TOWARDS A PACT TO ACHIEVE AN IMPACT: WHAT KIND OF AGRONOMIC RESEARCH CAN CONTRIBUTE TO THE EVOLUTION OF AGRICULTURAL PRACTICES?

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Summary

The aim of agronomic research has traditionally been to describe how the climate-soil-plant complex works when submitted to the actions of human beings. These general laws of operation allow the prediction of change, and hence must allow the farmer to act upon his or her «climate-soil-plant» complex in a particular way that conforms more with his or her interests. The agronomist, a technician of nature, is then asked to influence the processes and results of agriculture according to an implicitly universalist principle. The blueprints elaborated as a result of this process are technically viable and economically efficient, however their social validity remains ambiguous.

The systemic approach to agronomy has been constructed as a reaction to this ambiguity: a generalist approach to agronomy which focuses on understanding the results of climate-soil-vegetation relations governed by the producer in order to satisfy his objectives. This approach can be placed at the intersection between the decision-making system and the bio-physical system, since a technical intervention is at the same time a choice, a practice and a factor in the yield elaboration. This is, then, an approach which presents itself as «Action Research» (*Recherche-Action*), where technical judgement ceases to be dissociated from the decision-making context, and where the relevance of technical choices, their amenability to application in practice and the results of their application are assessed by the agronomist with farmers according to their own objectives.

From the sustainable development perspective currently widely invoked, it is not, then, the technical capacities of the agronomist that will be decisive - at least in the beginning. It is rather the agronomist's negotiation skills and abilities in building and managing a veritable social pact with local actors, that will allow him or her set in motion a technico-socio-economic process to achieve an effective social impact, in terms of better control by the actors of their farming systems and their environments.

Keywords : Action Research - Agronomy - Decision - Innovation - Rural Development - Sustainability - System Approach

Introduction

The question «can an agronomist have a social impact?» seems, at first glance, to be disturbing, even provocative. In fact, the theme of social impact goes far beyond the usual preoccupations of agronomic research which have tended to focus on the elaboration of new and efficient agricultural techniques and the adoption of the results of agronomic research by farmers. The issue of social impact, generally linked to the former preoccupations, also extends beyond the quantitative emphasis on increasing agricultural production within an implicit framework of linear and continuous growth.

Science does not only serve the objectives of creating knowledge, but is also directly or indirectly implicated in all sectors of human life (Thuiller 1996): it is, as Mauss has claimed, a «total social reality». In this sense, the issue raised above also reflects an ethical preoccupation (or, as some would say, a moral or philosophical concern) shared by many researchers concerning the function and responsibilities of research (here, more specifically, agronomic research) within society.

Because these responsibilities exist, whether they are made explicit or not, and the way in which they are perceived, create the ideological framework which structures the objectives and methods of research and also the modes of intervention in rural areas: the quality of the impact of the agronomist researcher, one actor in rural development, on society directly follows from this.

Without doubt, there is also a fundamental ambiguity linked to the dual status of science, defined by COMETS (the *Comité d'éthique pour les sciences*) (1997) as «a set of knowledge and experiences that are more or less systematised, characterised by having a pre-determined goal and method, based on relationships that are objective, verifiable or universally accepted at a given moment in history». Science is thus a tool for creating knowledge (accumulative, cognitive or academic), but also a instrument of action (technical or social change). Agronomy, like halieutic science (fisheries), does not escape this ambivalence (Catanzano and Rey 1997) - even less so as such disciplines deal with both knowledge and action at the interface of the bio-physical and social spheres.

Agronomy for sustainable development

Is it necessary to change agricultural practices, and if so why? This is the first question to ask, but it is such an obvious question that the agronomist often forgets to ask it. Changing practices implies an obligation and has a positive connotation which is not called into question: it is

necessary to change, and to change is to produce more and then in a better way.

But to change also implies being capable of adapting one's way of life or acting to a new environment, or even to new personal objectives....

