the SW) and an efficiency of RW of more than 80 h per LU, the CTA/pBG is satisfactory because the base group consists of 2 people.

Cheese-making goat farms (pBG = 2, CTA/pBG = 730 h)

The CTA/pBG is low. The combination of three areas of work (livestock, cheese-making and marketing) involves considerable routine work for the two people of the base group and of course brought to the LU. What is more, these farms do not benefit from volunteer labour and resort in a limited way (~10%) to paid workers. The seasonal work load is very light because most of the feed is bought in and the farms are small.

Beef cattle farms (pBG = 1, CTA/pBG = 985 h)

The CTAP/pBG is satisfactory, thanks to the highly efficient approach to the routine work load that is characteristic of suckler herds (18 h/LU) and to considerable delegation to voluntary help (16% of RW and SW). There is a considerable amount of seasonal work that remains the responsibility of only one person (more than 90 days/year).

Meat sheep farms (pBG = 1, CTA/pBG = 816 h)

Like the farms with beef cattle, the base group is limited to one person, and recourse to voluntary help is of the same order (14% of RW and of SW) and number of days of SW per person of the base group is identical, although the area is smaller by 30 ha and there is a higher proportion of SW on the

flock (shearing, treatments). The CTA/pBG is low because the routine work load per LU comes to 31 h.

Pig farms (pBG =1 , CTA/pBG = 695 h)

The CTA/pBG is low, in association with a significant routine workload (more than 5.5 h/day) because it also includes activities such as cleaning the buildings. Brought to the producing unit, it rises to 21 h per sow. The base group reduced to only one person delegates 30% of the RW to paid workers and more than 30% of SW to sub-contractors, voluntary help and paid workers. The SW is low and 60% of it concerns field crops.

Poultry farms (pBG =1, CTA/pBG = 980 h)

The CTA/pBG is satisfactory. 30% of the total routine work load is devoted to another meat herbivore unit. The seasonal work, in particular for the removal of the animals, is externalised (voluntary help and sub-contractor) so in the end the farmer carries out only half of the total SW of the farm, i.e. 65 days.

Discussion and Conclusion

The evaluation of livestock farm liveability in our sample shows that conditions are still difficult for 40% of the farms surveyed which have TDC/pCB values of less than 900h. We note that the average indicator values observed for the dairy and beef cattle and meat sheep sectors are comparable to those of the latest national multi-sector synthesis dating from 1996 (Jordan et al, 1996), nevertheless with a slight improvement in the dairy cattle sector (from 900 hours to 1000 hours) certainly associated with the significant improvement in equipment in this sector (Seegers et al, 2003). The liveability indicator clearly shows the handicap of goat farms which are severely burdened by the routine work load, a phenomenon that is accentuated when the farmers make and sell their own cheese.

Our results show that the production sector is important in structuring work organisation in livestock farms, by the technical contents associated with each unit of production certainly, but also because the technical and economic or socio-cultural models associated with these sectors are different. The importance of voluntary help in dairy sheep farms in the Pyrenees can therefore be explained by the logic in this region of handing down family farms to the next generation, which leads to continued close participation by the parents. On the other hand the strong autonomy of the base group in the dairy cattle sector as regards work with the animals takes us back to the model specific to this sector of the "good dairy farmer", for whom the milking activity is at the very heart of his work and cannot be delegated. The link between the productive orientation of farms and the size of the base group is an other illustration of the influence of production sector on work organisation. In farms with a dairy orientation, the collectives are mainly composed of at least two people, a situation which can be placed in connection with the routine work of milking. The archetypes which we built are therefore centred on base groups adapted to the sectors, thus taking into account "who directs the farm" in the characterization of the work organisation, following the example of the work of Beguin (2008).

The results obtained provide a framework of references for technicians, in each sector, for work durations but also for organisation methods in livestock farms. Analysing the results of the Work Assessments makes it possible to construct sets of references included in modelling the functioning of operating systems. These reference markers make it possible to discuss with the farmer about what happens at different periods of the year, to consider with him technical changes concerning the progress of the farm year, to see what would be the consequences on work organisation, the balances between management - workforce - buildings, etc. These results are discussed individually or in groups of farmers. The application of the Work Assessment method to the pig and poultry sectors has enriched the range of work indicators, with the appearance in particular of another category of work: the non-daily routine work load associated with work that cannot be deferred and which is not repeated from one day to another. Most of the tasks in pig or cheese-making goat

farming belong to this category. The cheese markets or deliveries, for example, cannot be put back and they obey weekly intervals like the Saturday market or the Tuesday morning delivery.

The application of the method to the monogastric sectors has made it possible to understand some of their specificities, such as the importance of paid workers and the management of batches of animals (Hostiou et al., 2007) but it has also shown how these sectors could share the same questionings as the herbivore sectors in terms of work organisation and draw benefit from the comparison of results.

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