AgriChannels

Application form

NATURE OF THE PROJECT

Research project

CATEGORY OF PROJECT

Category 1: "Open" component - Exploratory project

GENERAL INFORMATION ABOUT THE PROJECT

Full title
Ecohydrology of agricultural open channels for ecosystem services assessment

Short title
AgriChannels

Project leader

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Scientific fields

Genetics and genomics, plant breeding, ecophysiology
Integrated crop protection, plant pests and diseases, symbiotes, population ecology
Agro-ecosystems, agri-environmental innovations and resource management

Partnership

Participating units within the Foundation’s scientific network

Unit

G-EAU

AMAP

French partners

International partners

Category	Country	Name of the Institution
University	Italy	AgriPolis, University de Padova
University	Spain	University of Valencia

Type of funding request

Visiting Fellowship for short stay

Specify the number

2 weeks

Overseas travel grants for Doctoral students, Post-docs and scientists of the network

Specify the number

3 months

Publication and dissemination of research results

Small exploratory, risky & innovative projects

Project duration

12 months

Budget

Project's full Cost

58025 euros

Funding request

19025 euros

PROPOSAL SUMMARY - NON CONFIDENTIAL

ABSTRACT

Developing agricultural systems both environmentaly and economically competitives necessitates, to be viable, to consider all cultivated landscape elements, including those on fields borders. Those landscape element ,such as open channel networks (drainage and irrigation) at the interface between agricultural fields, are a lever to conciliate this double performance. Open channels of agricultural landscape were primarly settled by farmers to supply water for crops or drain excess of run-off or soil waters in order to increase crop production. But it is recognized now that these elements may also be biodiversity habitats, buffer zones to mitigate sediment/pollutant transfers, etc. These secondary functions of open-channel may be conflicting with the primary ones of these landscape elements and trade-offs, using vegetation maintaining strategies, have to be found. Open channels (drainage and irrigation) networks have a complex functioning at the earth between biotic and abiotic processes, an intermittent flow governed by rainfall events or irrigation periods, and a varying biodiversity level. Furthermore, the tree-structure of their network, their orientation according to flow direction and the great variations of biodiversity levels and abundances, made the study of this typical object not accessible by traditional methods in ecology. Management practices are also specific for this object and could be considered as the lever of the system for optimisation of ecosystem services purposes, provided that a integrated and spatially explicit modeling approach is realized. To this end, we proposed an original project focusing on the risky object “open channel” that constituted the drainage/irrigation network, by answering the following research questions:1) How to quantify effects of management practices on ecohydrological functioning of the channels network ?2) What is the effect of plant diversity on lateral and vertical flows in drainage networks via hydraulic roughness and conductivity, respectively?3) How to model the system functioning, considering an Eulerian approach of the water flows and a lagrangian approach of the plant biodiversity, to optimize the set of ecosystem services ?

The project aims at consolidating a collaboration between three laboratories (LISAH, G-EAU, AMAP) through an exchange of dataset, experimental dispositives and modelling platforms. It will allow filling the gap between abiotic process simulation in channels (hydraulics, soil hydrodynamics,…) and biotic process (plant community ecology) both stressed by human activities. In

addition, It will allow to enhance scientific partnership with other agronomic clusters in Mediterranean Europe (Universities of Padova (Agripolis) and Valencia).

Keywords (max. 5)

