THE ECOLOGIZATION OF AGRICULTURAL SCIENCES AND TECHNOLOGY AND THE ROLE OF SOCIAL STUDIES ABOUT IT

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Situation of Scientific Knowledge production, Innovation and Expertise in relation to the re-arrangement of agronomic science production under the conjunction of three intensive area of change and transition:

. Globalization and niches of sustainable innovation system involving in life sciences and agricultural technologies;

. Climate change and re-fuelling modernity with Fibers and BioFuels

. Claims for democratizing science and technological policies towards sustainable agricultures.

Rural Studies and Rural Sociology have a particularly promising job to do in re-assembling the Social, the Natural and the Technical within “the treadmill of sustainable development”.

More specifically, it is argued that the cross-fertilising of ecological modernization movement and Actor-Network-Theory is giving the opportunity to establish a perspective that might enlighten and accompanied the effective ecologization processes of modernized agricultures under certain requisite of deliberative conditions.
1. The trend towards an ecological modernity

The Treadmill of Production

The Ecological Modernization
The TOP: The Treadmill of production

- in the light of the raise of direct consumption practices or green consumerism involvement, the predominance of entering in the treadmill through the temporality of production and not consumption is an important bias;

- in the light of eco-service economy and deployment of eco-government settings and apparatus, the idea that the environment is only to be mined for natural resources or to be uses as a trash, do not account for the economy of recycling or industrial ecology.
The treadmill of Sustainable Development

- the expression of S&T in a sustainable perspective requests new political spaces (Latour, 1993) and a re-engagement of their social consequences (Redclift, 2005)

- The fact that a market governance of sustainability would mean addition and subtraction of environmental justice according to a non deliberated distribution of risk (Beck, 1992).
The Ecological Modernization

- The « ecological modernization school of environmental sociological thought in Northern Europe » (Buttel, 1996)

- Quoting the early work of Spaargaren and Mol (1992), he was pointing that « the development of environmental knowledge and social pressures were creating a basis for deflecting the course of modernity in the direction of ecological modernization ». 
Quite at the same time, Schmidt (1993) was also using the notion of “ecologization” to point the fact that environmental policies should pay attention to the social conditions that “may be favourable or impedimental to an ecologization of 'the economy'” such an economization being considered as a new phase of the “civilizing process”.
A theory of non-centralised and not planned change of social order because of environmental damages (Mol, 1992; Mol and Spaargaren, 1992).

The establishment of environmental issues as a turning point and a set of matters of concerns to frame a research program.

To fuel the political definition of alternative solutions to the post-industrial agri-food system described by Allaire (1996) and the decline of national food system linked to national agriculture (Friedmann and Mc Michel, 1989).
The reduction of ecological modernization to a type of alternative (assembling organic farming and short circuit or direct consumption):

But a constructive resistance to industrial agri-food system was also an alternative and a positive model associating very directly farm and rural development with innovative modes of food consumption, a “new rural development paradigm in Western Europe” as labelled by Goodman (2004).
Many Narratives about Ecological modernisation

- The ecological modernisation started to take place within the so-called conventional agriculture under local agri-environmental experiments and under the resources coming from the greening of agricultural policy.

- The ecological modernization started also to mean a variety of possibilities in terms of institutional arrangement of sustainable development (conventional, standards, labelling) and space (regions and nations).
The various master frames and narratives that shape the political agenda of sustainability and the distributional consequences of dynamic changes in agriculture (Thompson and Scoones, 2009).

Ecological modernization could mean also, among other things, a rationalization process until the last acre to be turned into “biofuel cropping”.

The competition of narratives is thus not concerning only food production and system of provision, but narratives concern more and more agriculture as a multifunctional and technological sector.

Objectives are addressed to agronomic sciences in order to develop the regime of evidences that could ground the measurement of sustainable agriculture according to multifunctional objectives and globalized governance of carbon emission and storage.
There is a promise, which is arising, showing the paths for an ecologically intensive agriculture, which presents itself as very technical and modernist project similar to the green revolution (Griffon, 2006).

A third Green Revolution is also proposed to promote an ecosystemic engineering based on ecological principles (Hastings et al., 2008)

Agroecology is advocated as new road of science and technology (Altieri, 1989)

European Knowledge Based Bio-Economy (KBBE) (Coombs, 2007).
Vanloqueren and Baret (2009): “This means not only a more balanced allocation of resources in agricultural research, but attention to the larger Framework that influences S&T choices”.

Advances Sciences studies and Science Policy Studies about regime of knowledge and transition in agricultural research is announced here.
ANT in the Rural
The opposition between the Natural and the Societal, which ground the modernist agricultural project, appears to be criticized.

But this critic seems to leave aside many Knowledge and Technical aspects, despite it has brought back human agency in the matters of concerns of environment and sustainability of agriculture.

