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PROVIDING ADVICE TO FARMERS : A COOPERATIVE PROBLEM SOLVING ACTIVITY?

Abstract : The development of services within industrialized countries results in an increasing number of studies by economists and management science researchers. These researchers describe the service relationship as a co-production of the service and as an exchange of knowledge but do not specify how these processes occur. We studied advisory relationship in the agricultural sector in order to analyze such processes. We tape-recorded interactions between farmers and advisors and collected documents written by the advisors before or after the interactions. According to a first analysis of these data, we propose to consider that the advisor conducts a cooperative solving problem process and also plays a mediating role between the farmer and the farmer's objects of work. This mediating role includes the management of the relationship, a change in the structure of farmers' knowledge on the domain and the introduction of methods that change the representation the farmer has about the object of his (her) work.

Keywords : consultancy, agriculture, problem solving, mediation, co-operation

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Providing advice to farmers : a cooperative problem solving activity ?

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INTRODUCTION

Services become more and more developed in industrialized countries. They are also more and more studied by researchers in the fields of economy, management science and sociology (de Bandt and Gadrey, 1994) who point out the co-production of the services (Gadrey, 1994) that is the user's participation to the design of the good that this user wants to buy. At the same time, they underline the fact that the relationship between the user and the operator rest on learning processes (Hatchuel, 1994). Nevertheless, they do not explore the way users participate in the design or in the learning processes occurring between users and operators. An ergonomic analysis of operators' and users' activities would result in a better understanding of this participation and would allow us to answer the following questions: Who produces in a given service situation? What is really produced? Who prescribes and assesses what is produced during the service relationship?

Advisory situations are a typical example of a co-produced service as, more than less, the good to be exchanged by an operator and an user is not designed before these two build a relationship. According to data we collected in the agricultural sector, we argue, in the first section of this paper, that advisory situations are cooperative work situations as defined by Falzon and Lapeyrière (1998). For these authors, a service situation should be seen as a cooperative work situation when four conditions are satisfied: (i) there is a shared object of work, (ii) the user and the operator handle complementary resources (iii) the resources (physical or cognitive ones) of these two actors differ (iv) a socially defined supporting relationship can be identified. More over, we argue that the advisory activity is a problem solving one and that cooperation takes place in the course of the solving process.

In the second section, we argue that advisory activity cannot be analyzed only as a cooperative

problem solving activity. We suggest that advisors also manage the relationship in the long term, provide knowledge on the domain as well as methods that allow them to change the representation farmers build of the object of their) work. Therefore, we propose to consider the advisor's activity as a mediating activity that the advisor exerts on the relation between the farmer and the farmer's objects of work (crop production, farm management, and so on).

In the third section, we discuss the variety of advisory situations as identified in the previous section and propose to structure such a diversity according to three dimensions : the field of action and the temporal horizon, the social posture of the advisor, the problem solving activity. We argue that a given service interaction can be characterized as a specific pattern of values on these three. Finally we present the method we will use in order to test this claim.

THE MAIN CHARACTERISTICS OF ADVISORY SERVICES IN AGRICULTURE

The advisory task in agriculture cannot be analyzed as a whole. First of all, many different organizations provide advice to farmers, each of them having specific aims and specific methods (Cerf and Lenoir, 1987). In France, it is usual to distinguish para-public organizations which are commissioned to provide advice to all farmers and receive public funds, and private ones which provide advice only to its own paying clients. It is also usual to distinguish the advisory task according to the farmers' activity which is supported. In France, advisory organizations often distinguish three kind of advice: technical advice (to control production processes), management advice (to control farm management), and strategic advice (to define a strategy of farm development). Finally, advisory task differ as advice can be given to individuals or to farmers' groups: this is due to the high number of farms and to the economic constraints which do not allow each farmer to be advised individually.

The advisory task can be considered as an ill-defined task as the way to conduct the advisory relation is rarely prescribed. Prescriptions are often only formal methods concerning the way to analyze a situation (for instance : a crop growth, a farm functioning, livestock management...) or the way to choose an action according to the analysis of the situation (for instance method to calculate the amount of nitrogen fertilization, method to decide investments...). But the way to use such methods to provide an advice to farmers is not prescribed. This results in a great variety in the way advisors carry out advisory tasks.

