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HOW TO MEASURE INDIRECT EMPLOYMENT LINKED TO LIVESTOCK FARMING?

developing a method for economic dependency assessment

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Abstract – This paper describes the method we developed to measure and describe precisely the indirect employment linked to livestock farming. Beside of the assessment of the number of jobs itself, we had to figure out a way to define which jobs were to be considered as indirect employment. That is why we developed an assessment of the economic dependency of each operator, consisting of three components: short term dependency, adaptation abilities and geographical constraints. This allowed us not only to evaluate the total number of indirect jobs depending on the presence of livestock farming in France, but also to describe them precisely.

Key words: Economic impact, indirect jobs, job creation, social impact

I. INTRODUCTION

Context

Considering the current economic situation, employment level is considered today as a key indicator to assess the economic weight of a particular sector.

European livestock sectors have gone through several different crises over the past few years. Those crises resulted in industrial tools closing down and livestock farmers numbers decreasing, leading to rural areas in general being less economically attractive. All this obviously had very strong consequences on both direct and indirect employment. However, no detailed and reliable data has been collected about those consequences nor the global level of indirect employment related to livestock farming.

That is why the Scientific Group of Interest *Elevages Demain* (Tomorrow's Livestock Farms) has decided to address this question by launching an innovative study on the assessment of employment related to livestock farming. This project aims to put a figure on the number of jobs

depending on the presence of livestock farms in France. Those jobs are referred to as indirect employment. This work obviously involved extensive data collection and processing. However, the main methodological concern that had to be addressed - even before collecting data - was how to determine which groups of operators would be taken into consideration to measure indirect employment.

As we have seen before, indirect employment of livestock farming is composed of all jobs depending on the existence of livestock farming. We therefore needed to define precisely the concept of dependency.

Research question

Measurement of indirect employment is not the only kind of study that calls for a definition of the perimeter of impacted operators. This is actually a central point in many methodologies: economic models, computable general equilibrium, multicriteria assessment methods, life cycle analysis etc.

This perimeter is usually determined on the basis of existing flows between operators. Those flows can be material or financial (with the exception of social life cycle analysis (sLCA), in which the perimeter is determined on the potential social consequences on different operators).

Consequently, for economic studies, the perimeter is usually determined by the existence of a client-supplier relationship.

However, the simple observation of existing economic flows only provides a static and short-term vision of dependency (Caporaso [1]).

It does acknowledge the role of neither opportunities (such as flexibility and adaptations abilities) nor specific constraints. All those factors yet play a major role in the dependency of an operator to another (Mentzer et al. [2]).

Besides, the *nature* of this economic relationship is not considered, resulting in a dummy variable for dependency. This comes out as a two-outcome evaluation: the operator either has an economic link and is related to the other or has no link at all. In this case, there is no way to quantify a level of dependency.

This led us to believe that indirect employment and economic dependency could not be expressed by the single existence of a financial flow.

We decided to define an operator's level of dependency to livestock farming as the significance of potential impacts of a change occurring in those farms on its activity.

In order to rank the jobs according to the level and the nature of their dependency on livestock farming, we needed to build a quantitative, multicriteria and dynamic method. That way, we would be able to fully assess the economic dependency between a group of operator and livestock farms, allowing us to measure and describe indirect employment.

II. MATERIALS AND METHODS

This evaluation of economic dependency has been developed thanks to several different economic approaches, such as transaction cost economics (Williamson [3] & [4]), industrial organization, incomplete contracts theory (Tirole [5], Masten et al. [6]). Other works were taken into consideration, such as up or downstream regulation (Montfort Dutailly [7], Kh Sekkat [8]) and systemic triangulation (Donnadieu et al [9]). All those theoretical principles were confronted and synthesized to identify three major components in economic dependency: short term effects, long term potential effects and geographical constraints. Measurable criteria have then been characterized for each of these components.

The first aspect considered was *short term effects*. The description of the existing situation provides information on immediate response to a change, before the operator has had time to adapt. The first component of dependency is therefore the *relative weight of livestock farming in the economic balance of operators*.

Several measurable criteria have been identified: part of the activity in relation with livestock products or livestock farming, number of

specialized operators, diversity of products (Table 1).

Table 1 Assessment of short-term dependency for the upstream section of operators

Criteria	Assessment	Grade
Livestock part in total outlets	<i>Global share of the outlets in livestock farming</i>	<i>% converted in a 0 to 5 grade</i>
Share of specialized operators	<i>% of operators that have only livestock outlets (or >90%)</i>	<i>% converted in a 0 to 5 grade</i>
Diversity of outlets	<i>Likert scale</i>	<i>0 to 5 grade</i>
TOTAL	Aggregation	0 to 15 grade

In this table are only presented the criteria specific to upstream operators; the same kind of assessment with slightly different criteria has been realized for downstream operators (such as food industry, trade etc.).

Constraining client-suppliers relationship or financial links with other operators have not been considered here.

In order to evaluate *long term potential effects* of a livestock activity decrease, a dynamic approach was necessary. Second component is the *adaptation capacity* to another activity and/or to other markets (Table 2). Measurable criteria are indicators reflecting the flexibility of the production process and the conversion capacity: sunk costs, asset specificity regarding livestock in general, asset specificity regarding each production, supply and demand level on potential substitution markets (Williamson [10]).

However, we chose to simplify the assessment by using an assessment on a Likert scale of asset specificity.

The existence of a relevant market, to either have outlet to a new activity or export toward livestock farms abroad has also been considered.