Goodman (1999) introduced radically the ANT points of views: “agrofood studies are weakened by their methodological foundations staying in the modernist ontology”.
The notion of corporeality: a metabolic relation, which is relating the “on the land” production of food and the “in the plate” consumption of food which signifies “organic, eco-social processes that are intrinsic to agriculture, to food, to agro food network and the hybrid constitution of the practices in the social worlds”.

A “second nature” is also introduced to define agricultural nature, as being “produced in interaction with social labour, and the corporeal metabolism that describes the nexus of food and human bodies of production and reproduction”.
As Higgins (2006) has also claimed that more place has to be devoted to the centrality of non-human in agri-food studies.

They are modes of ordering (Law, 1994) that enable to depict strategy and to move between actors and contexts, this framework has been mobilised by Lockie and Kitto (2000) to introduce ANT methodology in agro-food studies.
To go beyond the open-up and closing-down of controversies about the nodes of power relations within agro-chain,

To enter a more systematic programme of identifying and analysing the resources and contingencies of modes of ordering that are building agrofood networks in relation to agronomic sciences and to environmental management.
ANT was born in the attempt made by social studies of science to bridge the human and technical agency of laboratory life and the human and technical agency of technological innovation process in society.

- The concepts of translation, intermediary object, obligatory point of passage, immutable mobiles
- To give an account of the co-construction of technique and society in the script of simple technical objects or complex technical systems.
Translations that are punctualized after a long process of negotiations with multiple sophisticated arrangements are more easy to study because simply more “visible” and sometimes more “noisy” when socio-technical controversies had to be closed.

The semiotic of agrochain is, first of all, a methodological framework for the de-construction and understanding of the power-relation, heterogeneous human and non-human agency, functional materiality and knowledge that are punctualised in networks.
Following actants along translations relation and agentic intermediary objects is not enough, since the reason of a successful translation or even a deny of being translated always exists in a specific area of practices.

When one leaves the inscription of technoscientific networks, there is a need to explain how networks fit or not, under what kind of local historical determination or contingencies to the area of practices or organisational setting that the actor-network is relating.
**FIGURE 2**
The proposed layered representation for an ecology of knowledge

- Historical Events
- Macroscopic Institutions
- Institutions
- Occupations and Disciplines
- Organizations
- Knowledge/Skills
- Artifacts
- Actors
Biopolitics of actor-network and the Bios

□ When STS scholars take biomedicine and biotechnology as a matter of inquiry (either into resistance to biopower or into the pathways of innovation process),

□ what life sciences researchers or clinicians do to the human bios is frequently questioned in terms of social control, surveillance, knowledge and ethics. This also questions the status of gender in half ontological, half political debates in STS.

□ STS work mobilized in those circumstances of public and political debate about governing societies with technoscience affecting the bios
The scientific and public issues of food scares, of GMO controversies, of animal welfare in husbandry, and lately about biosecurity and climate change indicate that the “Science-Technique/Society” divide was undermining the fact that the politics of Nature (human or non-human) was also at stake within the technoscientific project.
Within an ANT framework we could say that domesticated animals or plants for food supply have (at least) three political voices:

- one as they encapsulate the human work who have breed them and put them into the metabolic relation (from farm to plate);
- another as they also encapsulate the human work who have selected or transformed their characteristic and the human agency about the fact that they have been engineered by technoscientific and/or breeding practices;
- and finally the fact that their ways of being in rural spaces is more and more a matter of monitoring for sanitary and environmental reasons.
3. The junction of 2 Divides

- The divide between Science or Technique and Society confronting rather lately to the issues of the politics of Nature for STS.

- Thet divide between Nature and Society hiding the politics of Technology in the ecological modernisation project as I tried to explore it in the first section for Rural Studies.

- “ANT has been slow to find its way into agrofood studies” (Goodman, 1999).
As far as those divides are recognised and also identified as sources of questions, problems and new scientific issues,

Two directions for social studies involved in the matters of cultivating, engineering, transforming, managing, governing “Nature”.
Disciplinary ontologies to be maintained despite the Nature/Society debate

Goldman and Schurman (2000) «sociology remains at its best when it tries to understand how new and enduring structures, institutions, and practices exploit and dominate people and nature, as well as reveal new strategies for emancipatory politics. We believe that once scholars begin to rethink the framework of the society-nature divide, other cherished but flawed ideas will also reveal their weaknesses. We hope that from this process, a new sociological imagination will spring». 
2\textsuperscript{nd} Direction

- 2\textsuperscript{nd} direction is to take risk with the recognition of the divides that grounds our modernity (Latour, 1993), and thus our position towards the people that are not supposed to be modernized enough and our responsibility towards matters of concerns.

- The primitives of our modernity are not defined anymore by colonial and post-colonial science.
  - Who has to take the blame: The farmer or peasant?
  - Who is the patient: The farmer or the agronomist engineer?
The ecological modernisation is having its “second nature” since the accelerating proliferation of eco-govermentality and ecosystem services during the past 5 years calls for many more works about the “treadmill of sustainable production”.