The advisory activity can be roughly divided into two sub-activities : the first one is allotted to "advice production" (acquisition of data and building up of "reference data", field experiments, farmers' training, meetings with farmers), the second one aimed at maintaining advisors' abilities (training, bibliographic research, meeting with other advisors). We focused our work on the farmers-advisors interactions as we wanted to analyze how advisors use the available methods in the course of the interactions : do they develop cooperation to share the methods ? Do they only use the

method as a tool to build the solution themselves and then inform the farmers of the solution ? Do they modify the methods in order to adapt them to specific interactions ? etc...

ADVISORY INTERACTIONS IN AGRICULTURE AS COOPERATIVE PROBLEM SOLVING

Advisory interactions include face-to-face interactions, written information exchanges, phone calls, and so on. In the following section, we focus on the analysis of face-to-face interactions and of some documents that advisors write either to distribute during meetings or to sum up discussions after meetings. Face-to-face interactions between farmers and advisors have been tape-recorded and transcribed. Interviews of the advisors have been carried out on the basis of these transcriptions or/and on the basis of the documents they wrote. We tape-recorded 18 interactions (15 with farmers' groups) and analyzed 55 documents (written for strategic advice). In the following section, we do not present a systematic analysis of the data: we only use some results and some examples to enlighten the various activities that advisors carry out when they meet with farmers.

Advisory activity as problem solving: diagnosis or design activity?

Advisory activity is often described as a diagnosis activity: the advisor is viewed as an expert who is called to solve a problem that the farmer has detected. We analyzed 40 forms that six advisors filled to sum up the discussions they had with farmers in order to start to define a project that the farmer or his (her) family have regarding their professional activities and/or the farm. The form may be roughly divided into 4 sections: the fisrt one aimed at describing the farm system (the structural components as the farm area, the number of workers,... and some indicators of the functioning of the farm system like economic ratio, work efficiency, and so on). The second one aimed at identifying the objectives of the farmer and of his (her) family and the projects they have for improving their professional activities. The third one aimed at providing a prognosis on the evolution of the farm and/or on the projects identifed previoulsy. The fourth one aimed at defining some actions that will be carried out during further meetings. To fill such a form, advisors interact with farmers using the form as a frame. As it includes analysis of the situation as well as identification of the project of the farmer and of the family, this activity is called a diagnosis task by those who prescribed it.

As shown by figure 1, advisors carry out a diagnosis activity (as defined by Hoc, 1990) and a design one (meaning that advisors build the solution space). The variety of the allocation of the two problem solving activity within the given task is not yet fully explained. However,we observed that while analysing the farm system, advisors try to identify the problem and the solution space for the project that has been expressed by the farmer and his (her) family, and, at the same time, try to identify the performance of the farm system in order to point out which results can be improved and to suggest some actions to carry out these improvements (diagnosis activity).

