Experiences from a winter school on landscape agronomy: stakes, difficulties, perspectives

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***Abstract**: In the latest fifteen years, agronomic research has shown a growing interest for studies which link farm or field scale to landscape scale. Thus, agronomy is called to renew its research questions and methodologies, and as well its educational programmes.*
In this context, some French and Italian researchers interested in these topics, coming from different scientific fields but sharing interests on landscape scale issues in research and higher education, decided to join their efforts around a common one-week educational programme on Landscape Agronomy for undergraduate and PhD students.
Their aim has been to develop a new form of knowledge transfer and application on Landscape Agronomy approaches to students of SSSA-Pisa (IT) and of the PhD School of ABIES-AgroParisTech-Paris (FR).
The educational programme consisted of three phases : 1) some theoretical contributions supported by presentations on : issues regarding agriculture and farming practices at landscape level, main approaches on environmental functions of agriculture, changes in farmers practices driven by environmental questions, spatial organization of agricultural activities, role of farming in ecological dynamics, identification of complementarities among agro-environmental functions, environmental impacts of cropping systems, biodiversity influence on agro-ecosystem functions and vice-versa ; 2) two case-studies: a "macro level" one (at landscape scale) to analyse the role of agriculture on landscape dynamics, and a "micro level" one (at farm scale) to analyse farming practices and their environmental impacts ; 3) a final evaluation of the educational programme based on : contents of oral presentations on fieldwork results, global evaluation of the educational programme contents by all the participants, each individual ex-post analysis of fieldwork results.
The evaluation of the students and teachers underlines benefits, requests and perspectives for education in landscape agronomy. Furthermore, this experience stimulated a collective conceptual and methodological debate that confirmed the necessity to favour and organise experience exchanges on researching and learning in landscape agronomy.

***Keywords:** agronomy, education, agro-environmental functions, research methods, multi-scale*

Introduction and context

In the latest fifteen years, agronomic research has shown a growing interest for studies which link farm or field scale to landscape scale. In that time the socio-economical and political context for agriculture changed with the increasing demands for analysis and evaluation of environmental issues related to agricultural activities, wider participation of stakeholders in territorial management, rural-urban dynamics, territorial planning and policy implementation. Thus, agronomy is more and more called to renew its research questions, methodologies, tools, and as well its educational programmes (Benoît *et al.*, 2006, Lardon *et al.*, 2005). In regard to these new issues, the current situation of Agronomy reveals different limits in its approaches linking farm or field scale to landscape scale: (a) a fragmented conceptual framework, (b) a loss of references to agronomic sciences tools, (c) some difficulties to work out synergies within other disciplines.

In this context, some French and Italian researchers interested in links between field, farm and landscape scale, coming from different scientific fields (e.g. Agronomy, Ecology, Geography) but sharing interest on landscape scale agronomic subjects in research and higher education, decided to join their efforts around a common one-week educational programme on Landscape Agronomy for undergraduate and PhD students. This is the reason why the Scuola Superiore Sant'Anna (SSSA) in

Pisa (Italy) with the contribution of these researchers organised a first winter school on this topic (http://www.land-lab.org/html/archivio/070205-09_Landscape-Agronomy_program.doc). The aim of the winter school was to develop and test a new form of knowledge transfer and application on Landscape Agronomy approaches to students of SSSA and of the PhD School of ABIES-AgroParisTech, Paris-France.

Objectives

The target students of the Winter School were PhD students in agricultural sciences Some MSc students in agricultural sciences with a special interest in landscape issues were finally accepted, as the SSSA is used to do. Almost all PhD students were involved in research dealing with landscape scale. Their researches present several levels of interaction with the landscape, going from the taking into account landscape issues to spatially-explicit studies in landscape ecology or agronomy.

The pedagogic and scientific team defined five macro objectives for the educational activity (see also figure 1):

- to introduce concepts defined and used in landscape agronomy approaches, specifically on the analysis of agro-environmental functions and their relations with agricultural practices;
- to review some methodologies and approaches used for such studies at farm and landscape scale;
- to implement some adapted tools in a case study carried out at farm or landscape scale;
- to exchange opinions on benefits and limits of such approaches and tools;
- to discuss specific contributions of a landscape agronomy approach to study agro-environmental functions at territorial level.