It is in this way that agronomic research has often confused change and possessing an aptitude for change, and that rural development projects have tended to provide more assistance to change than to creating an aptitude for change: agronomists have generally been content with the diffusion of experimental technical fixes, and have not aimed to create the conditions for technical innovation (Dulcire 1997 and 1993).

Even if sustainable development has become a universal preoccupation, not everyone agrees on the what achieving this objective entails. The provisional report on the Rio conference (Bruntland 1989) defined two main principles of sustainable development which have since been widely popularised: the satisfaction of current needs, but without affecting the capacity of future generations to satisfy their needs. In my opinion, these two principles are largely insufficient. This is because they are explicitly situated in a framework of «eternal growth» (Rist 1996) that has been assimilated into the domain of development. Further, it is impossible to reasonably judge future needs when present needs are already poorly understood.

Sustainable rural development can not be reduced to the quantitative approach of assessing the volume of production that the environment can support without affecting its ability to support the needs of the future. Nor does it consist in prolonging a linear growth curve. It is first and foremost an issue of the capacity of the rural populations concerned to assume responsibility for their own destiny (Collion and Merril-Sands 1992; Funtowitcz and Ravetz 1994; Pretty 1994).

It is in this sense that I will define sustainability here as the capacity of different actors to permanently react to unforeseen circumstances (to innovate and to anticipate) in order to achieve their objectives. Any intervention that results in an improvement of this capacity is therefore a matter of action for sustainable development. I situate the actions of agronomist researchers in this framework : that of mobilising agronomic knowledge to serve action for development alongside the different actors in the rural domain ; in return agronomic research also participates in increasing knowledge (the academic preoccupation).

Definition and purpose of agronomy

According to the dictionary definition, agronomy signifies the scientific study of the problems posed by the practice of agriculture (whether the problems are physical, chemical or biological). The discipline of agronomy includes all the sciences and their core principles.

This «ecology applied to the production of cultivated plant populations» (Hénin 1967 in de Bonneval 1993) is at the origin of two streams of thought: one being «crop-physiological»; the other possessing a more global understanding of farmers' practices which incorporates action. The latter has as its object of study «...the whole climate-soil-plant complex managed by human beings to satisfy their objectives».

This is, therefore, a science for action which works at three linked, spatial levels: the basic unit of the plot of land; the farm, or all the different plots together managed by the same individual or group of individuals; and the region. The way in which the cropping system, the farming system and agrarian system are structured corresponds to these spatial levels.

The concept of «technical itineraries», the logical and organised order of cropping techniques applied in a carefully thought-out way by a farmer to a cultivated plant population, on a specific plot of land, in order to achieve a given objective (Sébillotte 1978), underlines the way in which it is not possible to understand and judge a technological action (and thus propose technical solutions) by isolating it from the totality of other technical processes.

The concept of the agrarian system, a mode of organisation adopted by a rural society in order to enable it to exploit its space and manage its resources (Jouve 1995), situates a study, ie. the attempt to understand technology in its socio-economic and cultural environment. The study of farmers' practices (Landais and Deffontaines 1988) assists, then, in the understanding of the strategies that are employed (the decision system) to make them evolve.

This learning about anticipation and about decision-making is more a social construction than a technical one (Olivier de Sardan 1996): putting in place this type of process, as much as the quality of the technical responses which it will contribute to generating, is absolutely the responsibility of the agronomist who claims to be working to achieve sustainable development. However, for agronomists to be able to use their knowledge and methods to serve the goal of sustainable development, they must refer to technical or organisational requirements in order to construct research questions with agricultural producers and, more generally, with rural

development actors.