channel
ecohydrology
hydraulics
SFM
ditch

PROPOSAL DESCRIPTION

Background, state of the art, project context

Ecosystems have been degraded, damaged or destroyed, typically as a result of human activities (Benayas et al 2009). In the same time, agriculture must address one of the greatest challenge in the twenty-first century: meeting increasing population and consumption demands and reducing agriculture's environmental harm (Foley et al 2011). To this end, a better consideration of the ecological role of biodiversity in agroecosystems is necessary (Altieri 1999) and of the services they provide (Costanza et al 1997) by introduction of pest management strategies (Kogan 1998), ecological intensification (Zanten et al 2014) and ecological restoration (Benayas et al 2009). All these strategies need a better consideration of spatial processes to be effective.Among ecosystem processes evolved in landscape functioning, water controls the dynamics of terrestrial ecosystems as a resource for the biota and a driver for abiotic processes. The biota, in turn, modulate several hydrological processes, such as evapotranspiration, groundwater runoff and aquifer refill (D'Odorico et al 2010). The understanding of the interplay between biotic and abiotic fluxes in landscapes call for a discipline merging the gap between ecology and hydrology (Rodriguez-Iturbe 2000). The ecohydrology is the study of the interaction of the water cycle with biota and is a very exciting research frontier for the years to come, especially in agricultural areas because of the direct influence of human practices on the system. Understanding ecohydrological systems, i.e. systems for which a complex interaction exists between freshwater flows and biota and flora, in cultivated landscapes and how they are affected by human practices is fundamental to further optimize the services they provide.Among landscape objects, open channel networks gathering drainage ditches or irrigation channels are specific elements rarely considered in ecohydrological studies despite their primary importance for providing ecosystem services in agricultural areas. Drainage ditches and irrigation channels are human-made linear elements that constitute the upstream and downstream parts, respectively, of the permanent hydrographic networks in agricultural landscapes (Dollinger et al 2015). Services provided by ditches are primarly soil waterlogging and erosion control (Dollinger et al 2015). Irrigation channels are primarly devoted to the provision of water for downstream crops. Both ditches and channels contributed to groundwater recharge (Dages et al 2009) and biodiversity conservation (Herzon and Helenius 2008). In mediterranean areas, hydrographic networks are characterized by intermittent flows that are governed by rainfall events and irrigation periods for ditches and open channels, respectively. Both of these infrastructures are biodiversity hotspots in terms of flora (Herzon and Helenius 2008) or fauna (Fahrig et al 2011). Paradoxally, the biodiversity affects negatively hydraulic conveyance of open channels and they need to be correctly maintained. Consequently, vegetation in open channels contributed to a set of services and disservices that are sometimes in interaction.Open-channel networks are maintained using a combination in time of dredging, mowing, chemical weeding and burning techniques (Levavasseur et al 2014). Principal aim of open channel managements is to restore their hydraulic conveyance by limiting vegetation development and sedimentation. Management practices are the principal lever affecting the system as they exert a strong influence on both structural and functional abiotic properties of hydrographic networks (Dollinger et al 2015). As management practices affected both ecosystem services and disservices provided by vegetation of open channels, it is of particular importance to explore, via numerical simulations with spatially explicit platforms, the tradeoffs between these (dis)services.
The system results from two main processes with strong interactions: the plant development and the water flows, either lateraly along drainage networks or vertically with infiltration, that needed to be simulated with spatially explicit models for management purposes. Interactions between these two processes arise because water is a potential physical driver for hydrophilic plants and plant architecture has an impact on water flows and infiltration (Nepf 2012, Leyer and Pross 2009). Regarding recent work on the willingness to integrate biotic, abiotic processes and human activities in spatially explicit models (Vinatier et al 2016), we needed to manage our discipline-focused view of the system in order to balance between biotic and abiotic processes. Objects such as plant, bodies of water or sediment, and also open channel sections should be considered according to their mobility (or not) in space. From a conceptual point of view, biotic matters (plants, seeds,etc.) that circulate in open channels can be simulated individually according to a Lagrangian representation of movement, and abiotic matters (water, sediments, etc.) can be simulated as whole bodies, according to an Eularian representation of movement. There is now a very exciting research topic translating, for the first time, balanced ecological and hydrological processes in landscape modelling plateform for this particular system.Today, two participing units of the project (UMR LISAH and UMR G-EAU) had already collected consistent datasets to investigate how aerial vegetation structure and plant traits affect flow distribution using an hydraulic flume dispositive (Halle hydraulique, SupAgro). In the same time, initiated from Dollinger (2016) phD, a two-years study is actually in progress in the Roujan observatory managed by unit LISAH to get insight on how management practices affected vegetation structure and plant communities in real conditions. Chronosequences at high temporal (month) and spatial (centimer) resolutions are now available of vegetation parameters that affect hydraulic functioning, such as canopy height or vegetation covering/density under different management practices. Finally, the three modelling platforms used by the units (OpenFLUID for LISAH, SIC2 for G-EAU and AMAPStudio for AMAP) are complementary and may be coupled to simulate the ecohydrological functioning of the networks. For example, the spatial arrangement of vegetation community and their growth could be simulated through the AMAPStudio platform, translated into a hydraulic roughness parameter (Manning/Strickler coefficients) according to management practices simulated by OpenFLUID platform and its influence on open channel flows could be simulated by SIC2. The desire of the three units to mutualize their experimental, observational and simulation platform needed actually to be supported for either valorizing the already collected datasets, or running new experiments to gain more insight into some processes of the system.