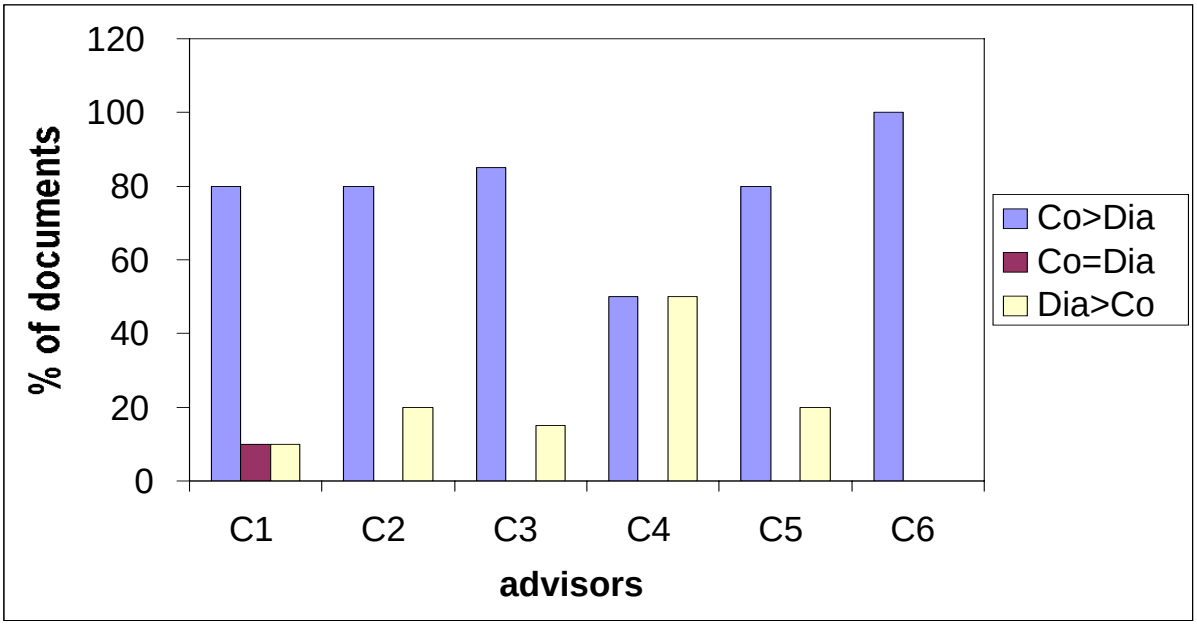

Figure 1: percentage of documents showing conception (Co) and diagnosis (Dia) activities with an indication of the most important activity

As a result, it seems crucial to be able to analyze the dynamics of the problem solving process in order to identify how diagnosis and design activities interfere during it. For the time being, models for problem solving activity are mostly devoted to the anlalysis of a given activity like diagnosis or design but hardly take into account the combination of these two activities. Rasmussen scale (1986) can nevertheless be seen as a good candidate even if it might need some adjustments.

Advisory situation as a cooperative work situation: negotiating the role in the solving problem process

When solving a problem, one has to carry out different steps like identifying the problem, finding a solution, evaluating the solution until he (she) is satisfied by a given solution. The analysis of different advisory situations show that farmers and advisors can both participate in each of these steps but do not play the same role in the different situations. As shown by the example n°1 (technical advice to farmers' group), it seems that the advisor has already built the problem to be solved as well as the solutions to this problem and that the farmers contribute to the problem solving process by assessing the proposed solutions in their own context of work. As shown by example n°2, in such a situation, when assessing the solutions farmers can formulate problems which were not identified by the advisor : then the advisor is in the position of building the solution. The example n°3 (individual management advice) shows that the advisor makes a diagnosis and ask the farmer to find the actions to be undertaken in order to solve the identified problems.

Example 1: Advisor: " For oil seed, I give you a procedure to follow: first step, to estimate already taken nitrogen, then to bring nitrogen and sulfur...then as an option, a growth regulator which has to be brought according to the variety, the sowing density and the effect of nitrogen…**Do you have questions, remarks, do you handle the situation ? "**
The advisor has identified the problem: to find a procedure to allow the growth and development of

seed oil. He built the procedure and than ask the farmers to evaluate it.

Example 2: Farmer : " *Karaté vert* does not work on cabbage aphids" ? Advisor " ...*Karaté vert*, it is pyrethrum only, it is not efficient enough for the cabbage aphids**...therefore with cabbage aphid infestation, *Karaté K* is better** "
The farmer asks a question about the use of an insecticide he has on his farm, and the advisor answers by giving explanations as well as a better solution to limit cabbage aphid infestation.

Example 3 : Advisor " Your circulating capital is negative here, but it is due to high private levying. **What can be done to diminish these ones**? ". Farmer: " Oh, but I know, why, it is due to investments I did... "
The advisor identifies a problem (a too low level of circulating capital) and diagnoses that this is due to too high private levying. He then asks the farmer to find a solution.

Moreover, as shown by example 4 (management advice) the farmer and the advisor can negotiate the part of the problem solving proces on which they want to cooperate.

Example 4: Advisor: " We just discussed what should be seen this morning (*economic results analysis and so on*). Do you think it would have been better to decide it before the meeting? " Farmer: " No, no, if you prepare the meeting alone...we both have to decide (*the problems to be studied in the meeting*). It is better like we do now....
The advisor wants to plan the meeting, but the farmer fears that the advisor will then be the only one to decide which problems will be solved during the meeting. He negotiates with the advisor their respective role in terms of problem formulation.

For the time being, we have not identified the factors which give rise to such a variety in the intercourse of the cooperation. We think that the confrontation between the dynamic of the solving process and the one of the interaction can enlighten such factors but we have not yet undertaken such an analysis.

ADVISORY INTERACTIONS IN AGRICULTURE AS MEDIATION

To sum up, advisory situations can be seen as a cooperative problem solving situation. Nevertheless, the advisor's activity includes other kind of interactions which we now detail .