So, the 12 researchers-teachers involved in the educational programme had a common preliminary work on: a) the selection of main references, key-words and concepts on the winter school subject, b) the identification of the scales at which the analysis had to be carried out, c) similarities and differences – between the farm-scale and landscape-scale approaches on the identification of agriculture-environment relationships. At this stage, the priority was to point out the necessary adaptations in farming systems and landscape descriptions, the adjustment of terminology, the attention to be given to new spatial entities and to non farming areas and non-agricultural stakeholders.

Construction of the educational programme

The educational programme was structured in three phases (①, ②, ③), each with specific aims, methods and stakeholders involvement, as summarised in figure 1. This structure originates from the definition of the main objectives, as explained in the previous paragraph (phase ⓪) and is still open for adjustment upon feedback of the final evaluation (phase ④).

In the first phase (①), the theoretical contributions have been supported by general presentations on: a) the main technical, ecological, economic, social and political issues foreseeable at landscape level regarding agriculture and farming practices; b) a bibliographic review of the main approaches on environmental functions of agriculture, focusing on their spatial dimension. After that, the theoretical contributions were supported by specific presentations on: a) changes in farmers practices as driven by environmental questions, b) spatial organization of agricultural activities at different scales, c) role of farming in landscape ecological dynamics, d) identification of complementarities among agro-environmental functions, e) environmental impacts of cropping systems, f) biodiversity influence on agro-ecosystem functions and vice-versa.

For each presentation and subject, two selected scientific papers were given to students before the winter school to set the ground for common discussion. Each presentation highlighted new questions and sensitive points of analysis emerging for agro-environmental demands, mainly in the domain of agronomic and geographic sciences. After each talk, one pre-defined teacher took the role of discussant, to animate and steer the debate starting from specific questions on the talk.

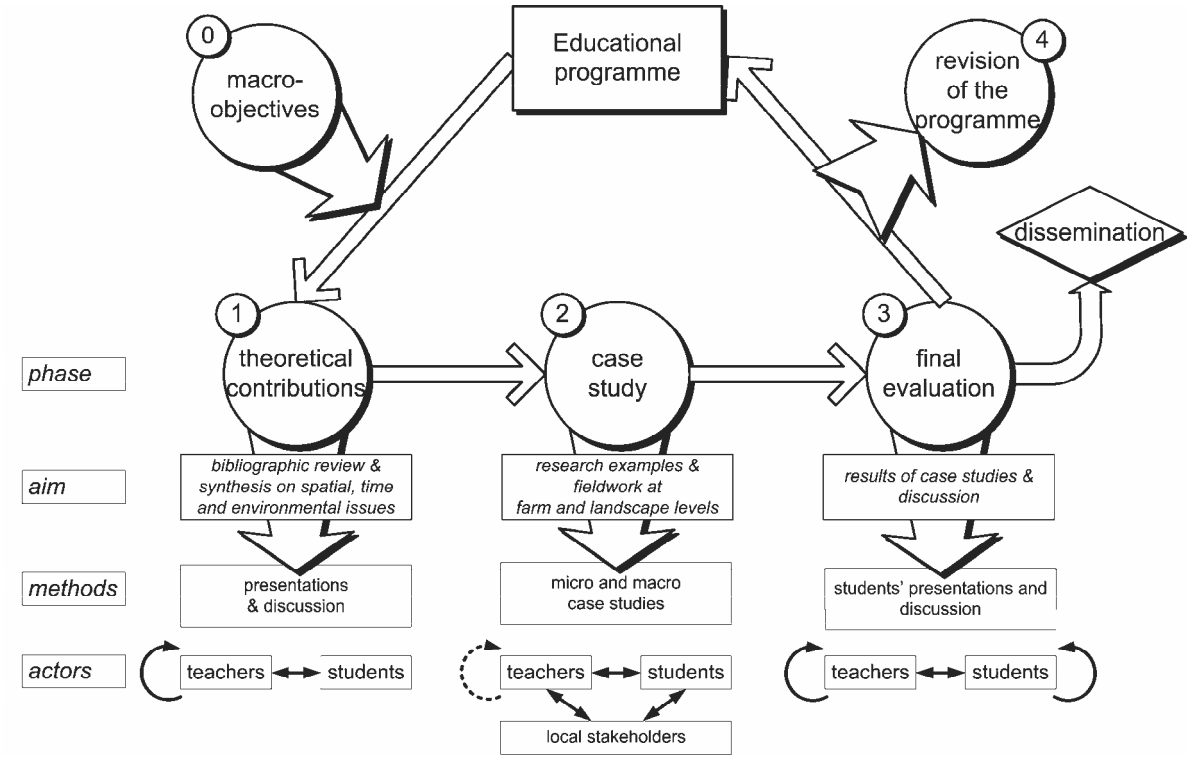

Figure 1. Flow chart of the educational programme of the first winter school in Landscape Agronomy