Illustration(s) and scientific references

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Describe objectives

The project aims at (i) coupling the three spatially explicit simulation platforms used by the units of the project with biotic and abiotic processes, ii) the latter being identified through the datasets and measuring equipment collected/developed by both units from years and iii) increase partnership with other agronomic European clusters to help and complete with required expertise/ innovative experiments.

Each laboratory has developed a spatially explicit modelling platform. The LISAH laboratory, through the OpenFLUID platform (http://www.openfluid-project.org/) proposed a way to couple various processes with different time and space scales, with a focus on hydrological watershed functioning. The G-EAU laboratory, through the SIC2 platform (http://sic.g-eau.net/), simulates the hydraulic functioning and control of open channels in terms of water flow, solutes and sediment transport. The AMAP laboratory, with the

AMAPStudio platform (http://amapstudio.cirad.fr/) simulates the 3D architecture of a plant or a scene of different plants. **The objective here is to use the three platforms, either sequentially to translate vegetation patterns in roughness parameters (AMAPStudio - > SIC2), or in a coupling procedure (SIC2 - OpenFLUID) to test the coupled model as a virtual laboratory to simulate effect of management practices on selected ecosystem services (Objective 1).**

The existing datasets acquired by both LISAH (on drainage systems) and G-EAU (on irrigation systems) laboratories need to be analyzed to disentangle effects of vegetation parameters (porosity, flexibility) on water and particle flows, and to study the spatio-temporal dynamics of these vegetation parameters in real conditions under human stress. **The objective here is (i) to determine how management practices induce vegetation patterning and therefore affect the flows in agricultural networks and in turn, (ii) to evaluate how vegetation patterning and flow affect seed interception and therefore spatial reconfiguration of plant cover after rainfall or irrigation events (Objective 2).**

Studying seed dispersal in open channels is a promising way to better understand spatial structuration of vegetation communities and their link to hydraulic parameters. Furthermore, a large amount of research is still lacking on how infiltration processes are driven by vegetation traits in open channels. **The objective here is to complete the dataset by new experiments in controlled conditions on effect of hydraulic flows on seed dispersal and plant materials on soil hydraulic conductivity (Objective 3).**

Illustration(s)

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Explain how objectives will be achieved

Objective 1: Coupling agro-eco-hydrological models***Activity 1.1***The AMAPStudio platform is dedicated to exploration and analyzis of various plants growth from an architectural point of view. It was initially dedicated to forests and tropical plants but is generic enough to be applied to vegetation diversity of open channels. It works both at individual or scene level. We planed to test how this platform could be adapted to simulate the vegetation patterning observed and how to derive aggregated channel vegetation geometric parameters to link with hydraulics parameters (Nepf 2012).***Activity 1.2***Each Labex laboratory of the project developed a spatially explicit modelling platform. The LISAH has developed the OpenFLUID platform dedicated to modelling complex landscape systems with a strong focus on hydrology and drainage through topologically connected rainfed cultivbated surface areas. It provided functionalities for automatic coupling of models and for different timestep managements, and for simulation monitoring. It benefited from the scientific contribution of the laboratory for modelling surface runoff, especially in Mediterranean cultivated catchment (Leonard and Andrieux 1998). The G-EAU has developed the SIC2 platform to simulate transient and steady flows in irrigation open channels using Saint-Venant equations. The platform is particularly suitable for simulation of water bodies and particles in drainage and irrigation open-channel networks. Specific modules are dedicated to the simulation of management rules (hydraulic device control, canal maintenance…). We planned to couple the two platforms but they necessitate parameters to be fully operational on the subject. Consequently, all the results on effects of vegetation patterning on soil hydraulic conductivity and hydraulic roughness should be integrated in the future coupled model, through the uses of Ksat and Manning parameters.