Advisory interaction as long term management of the advisory relationship

During the interaction between farmers and advisors, we identified at least three different activities which aimed at managing their relationship on the long term. Cerf and Rogalski (1998) studied technical advice that advisors provide to farmers'group. Their work is based on the analysis of the activity of three advisors during the different meeting they organize with farmers along the crop production process. They distinguished the winter meetings (in figure 2 : winter/ indoors) which take place when farmers have to buy their inputs, and spring meetings (in figure 2 : spring/indoors and spring:outdoors) which were organised when some actions have to be undertaken to control crop production. As well, they distinguished indoors meetings and outdoors ones as they assumed

that this might change the way farmers and advisors interact.

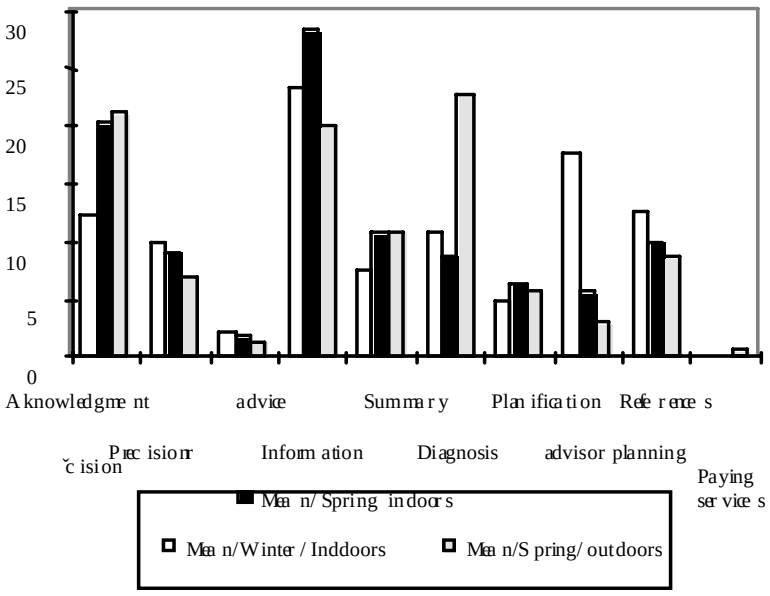

Figure 2 : Distribution of the verbalisations categories for the different meetings carried out during the crop season (mean for the three advisors)

They showed that the split into given categories of the verbalisations produced by the group varies according to the period and the location of the meeting (Outdoors/Indoors) (figure 2).

As a matter of fact, we can see such variations as an indicator of the way advisors adapt their advice in order to take into account the fact that they have to interact during the whole crop season. Therefore, during winter they mostly give general information about the inputs and the legal use of such inputs, while in spring they focus more on the way to diagnose some pest infestation, some lack of nutriments and so on. Doing so, they also adapt their advice to the decision process of the farmers.

An other way of managing the relationship is showed by example 5: advisor and farmer both agree on a schedule of their meetings which aimed at organizing the course of their relationship even if the points to be analyzed still remain to be defined. In this case, managing the relationship not only means adjusting the advice according to what the advisor knows of the farmers'decision process, it also means discussing with the farmer the planning of the advice according to the needs that a given farmer expresses.

Example 5: Advisor : " Do you have any claim about our last year relationship ? " Farmer: " No, it was OK for me, my needs are that we see each other often even if for only short visits. We should forecast two long visits and after short ones so that I can check that my actions are still in accordance with my objectives ".
By asking the farmer to assess their past relationship, the advisor leads the farmer to formulate his wishes for the next year.

Lastly, we make the assumption that a third way of managing the relationship consists in passing on knowledge to the farmer (see below): thus the farmer has new resources to formulate new questions.

Advisory interaction as development of farmers' abilities

Advisory interactions can also to be viewed as available means for the farmers which can enhance their abilities to carry out their work. According to this, advisors develop activities which we analyze as knowledge transfer or as an activity dedicated to redesigning the farmers' representations of their objects of work.

Advisory interaction as knowledge transfer

In all the advisory situations we observed, advisors provide information to farmers who do not have it and might need it. This information can be technical (innovations on inputs for example, legal rules…) but they can also result in a new organisation of farmer's domain knowledge. Example 6 illustrates this type of contribution for a technical advice as well as the way in which the farmer reacts to this contribution by reorganizing his (her) knowledge of the domain.