It is certainly obvious to say, in the same way as Latour (1997) has, that a population of plants, for example, has no absolute or universal meaning. The agronomist has to use this type of «technical» or «biological» parameter since it either permits or does not permit the satisfaction of a biological or economic objective. According to Sabelli (1993), this plant population is only an issue in the way in which it allows, or does not allow, the satisfaction of this objective. Its «normality» can then be evaluated with regard to its reference points: neighbours, others (Dulcire 1994 and 1997), history, technical reports, etc. This assessment in finalised terms (of objectives) and in relative terms (of points of reference) does not uphold the claim of biological and technical norms to universality.

Elsewhere, I have already expressed my very strong conviction that the key aspect of any «sustainable» development process is the appropriation by farmers and technicians of points of reference that they develop together: that is, the construction of their own system of references through practice and the assimilation of tools and methods which assist in the making of a «good» decision - «good» in the sense that it is inscribed in an itinerary which leads towards the satisfaction of their objectives of better control over their environment. The producer does not have to assimilate technical blueprints that he will reproduce passively on his plots of land, but rather, as is the case for each one of us in our daily lives, it is his or her abilities to identify and apply the techniques that at a given moment, and on a given crop, will permit him to better satisfy his objectives.

What is the use of agronomy? Agronomy as a tool for helping make the «right» decision

Agronomic science contributes, as does every science, to «...the development of a critical sense and of judgement, thanks to which individuals form their own points of reference in life, thought, action and adaptation to a less and less stable and palpable environment» (COMETS 1997).

Development is the product of the socio-economic and technical decisions made by human beings, what we call «actors». More concretely, these human beings will, in a more or less conscious way (Petit 1974), translate external constraints and their own understanding of the environment into technical choices so as to achieve their objectives. It is clear that it is these technical choices that are, in both an explicit and practical sense, the preoccupation of and the site of work for the agronomist (Sébillotte 1996). It is also clear that at the same time as a diagnosis of constraints and their solutions is carried out, the agronomist can not dissociate the

analysis of the techniques employed (timeliness of choices, quality of their application...) from the analysis of objectives and of the environment in which they are situated. Choices are situated in these objectives and in an environment, and are determined by these. As Pretty (1994) states, «...the data do not speak for themselves any more»: the claim that technical problems and solutions are universal is, by definition, contrary to sustainable development.

The levels of study adopted by the agronomist are at the intersection of the decision making system and the bio-physical system: to enable the assessment of the appropriateness, and the quality of the implementation, of techniques in the light of the achievement of individual as well as collective objectives, and to propose improvements within this framework.

This implies influencing human beings, not only techniques. Techniques are a means to an end, and to persist in proposing new techniques, elaborated without an end goal other than to serve the central concerns of research, relates more to the relentlessness of academic work, and to technological harassment.

It is not the quality of the technical message which is being questioned here. However, agronomic research deludes itself by seeking to perfect ever more efficient «techniques» according to its own perspective as this constitutes an unbridled advance whose consequences are not under control (Thuiller 1996). Neither the quality nor the relevance of technical ideas are sufficient. It is learning about and training in decision-making, and formalised exchanges between neighbours and colleagues, that will guarantee a real process of *autonomisation*, which in turn will provide the farmer with the tools to define *his or her* optimal decision. Research can not remain aloof from this debate.

Agronomy must not therefore limit itself to remaining an elementary experimental discipline, but it must also become an *agronomy of practices* - what Jouve (1995) calls «agronomy in non-replicable situations». Attempting to help practices evolve implies, first and foremost, explicitly linking the identification and analysis of a problem (the limiting factors) to farmers' objectives. The expression of these objectives results from the way in which the farmer perceives his own needs, in his environment.

The collective construction, or structuration, of a problem is already a first step towards farmers taking active charge over the problem. What may begin as a resigned question expressed as «we have a problem of poor yield» then becomes transformed into specific issues which need to be resolved.