Objective 2: Identification of biotic-abiotic relationships stressed by human practices from collected dataset on ecohydrology of drainage networks A total of nine experiments have been conducted by both LISAH and G-EAU laboratories during years 2014-2016. Two experiments conducted in natural conditions in the environmental observatory from LISAH (ORE OMERE) were devoted to the study of plant diversity in drainage networks under different management practices. Four experiments were conducted in controlled conditions in the hydraulic flumes (Halle hydraulique SupAgro) to study I) hydraulic roughness induced by plant covers, ii) seed dispersal and their interception by plants, using real plant material. The three last experiments were conducted in natural conditions in a domain supervised by UMR G-EAU (Domaine du Merle, SupAgro) to study the seed dispersal after unsteady flows. ***Activity 2.1:***The two experiments relating dynamics of vegetation diversity in drainage networks provided 37 diachronic 3D point clouds of ditch configuration. Clouds were created from Structure-From-Motion photogrammetry (Cunliffe et al 2016). We supposed that spatial and temporal dynamics of 3D clouds varied with management practices and we need to exploit the clouds in terms of spatial structure, species-environment relationships and diversity. Aggregated parameters such as vegetation height and porosity, representative of the vegetation effects on the lateral flows, should be derived from the 3D clouds' exploitation. ***Activity 2.2:***We planned with the AMAP laboratory to exploit the 3D clouds, through high performance computers by: (i) classifying the surface cover to differenciate bare ground from vegetation (ii) to generate digital plant heights models. The model AMAPStudio should be used to generate scenes of plants according to the 3D clouds. The scenes of plants simulated by AMAPStudio should be translated in hydraulic roughness or soil conductivity according, for the former, to the following results on the predetermination of hydraulic roughness from vegetation characteristics. To this end, an new and generic approach based on parameters generically called plant "blockage factor" (Nepf 2012) will be used. Further analyses of the dataset should be ran to determine how this hydraulic roughness could be affected by other spatial configuration and other hydraulic regimes to be closer to real conditions. For this purpose, we planned to use the same methodology as for the first analysis.

Objective 3: Identification of new ecohydrological processes from new experiments in controlled conditions***Activity 3.1:***To this end, we planned to test a new tracking technique based on UV powders (Tekiela and Barney 2013). We already finalized preliminary studies and protocoles to test absence of powder effects on seed buoyancy and some image analysis protocol to facilitate seed patterning in drainage networks. Experiments are planned to be conducted in the Domaine du Merle, SupAgro, and in the hydraulic flume to test conjuguated effects of flows and vegetation patterning on seed dispersal. The experiments are planned to be run in collaboration with University of Padova through the program Vinci to facilitate exchanges between Italian and French researchers. A shared PhD is already planned on this subject with the help of the program Vinci.***Activity 3.2:***Among processes governing water flow in drainage networks, infiltration contributed substantially to groundwater recharge during autumnal rain events (Dages et al 2009). Infiltration capacities of a ground could be measured via the hydraulic conductivity (called Ksat) that depends on soil conditions and plant root systems (Halabuk 2006).However, despite the large number of experimental studies on vegetation and hydraulic conductivity (Thompson et al 2010, Wu et al 2016, Halabuk 2006, Archer et al 2002, Yu et al 2016), results are not converging and are based on cultivated plots. Differences between perennial and annual plants are expected to be relatively low. Indeed, experiments comparing different cover crops in fields showed maximal Ksat differences only reached a factor 2 or 3 (Bodner et al., 2008; Hu et al., 2009; Yu et al., 2016). On the contrary, it is assumed to find significant differences under dead vegetation and living vegetation (Mitchell et al., 1995) due to root decomposition and shrinkage root processes after death of the plant. Transferring these results to the ditches or open-channels conditions to disentangle vegetation effects from the others is a challenging task that needed further experiments to be achieved.To this end, we wanted to collaborate and benefit of the expertise of the water and soil research group (Artemi Cerda, University of Valencia) via fellowship mobility. This collaboration hypotheses that management practice affected hydraulic conductivity through their influence on rates of living/decaying roots, susceptible to modify macroporosity of the ground. New experiments would be developed to explore this open question. The experiment would be a field-work, aiming at characterizing if there is a difference in terms of hydraulic conductivity under perennial, herbaceous and dead vegetation. References: Altieri, Miguel A. “The Ecological Role of Biodiversity in Agroecosystems.” *Agriculture, Ecosystems & Environment* 74, no. 1–3 (1999): 19–31.Archer, N. A. L., J. N. Quinton, and T. M. Hess. “Below-Ground Relationships of Soil Texture, Roots and Hydraulic Conductivity in Two-Phase Mosaic Vegetation in South-East Spain.” *Journal of Arid Environments* 52, no. 4 (2002): 535–53. doi:10.1006/jare.2002.1011.Benayas, José M. Rey, Adrian C. Newton, Anita Diaz, and James M. Bullock. “Enhancement of Biodiversity and Ecosystem Services by Ecological Restoration: A Meta-Analysis.” *Science* 325, no. 5944 (2009): 1121–24. doi:10.1126/science.1172460.Bodner, G., W. Loiskandl, G. Buchan, and H. -P. 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Illustration(s)