Example 6: Advisor: the CETIOM method…the bigger an oil seed plant is, the more nitrogen it has absorbed during autumn, the less nitrogen you have to bring during spring. Farmer: but...the bigger it is, the more it can grow, the more you need to bring nitrogen. Advisor: No because for a given yield, the quantity of absorbed nitrogen is fixed. Farmer: OK, it is new....
The advisor brings a new method to reason nitrogen fertilization. Farmer discusses it but finally seems to accept to change he own knowledge about nitrogen needs for oil seed.

For advisors, providing such information can be considered as necessary so that the interaction can be successfully achieved : from this point of view knowledge transfer can be analyzed as a mean to achieve cognitive synchronization. But, knowledge transfer is oftenly directed towards opportunistic learning : advisors use the interaction as a mean to pass information to farmers when they think that such information can be of some use for them.

Advisory interaction as designing the farmers' objects of work

Knowledge transfer does not solely relate to the domain, but also to methods. Methods allow the farmer to build a new representation of his (her) situation and/or problems. Example 7 shows in the case of a strategic advice, the existence of such contributions. On the basis of this example, we make the assumption that the advisor not only seek to share with the farmer a frame of analysis of a situation, or to build with the farmer a common language (Falzon -1989- say an operative language) but also seek to give farmers means to analyze differently their situations or their problems.

Example 7: Farmer: " you employed words which were unusual ". Advisor: " OK...for instance

these strategic activity domains (SAD), it is unusual to analyze the farm on the basis of SAD...usually it is analyzed through its productive activities.... " Farmer: Well, when you used this frame (the SAD one) you realized that our choice to invest on the farm was non profitable and was not consistent with the development of our SAD… Now we (*they are three farmers on this farm*) can start on new basis It might be the approach we will follow now...Because we not only manage a farm but also an economic entity (*they make cheese and yogurts and they sell these products on the farm as well as to supermarkets*)...it is something which needs to be theoretically thought "
The advisor introduced new terms like SAD, like " economic entity " according to a strategic method of analysis, and the farmer has changed his way of thinking the investments on the farm as well as his way of analyzing the farm: he no longer views the farm as a productive unit only.

During such interactions, the advisor support the learning processes of the farmer in that sense that they allow them to be conscious of the limits of their representations of the objects of their work and to develop new abilities in order to manage these objects. Such an activity illustrates, in the field of consultancy, Vytgoski work (1985) on the proximal development area.

ANALYZIS OF THE COMBINATION OF ADVISORY ACTIVITIES

In all situations we studied in the agricultural sector, the various activities we identified in the first and the second section were combined : for the time being, we are not able to fully explain the variety of the combinations we observed. In this section, we first discuss the factors we intend to explore in order to explain such a variety, and then describe the method we intend to use.

Patterns of advisory interactions

We propose to characterize a given advisory interaction as a specific pattern of values on three dimensions.

- Dimension 1 : Field of action and temporal horizon

  Advisors may limit their interventions to a local problem (for instance, in the task considered here, defining the disease that affects a crop), or, on the contrary, extend them broadly (for instance, considering the whole farm in various aspects : economical state, management, life of the farmer and his/her family, etc.). Similarly, the way time is taken into account varies : advisors may seek a solution in the short-term or try to consider the long-term evolution of the situation. Obviously, various factors affect this dimension of variation : work conditions (the advisor may not have sufficient time to investigate the problem, for instance because of a constraint of production), training (the advisor may believe that his/her expertise is limited to a domain).

- Dimension 2 : Social posture

  Advisors may think of their task in different ways. Some may think that, being experts in a domain, they are expected to solve the problem alone. Others, on the contrary, may think that the

problem cannot be solved without the active participation of the person seeking advice. Typically, physicians often see themselves as experts (and behave accordingly) while architects may see themselves as engaged in a partnership with a client, with whom the solution is built. This difference in posture may vary within a profession. Drass (1988) has conducted a study on two categories of mid-level practitioners: nurse practitioners (NPs) and physician assistants (PAs). While the two groups are allotted exactly the same task and responsabilities, they have different representations of their tasks and thus different postures : PAs emphasize the curative activity (prescription), and NPs the prevention activity. This leads to different behaviors during medical interviews.

- Dimension 3: Problem solving activity

  The same situation may give rise to a diagnosis activity or to a design activity. This dimension is not totally independent of the preceding ones. An advisor who sees himself as an expert and who reasons locally and in the short term will tend to have a diagnosis activity rather than a design one. This dimension is also not totally independent of the advisors' level of competence : an experienced advisor will benefit of a richer categorization scheme and will be able to classify situations more easily than a less experienced advisor.

