

Implementation of a new organisation at Terrena in order to collect, test, validate and spread Ecologically Intensive Farming solutions: the new role of advisors.

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Abstract

*As a case study, this paper explores how Terrena has changed its “extension services” organisation in order to promote Ecologically Intensive Farming (EIF). Another way to write it down would be this question: “how can a French cooperative help its members practise “green” conventional agriculture?” Terrena, the largest agricultural cooperative in France (22000 farmers) decided, in 2008, to put EIF as the main axis of its 5 year strategy. The objectives are: i) maintain high yield production and ii) reduce the use of non-renewable inputs of its farmer members. Until now, with conventional farming, most of the technical advice given to its members by the 300 Terrena’s advisors were top-down solutions, which were supposed to be efficient in all farming systems and every year. On the other hand, to “produce more and better with less”, EIF has to be more intensive in field observation, in one-year one-field adaptation. EIF solutions are local solutions, invented and improved by farmers themselves. EIF solutions can come mainly from bottom-up knowledge. This reality leads to two main changes in knowledge flows : i) EIF solutions could be known first and known well more by the farmers than by the advisors ; ii) bottom up knowledge which is, at the beginning, a non-evidence based knowledge has to be tested and validated to be sure it is interesting and consequently worth sharing. In order to collect, test, validate and spread EIF technical solutions, Terrena has modified its organisation of internal knowledge flows: the cooperative is the first in France to have set up an R&D team, which, among other objectives, aims at collecting EIF solutions in research centres and in farms. Terrena has also grouped together some of its members to build a network of “forward looking farmers” who are able to innovate, test and popularise EIF technical solutions. For the last 4 years, Terrena has enjoyed real success in spreading EIF solutions (for example the use of a ultra-early oilseed rape to avoid pollen beetle (*Meligethes*) damage), but has also recognised that sometimes some advances come slower than expected (for example the use of leguminous plants in rape sowing in order to avoid the use of herbicide).*

1. Purpose and objective

1.1 Ecologically Intensive Farming (EIF) as a basis of a sustainable food system

Terrena, as many other European farmer organisations, has understood that the challenge of farming for the next few years will be to go on feeding a world population which keeps increasing, but using less artificial inputs.

On the one hand, food production needs to be increased to feed a world population of 9 billion inhabitants expected in 2050 whose eating habits will certainly evolve. Indeed, FAO says it will be necessary to increase farming production by 70% until 2050 (FAO 2011). Clearly, it is on the African and Asian continents that the problem will be most keenly felt. But in a world market, commercial flows are interdependent and this issue notably involves the equilibrium of European markets.

In Europe, on the other hand, farmers and society want to reduce the use of artificial inputs (pesticides, fertilisers, antibiotics, energy...). In fact, these inputs will become rarer and rarer and more expensive (in relation to the price of oil) and they will possibly result in a negative impact on ecosystems (water pollution, air pollution...) that society is no longer prepared to accept.

Ecologically Intensive Farming pursues clearly this double objective: "Produce more and better, with less".

EIF is based on the amplification of ecosystem functionalities (Griffon, 2006), as a replacement of some of the artificial inputs. In addition, the use of non-renewable inputs is not forbidden (contrary to organic farming), in order to maintain high yield production. But EIF tries to significantly replace inputs in order to minimise as much as possible environmental impact. Some EIF solutions are already being tested and others are used by farmers more and more: direct seeding, mulch-based conservation agriculture, agro-forestry, leguminous sowing instead of nitrogen fertilizers and biological control are some examples.

Farmers are still waiting for research innovations: soil natural functionalities enhancement (microorganisms), genetic selection, bioactive molecules (like semiochemicals for crop protection)...

However, two limits of these EIF solutions must be taken into consideration.