The contestability of technoscience promises as well as the contestability of technological artefact deployed in society are both calling for new ways of governing innovation process in societies, specially according to existence or allegation of collective risk.
For social or biotechnical research in and on the rural and agriculture, participation is of course an issue or a matter of fact to get into the biopolitics with the treadmill of sustainable development.

It is also a matter of professional attachment to the situation, place and social worlds where scientists are going to get close to the materialisation of biopolitics in dispositives.
Conclusion

Conditions to re-assemble the Social, the Technical and the Natural
Condition 1

- To recognise the idea that there is a co-production of technology, nature and society
- New regimes of power-relations are then appearing within the legitimacy that the protection and value of environments had gained in discourses.
- The contestation and the contestability of this integration has become a public problem to design sustainable.
The integration of biological life into politics may define governmentality in a much more performative conception of biopolitics, where practitioners, regulators, stakeholders and activists do not conceal the fact that they are making history in a state of vulnerability and that irreversibility follows from decisions or non-decisions.
A pragmatic approach of the “use of our knowledge” in this turn is an obligation that we cannot escape.

We shall not only produce ontology and methodology to get the Social Sciences right, we also have to perform the re-assembling of the social, the technical and the natural.
to be present, as social scientists on the “field”, whatever the intensity of this attachment.

to include those who create knowledge and technologies on one hand

to pay attention in pulling-in those who have concerns, ideas or claims

Thus, the systematic treatment of the dynamics of coproduction and the re-assembling of the social, the technical and the natural is something that can take place under specific conditions and kairos
Properties

- to involve situations and practices of cooperative design between scientists, engineers and practitioners;
- to involve a certain level of worrying without tolerance about the re-framing of occupations and identities in systems of practices (farmers, land managers, R&D engineers, scientists, etc.)
- to involve a certain level of hybridity and openness in order for claims and concerns about producing “Natural” goods (first of second agriculture) to be translated.
the re-assembling of the social, the technical and the natural is requesting a dense milieu of heterogeneous practices, a collective exploration of the potentiality of innovative design and of course to cross many of the organisational and institutional layers that new arising networks will cross.
Thank you for your attention

Web site: http://www.ifris.org
Visualizing of Actor-Networks
Total number of farmers: N=36 - Protected Area in 1996: 2,700 ha, which means 25 farmers adopting new specifications and 13 of them working completely in the catchment area.
GLOBAL NETWORK

RESOURCES
NEGOCIATION SPACE UPON RESOURCES AND SOLUTIONS IN ORDER TO FIND SOCIO-TECHNICAL SETTING WHICH KEEP ATTACHED GLOBAL NETWORK INTERESTS AND LOCAL NETWORK CAPABILITIES

OBLIGATORY POINT OF PASSAGE

INNOVATION AS PROCESS
INNOVATION AS OUTPUT

LOCAL NETWORK

Try to enrolle and stabilize resources which are necessary to keep the innovation as a process

Try to enrolle and stabilize actors and sociotechnical settings in order to shape the innovation as an output

Mapping of transalition trajectory of innovation process

Degree of attachment of to global network actors

Degree of mobilisation of local network actors
Une instance est ainsi définie comme un point fixe du réseau, qui indique une opération de transformation reliant deux actants, soit par sa capacité normative soit par sa souplesse (Dodier, 1995, pp 56-57: « chaque instance représente un type d’exigence relatif aux êtres en circulation, et qui a été identifié, isolé, stabilisé », p.56). Le schéma de principe de l’Encadré 6-12 reprend la notion de traduction en insistant sur le médiateur, objet ou actant intermédiaire d’une mise en relation, qui désigne autant la relation comme moyen d’une action que comme son résultat (voir Latour, 1991). Le corollaire de cette représentation des relations fonctionnelles entre les actants d’un réseau est que des objets font faire des choses à des acteurs, (par exemple un contrat qui oblige les parties). Mais la taille de ces actants intermédiaires fait qu’il peut s’agir d’une boîte noire qui replie dans ce qui fait office de médiateur, tout un autre réseau.
### Five stakes for a sustainable transformation of farming practices

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<tr>
<th>Stake</th>
<th>Description</th>
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<td>Integrating the uncertainty on the acknowledge of the problem</td>
<td>Promoting the Socio-technical negotiations on change path</td>
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<td>Estimating the temporality and territoriality of actors</td>
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<td>Promoting Actors’ autonomy</td>
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<td>Democratising power relationships</td>
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#### Create the conditions to facilitate negotiated transformations of practices

- **Promoting**
  - **Human assembly 2**
    - Representing the collective of actors and promoting debates about the way the innovation is shaped
  - **Human assembly 1**
    - Convening a setting to achieve the definition of a common problem

- **Convening**
  - **Convening**
  - **Convening**

- **“Laisser-faire”**
  - **Human assembly 3**
    - Let an autonomous set-up emerging in order to treat the problem in a practical way