Table 2 Assessment of adaptation abilities

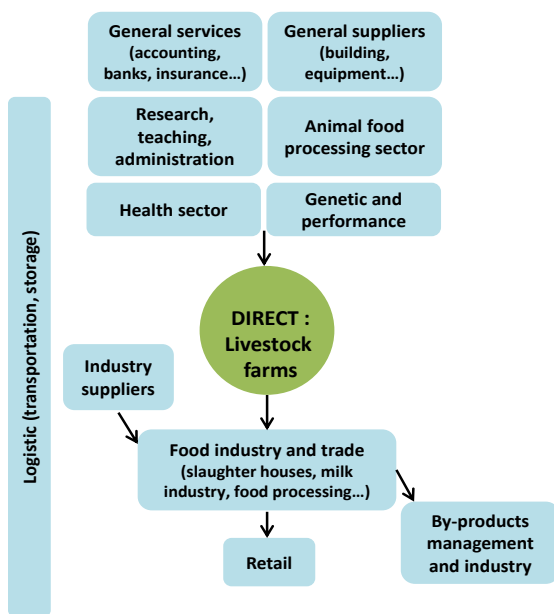
Criteria	Assessment	Grade
Asset specificity to one livestock sector (dairy, meat, eggs...)	<i>Likert scale</i>	<i>0 to 5 grade</i>
Asset specificity to livestock farming	<i>Likert scale</i>	<i>0 to 5 grade</i>
Relevant market for export or reconversion	<i>Likert scale</i>	<i>0 to 5 grade</i>
TOTAL	Aggregation	0 to 15 grade

At last, we identified a *geographical component* playing a part in economic dependency: the territorial constraints existing between an operator and the location of farmers. The more the activity is geographically dependent on livestock farming, the more the constraints on finding other clients are strong, and the less the possibility of offshoring the activity is conceivable (Dervillé [11]). But territorial constraints will not only affect the ability to adapt to change. It will also determine on which level the change, from a local to a global trend, will be decisive. Regardless of the importance of the change, the scale on which it will impact the operator can be characterized. This component is directly assessed by the average distance that is considered as a maximum for operational and/or economic reasons.

III. RESULTS AND DISCUSSION

Over 160 groups of operators linked to livestock farming have been identified (Figure 1). Those were potentially dependent to livestock farming. To determine which were to be considered as indirect employment, economic dependency of each group of operators has then been assessed.

Figure 1. General mapping of operators linked to livestock farms



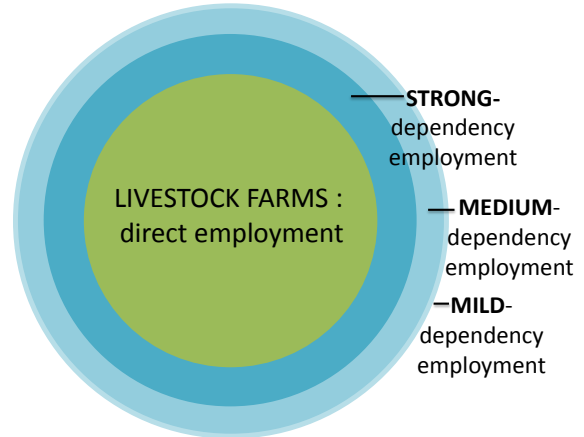
Over a first phase, we decided to aggregate the three components. Each group of operators therefore received a single grade.

That grade represents its global level of dependency (the strength of potential impacts of a change in livestock farming on its activity).

Those 160 grades have been split in four groups to allow better interpretation of data. The identification of those groups has been realized by an agglomerative hierarchical clustering of data. The lowest level of dependency has been considered as *not significantly dependent* to livestock farming. Therefore, we were able to identify which operators were not dependent; this employment was not linked to livestock farming. Other groups were identified as strong, medium and mild dependency. This allowed us to rank operators based on their level of dependency.

Once those dependent operators were identified, we gathered data from professional surveys¹, official State statistics² and professional representatives' knowledge to assess employment. Several data sources were compared to reduce and measure the error margin. We are therefore able to fully assess the number of jobs depending on the presence of livestock farming, ranked by their level of dependency (Figure 2).

Figure 2. Direct and indirect employment linked to livestock farms in France



¹ Collective bargaining agreements (data gathered by the Ministry of labour); professional and interprofessional organizations (Coop de France, FIA, CNIEL, Interbev, Sifco...); direct enquiries (Genetic improvement firms, Accounting firms, Ministry of agriculture, Research institutes...).

² Agreste - Recensement agricole 2010 ; INSEE – ESANE 2011 ; INSEE – CLAP 2011 ; SSP – enquête Prodcom

Only national-livestock-related jobs were considered. To allow comparison, we used full-time equivalents rather than headcount. The results are detailed sector by sector, covering all animal productions (dairy, eggs, and meat). Final results and figures will be available by July 2015.

IV. CONCLUSION

This study is an on-going work: the French employment study is still to be completed, to be able to present global results on indirect employment dependent of French livestock farms. Concerning the dependency assessment method, data have still to be tested and consolidated. The method of aggregation is a particularly sensitive point to that regard.

However, perspectives are wide. An interesting development that is currently considered would be to rank operators not only according to the level of dependency, but to also distinguish them by its nature. We would have a better understanding of the kind of impact (short or long-term, global or local...) that would have an effect, and of their possible reactions.

Moreover, in further projects, this work will provide information to build up full scenarios. The precise impact of a specific change in livestock farming activity on employment will then be precisely characterized.

Finally, this evaluation of dependency could be much more widely used. It is not specific to the agricultural sector, and could therefore be applied in employment studies of other sectors. More generally speaking, many economic studies could benefit from this evaluation method.

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