This type of learning that leads to more autonomy (Dulcire 1989) is related as much to the way in which problems are anticipated and framed as to the way in which they can be resolved. «Interest groups» constitute one of the promising ways that have been tried to achieve this

(Dulcire 1993). Such groups organise the analysis of differences in practices between producers, using the research questions, trials and monitoring of commercial plots of land provided by agronomists. This approach has, at the same time, an objective of creating knowledge (noting and explaining the differences), and a pedagogical objective: the producers appropriate for themselves a process of comparative reflection and diagnosis applied to their own situation. This enables them to adapt the technical proposals emanating from research and other producers by themselves. Without doubt, it also provides a way to get beyond the debates on technical validity and social validity (Dulcire 1989).

The diffusion of scientific knowledge via the transmission of undifferentiated technical messages often takes the place of cooperation between «Agronomic Research» and «Development». The social, cultural and economic environment in which farms are situated is considered stable and outside of the decision-making process, and hence outside the research question. This is a catastrophic error.

Farming Systems Research (FSR) has reinforced this tendency by giving greater importance to the farm as the dominant decision centre (and hence the main object of research) or, in other words, by not including its environment as a parameter of decision-making in the research domain. The environment is considered to be stable, not intervening in the decision-making process, and therefore not part of the object of research.

Research on agrarian systems has shown that the environment (social, political, economic and cultural) takes priority in determining the functioning of the farm (Milleville 1991; Jouve 1995). The current work being undertaken by Gerbouin demonstrates the dominating influence of communication networks (eg. family, friend and clan relationships) on the adoption of technologies, and hence on the decision-making function. A given yield signifies, first and foremost, success or failure in satisfying objectives that have been set *in a specific environment*. Estimating this yield remains largely insufficient, however, if we are to encourage the evolution of practices.

The agronomist in the field: knowledge and action

The undoubted scientific quality of the discoveries made by agronomic research do not automatically provide answers or solutions to the problems faced by farmers (Dulcire 1997). By favouring explanatory relationships that are linear, such as «technical change results in increased yield», agronomy has certainly produced enormous numbers of points of references, but these have provided partial knowledge, and generally their conclusions only serve the preoccupations

of research and inquiry. Such points of reference are therefore too heterogeneous. They are incapable of comprehending the complexity and diversity of the process of agricultural production: the juxtaposition of data is not equal to an holistic understanding. Having been elaborated according to different objectives than their own, the users of technologies can only directly exploit these results in their raw state on rare occasions. This fragmentation and separation is, in itself, evidence of the dominant position of bio-physics in the discipline of agronomy.

Further, if farmers know about the technical knowledge produced by agronomy, but do not apply that knowledge, the most relevant discoveries made by research end up serving no useful purpose: they remain dead knowledge. Finally, a relevant solution has to be elaborated to respond to a clearly identified problem that is situated in precise social, technical and economic conditions: this is one of the core objectives pursued in on-farm agronomic research. The object of study is not the «climate-soil-plant system», or, worse still, plants, but rather the «climate-soil-plant system subject to the actions of human beings». Our interlocutor, here, is not the soil, climate or plants, but human beings who manage them: «the curse of having to deal with an object that can speak» (Bourdieu *et al* 1983) is first and foremost a piece of good fortune for the agronomist in a process of undertaking research for development. Olivier de Sardan (1996) has remarked that even if agronomy is not a «social» science, it nonetheless almost *has* to remain in contact with social practices. The ways in which the agronomist intervenes in the farm are the outcome of this.

Surveys and appraisals, even if they are rapid or participatory, will not by themselves facilitate the setting in motion of a social dynamic wherein needs and demands are expressed, then taken into account and satisfied. This is particularly true when the participation of farmers is limited only to the collection of data to help begin a research project (Dulcire 1996). Nor will large-scale on-farm experimentation - even if participatory - be sufficient to achieve this end (Jouve 1995). We normally say that a good response at one point in time will not necessarily be good at another time (Sébillotte 1996). I think that we should also say that factors limiting development are tied to a point in time: the characteristics of the environment, the prime concerns of producers, their relations with each other and with the rest of society evolve. So do appraisals and responses. Agronomists' research concerns should not be angled uniquely towards the technico-economic resolution of problems expressed by producers at a given moment in time. Research must use these to improve the ability of producers to identify and resolve new problems as and when they arise, in a way that is helpful to achieving their objectives. This implies that there is a joint or common part of a programme of identifying and resolving problems. That is to say, there is a process of dialogue, and of negotiation of a compromise on a common research problematic (Verspieren 1990). The active involvement of farmers (and researchers!) allows us to go beyond the purely experimental character of, for example, on-farm trials to turn them into «educational workshops».