In the second phase (②), the case studies were realised to transfer some theoretical issues arising from research examples to a practical case study with the aim of testing them through fieldwork. Two case-study groups were then identified: the “macro level” (M_group, landscape scale), aimed to analyse the role of agriculture on landscape dynamics, and the “micro level” (m_group, farm scale) to analyse farming practices and their environmental impacts. The case study was performed by two groups of students (one at each scale) under the supervision of a teachers' group: the “macro” case study was focussed on the plain of Pisa and the “micro” case study on the experimental farm of the University of Pisa (CIRAA). Research questions were formulated and intended for each group:

- M_group: Does actual landscape management of the Pisa plain incorporate agri-environmental issues? How? What is the current situation? What are the future perspectives?
- m_group: Does farming system activities at CIRAA take into account the landscape context? How? What is the current situation? What are the future perspectives?

A database was supplied to each group, with information on the Pisa plain and on CIRAA, respectively. In this phase some local stakeholders were involved by establishing a focus group, performing interviews and using other specific participative methods.

The final evaluation (third phase, ③) considered three aspects: (a) the analysis of fieldwork results and oral presentations carried out by teachers and students during the last day of the winter school; (b) the evaluation of the programme and its contents by all the participants (teachers and students) at the end of the school (oral discussion); (c) individual students' reports based on ex-post analysis of fieldwork results. Finally, the teachers team elaborated a synthesis and listed the main interests and limits of the educational programme (form and content), with the aim to improve the educational programme in view of the second winter school and to formalise the feedback to the students.

During this phase, the students communicated the results of their fieldwork experience as group presentation. One month after the school each student was also asked to reflect in-depth on the results and to formulate a synthesis by writing a report. In their essays, they were required to highlight benefits received after the winter school by focussing on one agro-environmental issue linked to the case study in relation to concepts and methods shown in the theoretical presentations and papers.

Individual students participation was also evaluated by the teachers team considering in equal part: (a) the individual student's contribution to the field work, (b) the quality of group presentation on the fieldwork, (c) the quality of the individual written report

Results and discussion

In order to show and discuss the main results of our experience, we refer to four expectation for education in Landscape Agronomy.

Which elements have contributed to combine the different disciplines and approaches in the educational programme?

The pedagogic team highlighted different uses of terminology related to landscape agronomy issues depending on discipline. For example, *territory* is used by a large panel of disciplines, but with different declinations, e.g. *farm territory* (mainly ecology, agronomy, geography), *farm territorial management* (agronomy and landscape ecology), *spatial organisation* (geography, landscape ecology); *landscape* is mainly used by geography and landscape ecology or referred to *landscape management* in agronomy; *farm management* is used as *farming land-use* in agronomy, geography, landscape ecology, then also as *farming practices/ farming management / farming system* in agronomy; *biodiversity* is used as *functional biodiversity* in ecology and agronomy, as *biodiversity functions* in agronomy and geography; *environmental assessment* is used as *environmental indicators* in agronomy and ecology, as *ecological assessment* and *ecological indicators* in ecology and landscape ecology; *landscape multifunctionality* is used as such in landscape ecology, as agriculture multifunctionality in agriculture, whereas in other disciplines (e.g. geography) the term is often associated with *sustainable development*.

To characterise and assess these concepts, some common tools have been used in different contexts and scales of analysis and by different disciplines: interviews (farmers interviews, stakeholders interviews), maps (landscape area mapping, farm territory mapping, local knowledge mapping, spatial organisation representation with chorems), land observation (aerial photography, landscape observation in the field), landscape characterization (landscape elements identification and characterisation qualification), and agro-environmental assessment. Their actual contents are also various between disciplines, according to the types of analysis under focus. In this perspective the case study has represented the concrete place to apply and debate differences between the disciplinary keywords toward common topics on landscape issues.