For a given advisory situation, the specific pattern of values on these dimensions depend on the behaviour of the advisor and of the advice-seeker. Some advisors might behave in a constant way, that is follow a stable advisory pattern (for instance here as an expert in some crop diseases). Others will behave in a more flexible way, adapting their advisory pattern according to the situation, to the problem and to their interlocutor (Falzon, 1991). Similarly, advice-seekers may not wish the advisor to interfere with some decisions (for instance here, decisions related to the long-term management of the farm). Thus, the advisory pattern should be seen as a product of the interaction between the advisor and the advice-seeker.

Designing a method to analyze and to compare various combinations of advisory activities

To test our conception of advisory situations, we propose to develop a methodology which firstly allows us to compare advisors in their way to solve a given problem, and which secondly allows us to compare different advisory situations in order to identify how the formulation of the farmers' requests and the intercourse of the interaction affect the advisory pattern. Our study will be carried out on strategic advice as we already identify that it covers a great variety of advisory situations.

An experiment to compare advisors' problem solving processes

Real advisory situations are sometimes hard to capture (farmers and/or advisors do not always accept the presence of an observer). More over, as each situation is singular (singularity of the problem to be solved for instance), it is uneasy to carry out comparisons between advisors' problem solving processes. To overwhelme these problems, we propose to design an experiment. An experimental phase sould help us to answer several questions: which information do advisors seek for in a given advisory situation, how do they take such information into account, do advisors end up with the same anlaysis of the problem, do they design the same solution, and so on. We make the

assumption that the diversity of advisors' competences will result in the design of different solutions.

To carry out the experiment, we will choose two real advisory situations. Each situation will bring into play a specific "farmer–advisor" couple and a specific request. Once collected inherent information in these situations, we will build an "information to the request" protocol of experiment, so that the data collected in a real situation can be used to simulate an adviory situation with advisors who do not have previous knowledge about the farmer and his (her) request. Their task will be to solve the problem as it had been formulated by the farmer. Plans and photographs (or video if needed) of the farm will allow to bring to advisors some insight of the farm (property of the surroundings, available machinery, field location...).

A longitudinal study to identify patterns of advisory interaction

Our assumption is that the request formulation as well as the intercourse of the interaction lead to given advisory patterns that is to say to a given combination of the three dimensions we propose to use in order to characterize the advisory situations. Thus, the second phase of our methodology consists of a longitudinal study in order to analyze the interactive solving process. We will pay more attention to the first stage of the process which is dedicated to the formulation of the problem and the understanding of the farmer's situation (his (her) objectives, the farm system,...). Nevertheless, we will also follow-up the whole problem solving process : indeed, providing a strategic advice oftenly results in a sucession of meetings not only with the advisor, but also with specialists who intervene on specific fields that the advisor does not master. This follow-up will give us the opportunity to analyze simultaneously the dynamics of the interaction and the dynamics of the problem solving. Specific protocol analysis should be develop to catch the whole movement of the problem solving process, and to catch as the same time, the field of action that is taken into account and the conservationnal level. We intend to use an activity model such as Rasmussen scale (1986) to identify the macrostructure of the protocol before developing more in-deep analysis at the conversational level.

CONCLUSION

As we argue it in the first section, advisory situations in agriculture can be analyzed like situations where the user (farmer) cooperate with the operator (advisor) to solve a problem. However, the activity of the advisor, at the time of interaction with the farmer, cannot only be described as a problem solving activity. Managing the course of the relationship, providing information, inducing reorganisation of farmers' knowledge, providing methods which contribute to modify farmers' representations of their situations and/or problems, are as many activities which accompany the problem solving activity. These various activities all are intended to help the farmer in designing his (her) relation to his (her) object of work. This is why we suggest to regard the advisor as a mediator between the farmer and his (her) object of work and not only as a co-producer in the problem solving process.

Our data show that in several advisory situations advisors combine these different activities. Further analyzis of advisory situations is needed to enable us to identify advisory patterns and to classify advisory situations. This can only be achieved through a specific methodology which enable us to overwhelme some specific traits of advisory activity like the singularity of each request, the

singularity of each case that the advisor has to analyze, the long term management of the relationship. In this paper, we propose a methodology based on the combination of case simulation and longitudinal follow-up of advisory interactions. Such a methodology should enable us to identify if the field of action and the temporal horizon, the posture of the advisor and of the advice-seeker, the problem solving activity can be used to categorize advisory situations.

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