Firstly, EIF solutions compared to using artificial inputs need more local adaptations (Chevassus et al, 2008: if this solution is interesting in this field, perhaps it will not be interesting in another field). Originally, agricultural extension had a strongly supply-driven character, in which farmers were seen as passive recipients of information that they should uniformly adopt and apply (Leeuwis and Van den Ban, 2004). In opposite, EIF will be partly based on bottom-up knowledge, with a larger spatial approach (global farming system) than the field or the herd. But this tacit knowledge, this non evidence-based knowledge (farmers' knowledge about their fields, their practises) has to be validated before its diffusion to other farmers.

Secondly, using natural functionalities is also more risky. In many occasions, these functionalities will not be sufficient enough. For example, nitrogen fixation by leguminous or protection by a beneficial insect will not be effective enough and this lack of efficiency will lead to a loss of yield. Thus this will leads to a loss of income for the farmers and also for the whole downstream agricultural sector. The economic and financial constraints often impose very short-term views in the strategy of the farms which slows down the process of acceptance of the application of the EIF (Bonny, 2011).

1.2 Two key research questions

Thus, more and more public research teams and farmer organisations in France and other countries consider that Ecologically Intensive Farming could be the basis of sustainable food system. EIF could be one answer to the new challenge of farming, which could be summarised by this sentence "Produce more and better, with less". EIF could be a form of farming able to feed nine billion people by the year 2050, and provide them with energy and biomaterials while preserving the environment.

But, to succeed in developing EIF, we have to consider these two topics:

i) Partially based on bottom-up knowledge (knowledge which comes from the farmers vs knowledge which comes from the engineers or researchers (top-down knowledge)), EIF requires changes in agricultural extension. It will be difficult to completely reproduce some laboratory-made solutions in the field. Farming will be undergoing continuous innovation directly on the farm. It is now recognised that, to achieve more sustainable agricultural practices, all the agricultural parties (farmers, advisors, researchers...) will have to contribute on equal terms to knowledge building.

The term 'extension' has become a generic term employed to refer to the variety of systems and providers that have emerged for communicating and transmitting information and technology to farmers (Rivera et Sulliman, 2009). A large part of extension services is managed by agri-cooperative private advisors.

These advisors embed advice within a broader palette of goods (feed, seeds, fertilizers, pesticides...) and services. Some authors (Klerkx, 2010) call them "embedded advisors". In some European countries these embedded advisors are widely used by farmers (in France more than 50%), often more than specialized independent advisors (agronomists). Many studies try to verify if this kind of private extension services could really promote the reduction of the use of non-renewable inputs. It is still interesting to study what the different evolutions in cooperative knowledge management are, in particular for the back office teams.

ii) Partially based on more natural solutions, it also means that farmers have to practice more risky solutions and therefore advisors have to give more risky advice. This is new for the advisors. Yet, Cooperative extension services rely on the dynamic and confident interaction of long-term partnerships between farmers and advisors. By definition, risk is opposed to confidence. Yet, as many researchers have already shown (Laurent et al 2006 ; Ingram, 2007), the promotion of better management practises in order to implement sustainable farming depends on the confidence and the shared understanding between farmers and advisors. Extension is presently an object of reform, while continuing to be an increasingly important engine for knowledge, innovation and development (Rivera et Sulliman, 2009). So, sustainable agricultural policies in France try to link the cooperatives to the reform of extension. The high level of confidence between the farmer and his cooperative advisor has to be kept. The role of the embedded advisor will have to change. So, it is another reason to study French cooperative extension services.

2. Terrena, a strong farmer organisation in France

As already stated, a large part of the private extension services (advice, knowledge transfer...) in France is carried out by agricultural cooperatives. This paper will take Terrena as a case study of the evolution that could happen in privatised agricultural extension in order to promote Ecologically Intensive Farming.

Terrena (www.terrena.fr) is a French agricultural cooperative in the West of France. It gathers 22,000 farmers (approximately 2 billion hectares of Utilised Agricultural Area (UAA)) around three main activities:

i) upstream, the commercialisation of farming inputs (pesticides, fertilizers, seeds, animal feed and care...). Terrena supplies its members to a value of 970 million Euros with fertilisers, animal feed...

ii) downstream, Terrena collects its farmer members' productions (cereals, wine, milk, cattle, pigs, poultry...) to a value of 2.3 billion Euros which accounts for approximately 10 % of the agricultural production of the West of France, a key European region.

iii) Also downstream, using its industrial equipment, Terrena processes and commercialises the equivalent of 2.9 billion Euros of products through major retail outlets to the general public and final consumers.