The collective discussion among teachers and with students was also useful and significant to reveal different or common views on farming practices, farming systems, and their local and political context. As a result of this experience, it is possible to distinguish and relate different approaches in landscape agronomy according to four types of research focus:

- ecological processes interacting with farming practices (e.g. characterization, assessment, spatialization);
- farming practices (e.g. characterisation, drivers, spatialization, impacts);
- stakeholders expectations on agricultural activities (e.g. characterization, location, interactions);
- actions able to fulfil these expectations (e.g. design, decision supporting, assessment).

This partition could be a relevant background to revise and re-organise the content of next educational programmes on landscape agronomy.

Which elements have contributed to the success or difficulties of such educational programmes?

Students have expressed three main benefits arising from their winter school experience: (a) the adaptation and enrichment of their initial agronomic questioning; (b) the opening on complementarities between quantitative and qualitative methods to describe and understand the agronomic context of a landscape; (c) the stimulating effect of discussions among persons with different perspectives on landscape issues (students, researchers and local stakeholders). Two difficulties were underlined by the students: 1) to keep and transfer a readable common meaning of the key-concepts of landscape agronomy, 2) to improve the integration of methods coming from different disciplines to be used in landscape agronomy and make it operational.

The teachers have underlined as an element of success the active participation of the students coping with a new learning experience. The bottlenecks identified concerned: (a) the balance among the content and duration of the three phases, since the theoretical contribution has been too large and compact; (b) the fragmentation of presentations on tools and methods in the first phase complicated their appropriation by students for use in the fieldwork; (c) the insufficient time for appropriation and maturation of fieldwork questions and data and for the integration between results of the macro and micro case studies; (d) the differences in demands from undergraduate and PhD students about landscape agronomy knowledge.

How is it possible to mobilize stakeholders in the building of such educational programmes?

During the school, local stakeholders were mobilized in different forms (focus group, local knowledge mapping, interviews) but only as a source of knowledge. Instead, it could be interesting to consider their further involvement in such educational programmes also in the final evaluation of the case studies, even if we have to bear in mind that the interaction between students and local stakeholders in a short time could be difficult.

What type of follow-up activities has been produced by the winter school?

As previously described, the objective of the school was to familiarize students with a territorial approach to Agronomy. The winter school has generated two kinds of follow-up activities from the students: communications to scientific meetings (Costanzo *et al.*, 2008; Debolini *et al*., 2007; Galli *et al*., 2007) and revision of graduate (Costanzo, 2007; Dragoni, 2007) or post-graduate (Debolini, 2007) research projects. Students' contributions have been both individual, such as MSc research projects based on other case-studies than those of the winter school, but also collective between French and Italian PhD students developed on the case study of the Plain of Pisa (Debolini *et al*., 2007). Moreover, the school has been an occasion for researchers involved as teachers to discuss, precise and formulate scientific bases for landscape agronomy and to plan new scientific contributions (Benoît *et al.*, 2007). Indeed it has also been an occasion to further exchange and interaction between researchers and students on their research projects, by starting new partnerships, like the organisation of this satellite session in the 2008 IFSA symposium.

Conclusion

The experience of the first winter school on Landscape Agronomy encourages to continue the development of such educational programs for three main reasons.

First one is the complementary enrichment of teachers, students and local stakeholders resulting from this experience, thanks to the time and place during the educational program and the case study analysis, left for reciprocal questions and debates on issues, terminology, results, effectiveness of such an agronomic approach; it's a concrete way to experiment ‘learning by doing’, and to stimulate the participants to a reflexive attitude.

The second reason is that the complexity of the scientific concepts that have to be used, and their regard at different levels, highlight the multidisciplinary necessity and practices of a landscape agronomical approach. The formalization of the educational programme in terms of pedagogic structure and balance between theoretical contribution and practical work helps to integrate disciplinary expertise and to better define the expectations we have from this new field of landscape agronomy in terms of research. It is therefore important to compare the experiences of both researchers and teachers in landscape agronomy during this IFSA Satellite Session.

Thirdly, the double presence of research and action in our doctorate education, questions our institutions on their capacity to integrate these new forms of knowledge and production in their academic courses. The opportunity to institutionalise our experience by including it in the yearly programme of courses of the involved doctorate schools is a first step. The comparative analysis among several countries regarding education experiences dealing with questions on changes in agriculture, related to landscape and territory dynamics and environmental demands could make it

possible to specify more in depth the interests, difficulties and the limits of this approach towards the construction of an evaluation framework of existing educational programs.

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