Permitting participation is not sufficient to create the conditions for dialogue. A capacity to listen is required, that is to say changing the mindset of institutions and people. A process of true dialogue has to prevail over simple discussion, working together must prevail over the diagnostic survey, and research in partnership must prevail over participatory research (Dulcire 1989 and 1994).The agronomist is a negotiator above being a technician, his or her technical knowledge constituting the currency s/he can exchange.

«Farmers have good reasons to do what they do»; «....their understanding of problems is subjective and often dependent on particular circumstances». These are two commonly cited opinions which are part of «shared meaning» (Bourdieu), but which are difficult to uphold within the perspective of a sustainable development owned by all actors. I think that we must explicitly integrate into our thought processes the idea that the farmer's perception of an object, and of the different ways in which s/he can achieve his or her objectives, is not the same as that of researchers. These different perceptions are linked as much to different objectives as to a different history and different constraints: to understand these, modify them or construct a common perception are functions that *Recherche-Action* (Action Research) has explicitly set for itself (Albaladejo and Casabianca 1995). The judgement of the appropriateness of technical choices and of the quality of the way in which these are implemented can not take place solely at the level of the farm, nor solely applying the point of view of the agronomist. Here also the agronomist will favour relations between two levels of perception (negotiation, compromise), the farmer's «technical» logic and the agronomist's «scientific» logic.

Drawing to a close, it is useful to highlight a number of dangers linked to any on-farm intervention undertaken by agronomic researchers, who in this situation leave their academic ivory towers of experimentation in order to get involved (act) in such processes (Dulcire 1996). The «...illusion of immediate knowledge» (Bourdieu 1982) easily brings with it the risk of confusing «...success in action with validity of knowledge» (Sébillotte 1996), or of «...declaring research to be a completed action» (Verspieren 1990), thus evading the institutional process of «confrontation / validation / evaluation», or again, to muddle a declaration or intention to act with the action itself (Bourdieu *et al* 1983; Sabelli 1993).

Knowledge and action come from different logics (Olivier de Sardan 1996). The first distrusts beliefs, the second needs them. Delbos (1993) notes how scientific knowledge has often led us to forget that it is the knowledge possessed by actors (the «belief») that generates their production strategy (their practice): it is within this relationship that belief and action understand each other, and not in the absolute, it is *doing* that determines the validity of belief. This is the explicit reasoning behind approaches that study agricultural practices (Deffontaines and Landais 1988).

It has been possible to wrongly confuse the study of farmer's practices (or the study of farmers themselves) with processes of collaboration with farmers, confusing FSR with intervention in rural areas (Jouve 1995).

Provisional conclusion

In order to claim to be working for sustainable development, agronomic research must re-appropriate for itself the systemic nature of the object of its research: lying at the intersection of the decision-making system and the bio-physical system, a climate-soil-plant complex on which human beings act with techniques to achieve their, and wider society's objectives. Agronomic research has to reappropriate for itself its practical end goal of assisting rural development.

Such a re-appropriation will mean that agronomists will rediscover their original role of assisting decision-making so as to give farmers autonomy in the management of their production processes beyond the use of technical blueprints.

In order to achieve this, agronomists must leave their research stations in order to act upon the production process within a reasoned and negotiated framework, through the implementation of research-action processes that focus on technical problems.

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