With 4.3 billion Euros of Turn Over in 2011, Terrena is the largest agricultural cooperative in France.

To prepare its future Terrena commits itself to a new pact between farming and society based on two axes: Ecologically Intensive Farming upstream and Nutrition and health downstream.

In 2008, faithful to its cooperative values, Terrena organised a big debate with all its farmer members. The surprise was big for Terrena's advisory board: 90 % of the 3 111 farmers who participated answered that a 50 % reduction of pesticide use, even if difficult, is not impossible on their farm. 84 % told Terrena to be even favourable, very favourable, to the fact that their cooperative works in this direction and offers them alternative solutions for non renewable inputs. The answer was the same for fertilizers. For Terrena it was clear: there is a strong member-driven-demand for new "green" advice.

In addition, Terrena's great commitment to the commercialisation of food products allows the cooperative to better understand the expectations of consumers, and so of society. This demand-driven evolution for more sustainable agricultural practices has also been discussed inside the different business activities and also calls the cooperative and its 300 embedded advisors for an overarching attitude change.

For these two reasons, Terrena decided to put Ecologically Intensive Farming at the heart of its 5 year strategy (Terrena 2010). Terrena wishes to provide solutions for the farming of tomorrow and to contribute to consumer well-being.

The promotion of EIF as the new strategy of Terrena provides the empirical context of this study. It will show i) how Terrena is modifying its internal knowledge diffusion to succeed in communicating EIF solutions to a maximum of its farmer members and ii) how the advisors' job has evolved in this context of bottom-up knowledge and more risky solutions.

3. New organisation at Terrena in order to spread EIF

To manage to spread EIF to a maximum of its members, Terrena modified its internal organisation of knowledge flows (see figures 1 and 2).

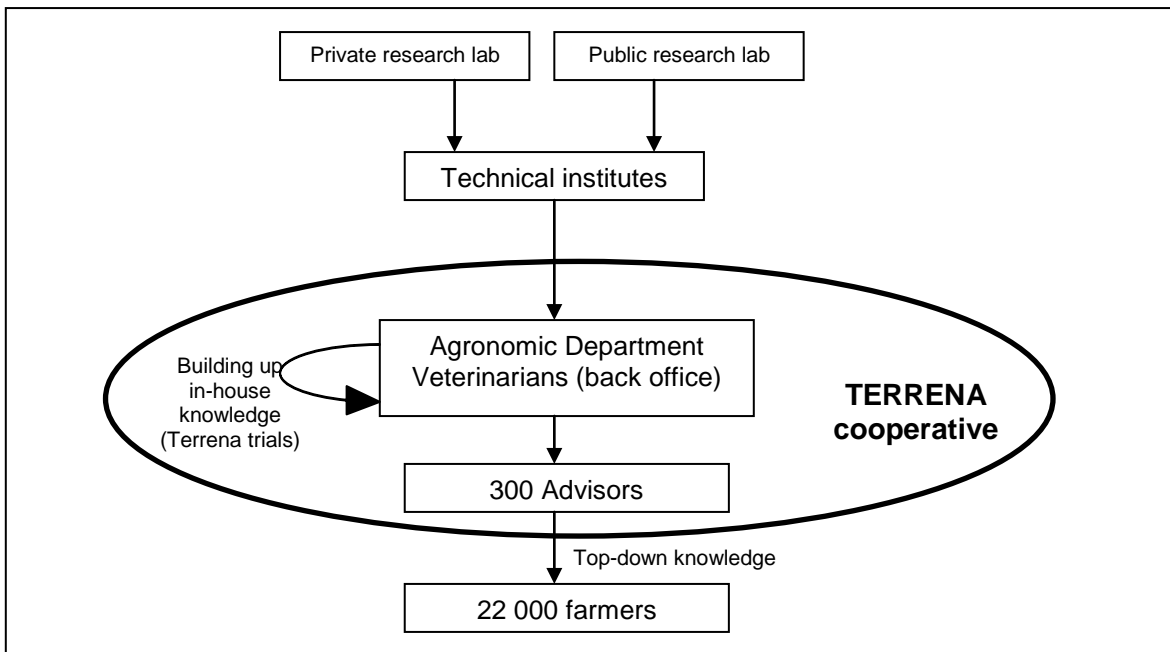


Figure 1. Knowledge flow at Terrena before the implementation of its EIF strategy

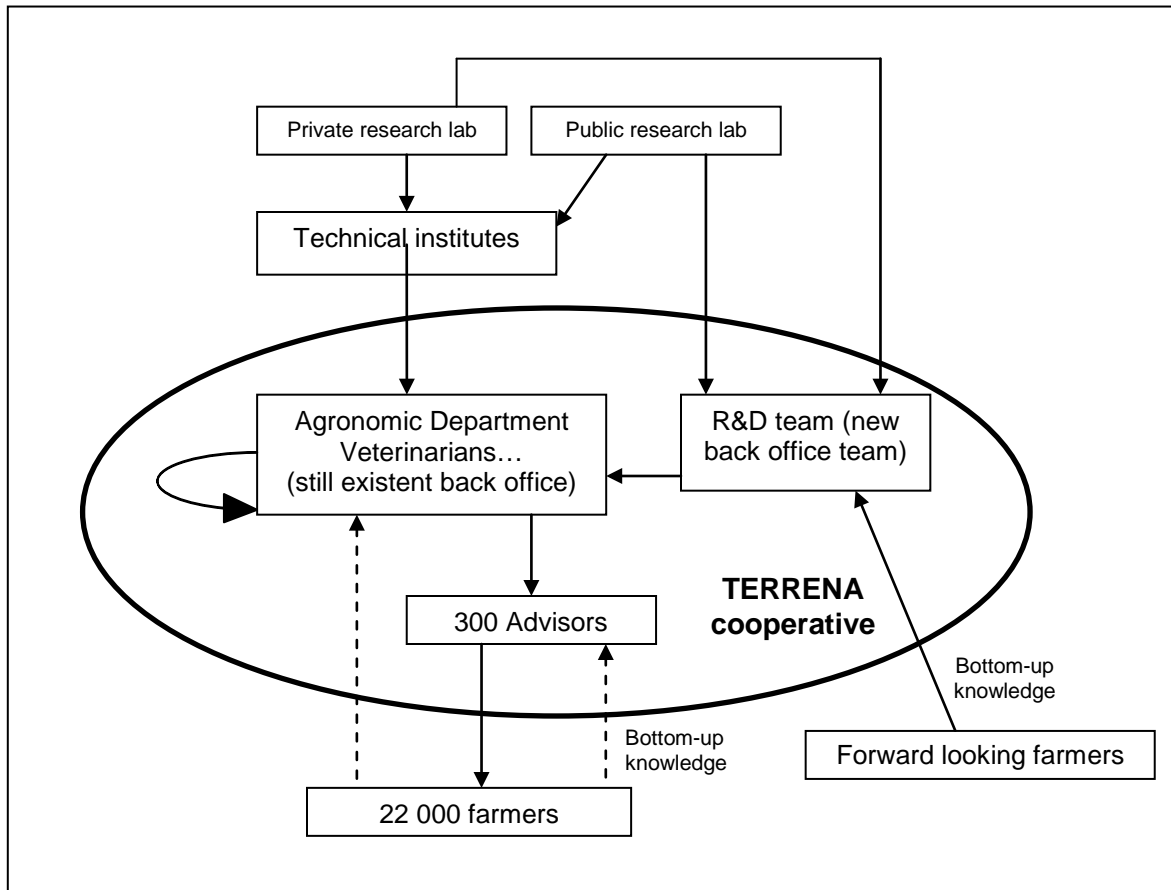


Figure 2. Current knowledge flow at Terrena with the implementation of its EIF strategy

Alternative solutions to agrochemicals and the enhancement of ecosystem services put the farmers back into the process of innovation: some innovations come from farmers themselves (bottom-up knowledge). These innovations must be identified in our members' farms, tested and validated in Terrena's Agronomic and Veterinarian Departments on a new scale (farming system scale and not only at field or herd scale) and then shared with our 22,000 members. This will slightly modify the job of the 300 cooperative advisors (crop and animal productions): they will be rather "facilitators" of farm knowledge spreading than "teachers" of top-down knowledge.

The new organisation of knowledge is currently based on two main evolutions:

3.1 EIF R&D team

Firstly, in 2009, the creation of a R&D team which is specially dedicated to collecting EIF solutions.

This R&D unit is a 6 engineer team working on 10 separated topics: e.g. soil protection, water management, animal nutrition and health, farm tools and machines... It develops strong synergetic links between farmers and already existing teams of engineers, veterinarians and technicians (the back-office of the extension services). With new computing means for project managements, the 6 EIF project leaders are able to collect potential innovations not only from research labs but also from the farmers. Every new idea is registered and codified as a prospective new project in one of the 6 project portfolios.

Then the R&D team has to find the human and technical resources to challenge these new ideas in a classic way of project management. Could this idea lead to a real EIF innovation? After the registering step, each project will follow the 5 step project management methodology to become perhaps an EIF solution. Between each step, many criterions are checked in order to kill or to push the project further: for

example, technical feasibility, economic interests for farmers and for the cooperative, risk management... To ensure correct management of project portfolios, a manager is appointed to head each project. The R&D team has to name a Terrena employee among, for example, the Agronomic Department, the Veterinarian Team or the Board of Directors.

Another important criterion is to transform farm-made solutions to evidence-based solutions. This is the goal of step 3. This can be done by historical activities of the cooperative, and also by other stakeholders such as technical institutes or research centres. The project manager will have to take advantage of these different experts to be sure there are a real and interesting innovations and not only personal convictions of the farmers. Besides, some of the EIF solutions may not have been validated in the classical way of agronomic trials (plots...). Beneficial insects, crop rotation... which could be the basis of EIF solutions need larger scale to be taken into consideration. That is a reason why Terrena built up a "forward-looking-farmer-network" (see below).

In addition, we can add that this need of scientific proof is the subject of many current researches inasmuch as EIF and sustainable practices are based on farmers' innovations.

Finally, the R&D team helps the classical Terrena back-office activities to communicate the innovations to maximum farmer members of the cooperative. The role of the R&D team is to keep all advisors and farmers, who naturally tend to prefer the less risky solutions, motivated. In order to keep every employee (advisors, engineers, directors...) on the same line, the R&D team had first established an indicator grid to qualify each solution. Four criteria have to be taken into consideration: i) preservation of high yield and quality; ii) significant reduction of input uses; iii) significant reduction of the negative impacts of ecosystem; iv) double green revolution (disruptive progress vs continuous agricultural progress).

3.2 Forward looking farmer network

Secondly, since 2011, Terrena has organised and has been the driving force of a network of some of its members, the most interested in inventing and sharing knowledge. Terrena calls these farmers "forward looking farmers". They are at the heart of the process. Some of them will be the inventors; others will be the testers and finally the popularisers. In January 2012, only a few of them had been identified, but the objective is to have 400 forward looking farmers in the near future.

Thanks to this forward-looking-farmer-network, Terrena hopes not only to collect but also to validate some of the farm innovations. Indeed, until now, the scientific model (labs, agronomic department...) was almost exclusively based "on experimentation and not on experience" (Tassin, 2011). In this new farming approach, this model does not seem to be totally adapted: it overlooks the history and the variability of a complex agro-ecosystem reality. In the farm network trials could give statistical proofs as well as plot trials. Almost the same process was in progress during the Green Revolution during the fifties and sixties.

The cooperative has written down a contract with the rights and the duties of the farmers and the coop. For example, the farmers agree to let the cooperative use their name and photograph if there is an interest in promoting EIF to other farmers and to Terrena customers for example. One experienced employee has been named to drive the network over all the Terrena area.

3.3 The advisors: facilitators of knowledge diffusion and risk acceptance

Terrena managers are also thinking about the evolution of the advisors' role. This sometimes difficult evolution has already been studied (Cerf, 2008).

As some of the EIF solutions will be very local solutions (one farm, one field, one year solutions) the advisors will not be able to technically master all of them. This is new for them. Until now, most of their legitimacy came from the knowledge that they had and that they were able to bring to the farmers. With EIF, they won't be able to master all the local solutions. But if they try to be aware of all of them, they will play a role of facilitator of knowledge diffusion. They will not say: "Here is the solution to your problem"; they will rather say: "For your problem, I heard that so-and-so has tried this solution, and in this condition,

it was a success. I think we also have good result in other forward looking farmer trials. Do you want me to get more information for you?" Instead of being solely technical experts, advisors must take on the role of coach and facilitator from a reflexive and adaptive position (Leeuwis and Van den Ban, 2004).

The second aspect to be taken into account is the acceptance of the risk. As we have said before, a strong interaction between advisors and farmers is necessary to achieve agricultural extension. And it just so happened, it is more difficult for an advisor to put forward such risky solutions, because, nowadays, in case of failure, the farmers would certainly lose their confidence and would try to make the advisors bear full responsibility for it. Thus advisors of course prefer to work within what Ingram (2007) calls their "comfort zone".

An interesting example clearly shows this aspect. It is the comparison of the launch of two EIF solutions for oilseed rape in August 2011 at Terrena. At the beginning, these two EIF solutions were farmer trials. They followed the 5 step project management methodology and were ready to be launched last August by the cooperative advisors and farmers.

The first one is the sowing of 5% of an ultra-early green rape among the oilseed rape seeds in order to attract the pollen-beetles (*Meligethes*) before the rape flowers and thus to reduce the use of insecticide. In fact, these insects are pests before the rape flowers, because, in order to eat, *Meligethes* make a hole in the future flowers and destroy them. But after the oilseed rape flowers, *Meligethes* become beneficial insects as they no longer destroy the flowers but improve the pollination. With this ultra-early rape, *Meligethes* are attracted: they destroy the green rape flowers and meanwhile the oilseed rape can bloom. Last August, around 35% of all the oilseed rapes were sown with this ultra early rape. It is considered as a success. This success is maybe partially due to the fact that the technical commitment of the farmers remains relatively limited: in case of *Meligethes* attacks, the use of insecticide is still possible.

The second example is sowing leguminous plants in oilseed rape rows to avoid using a systematic pre-emergent herbicide. This solution was tested over two years in the looking forward farmers and Agronomic Department fields. During Spring 2011, Terrena agronomic engineers presented this solution to the advisors who should have proposed it to many farmers all around the Terrena area. At the end, only 1,000 ha were sown over a total 30,000 ha of oilseed rape. This setback is the result of the non acceptance of the risk, not only by the farmers but also by the advisors.

With these two examples, we can understand that the acceptance of these technical risks could slow down the spread of EIF. Its diffusion will take time. The organisation of the knowledge flows will perhaps have to evolve again.

3.4 La Nouvelle Agriculture®

Finally, we can also mention in this paper that in order to succeed in spreading EIF, which leads farmers to take more risks compared to using artificial inputs, Terrena is trying to sell its members' productions for a higher price.

EIF does not seem to be the right way to explain to Terrena's customers what the farmers' efforts are. "Ecologically Intensive" is an oxymora that makes the farming sector become aware of the need for changes in their practises. But this oxymoron seems to be too complicated to be understood by superstores and the general public. Contrary to Organic Farming, the cooperative agree to recognise that EIF will not lead to better agricultural production value. That is the reason why Terrena changed its identity to become "Terrena, la Nouvelle Agriculture®" (Terrena, the New Farming) in September 2011. This new identity will be useful to explain to the cooperative's customers what EIF and the looking forward farmers are. With the help of the marketing department, Terrena has already registered a first success: an important firm in the meat business has signed a contract with higher profit for Terrena and thus for its members.

Conclusion

Terrena made a strategy decision to commit itself to EIF and thus include a maximum number of its farmer members in the application of EIF principles. As has been stated in this paper, Ecologically Intensive Farming solutions will be much more local, punctual and more difficult to be applied generally than input-use techniques. Some of these solutions will be invented by the farmers themselves.

To manage to mobilise its members, it seemed necessary for Terrena to change the organisation of the cooperative knowledge flows, in particular to collect and validate farmers' solutions. For this purpose, the cooperative created i) an R&D team especially dedicated to EIF in 2009 and ii) also built up a farmer network to manage the question of bottom-up knowledge in 2011. The cooperative is also aware that its 300 advisors' job has to evolve: advisors will become "knowledge diffusion facilitators", while at the same time having to manage to give more risky advice.

In France, agri-cooperatives are mainly engaged in extension services: they are a major vector of innovations. Today, many other large French cooperatives are starting spreading EIF knowledge and then modify, as Terrena, their back-office organisation and reinvent the role of their advisors. So this paper could interest the different considerations about changes in agricultural policies (Labarthe, 2011) and the difficulties to evaluate them.

As 2012 is the international year of cooperatives, Terrena would be interested in sharing its experiment with other European farmer organisations and research centers in order to improve its own strategy and thus enable Ecologically Intensive Farming to become more widespread.

References

- Bonny, S., 2011. L'agriculture écologiquement intensive : nature et défis. Cah Agric 20 : 451-62. doi : 10.1684/agr.2011.0526.
- Cerf M., Guillot M.N., Olry P., 2011. Acting as a change agent in supporting sustainable agriculture: How to cope with new professional situations? Journal of Agricultural Education and Extension, 17(1):7-19.
- Chevassus-au-Louis, B., Griffon, M., 2008. La nouvelle modernité : une agriculture productive à haute valeur écologique. Déméter : Économie et Stratégies Agricoles. In : Déméter 2008 : économie et stratégies agricoles. Paris : Club Déméter.
- FAO, 2011. Save and Grow. FAO, Rome June 2011.
- Griffon, M., 2006. Nourrir la planète, Odile Jacob, Paris.
- Ingram, J., 2007. Agronomist-farmer knowledge encounters: an analysis of knowledge exchange in the context of best management practices in England. Agriculture and Human Values, 25(3):405-418.
- Klerkx, L., Jansen, J., 2010. Building knowledge systems for sustainable agriculture: supporting private advisors to adequately address sustainable farm management in regular service contacts. International Journal of Agricultural Sustainability 8(3):148-163.
- Labarthe P., Laurent C., 2011. Économie des services et politiques publiques de conseil agricole. Cah Agric 20 : 343-51. doi : 10.1684/agr.2011.0508
- Laurent, C., Cerf, M., Labarthe, P., 2006. "Agricultural extension services and market regulation: learning from a comparison of six EU countries. European Journal of Agricultural education and extension, 12, 15-16.
- Leeuwis, C., Van den Ban, A., 2004, Communication for Rural Innovation: Rethinking Agricultural Extension, Blackwell Science, Oxford.

Rivera, W., Sulaiman, R.V., 2009. Extension: object of reform, engine for innovation. Outlook on Agriculture, 38(3):267-273.

Tassin, J., 2011. Quand l'agro-écologie se propose d'imiter la nature. In Le courrier de l'environnement de l'INRA n°61, décembre 2011.

Terrena, 2010. Sentinelles de la Terre, mettre en pratiques une agriculture écologiquement intensive. Ancenis : Terrena.