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Detail major outputs and outcomes of the proposed project

The major output resulting from Objective 1 is a digital simulation platform coupling the ecohydrological functioning of open-channel networks under management practices. The platform will result from the combination of OpenFLUID (LISAH), SIC2 (GEAU) and AMAPStudio (AMAP) and will be applied to every networks of open channels. The outcomes of Objective 2 and 3 are knowledge and parameter databases on hydraulic roughness macroparameter (Manning) and soil hydraulic conductivity (Ksat) induced by plants in open-channel networks of (irrigated/rainfed) agricultural areas, stressed by management practices. The general of outcomes of the proposed project are new insights into the ecohydrological functioning of open channels under anthropic constraints. It should bring new tools to study ecosystem services provided by agricultural watersheds from a process-based view.

Illustration(s)

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Describe the project’s capacity building/training component , if any

The originality of the project made it relevant for the construction of training components, reinforced by the strong implication of the two units (LISAH and G-EAU) in the master and engineering program called “Eau et Agriculture” (SupAgro), especially with Jean-Stéphane Bailly and Gilles Belaud who are both leaders of the master program. The project should also participate to the training of a PhD working on a similar subject, Gabrielle Rudi.A first collaboration with University of Padova has been realized in 2015 with the training of a student from Paolo Tarolli called Alberto Bollettin on “Using Structure from Motion photogrammetry and Terrestrial Laser Scanning to estimate blockage factor of vegetation in open channels”. The student was supervised by the laboratory LISAH (Jean-Stéphane Bailly and Fabrice Vinatier).

Scientific projects would be proposed to students groups (three weeks duration for each project) on (i) the use of SFM tools to characterize hydrodynamic phenomena in open channel flow, and (ii) the temporal dynamics of hydraulic conveyance of open-channels.These projects would be proposed in 2017 to the students on the basis of the first experimental knowdlege acquired on the subject.Experimental protocols have been proposed to students during the field training organized every years in the Domaine du Merle (SupAgro) for the Master “Eau et Agriculture”, on observation of plant richness along open channels and on seed dispersal during irrigation events in 2015 and 2016, respectively. New protocols would be proposed in 2017 on the basis of the project.The project should help advocating recommendations for managers and advisers who are in charge of drainage and irrigation networks management, by organizing professional seminars about the link between biodiversity and ecosystem services. The project should bring a concrete illustration of the ecohydrological functioning of the open channels. The coupled model proposed in objective 1 would be considered as a decision support tool to that end.

Illustration(s)

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Communication and outreach/dissemination

The project aims at attracting a large audience of scientists from different disciplines. Results of the objective 1 on the coupling between different models would be valorised in scientific publications in “Environmental modelling and Software” review and in scientific networks working on biotic and abiotic processes in landscapes, such as the Payote network (INRA) to which Fabrice Vinatier belongs. The attempt to couple different platforms for ecosystem services optimization should be presented in conferences organised by the metaprogram Ecoserv (INRA).Results issued from the objective 2 should provide spatial databases on vegetation and seed patterning under hydrodynamic flows. These database are planned to be shared for reuse in “Data in brief” review, for example. Furthermore, the results on hydraulic roughness induced by vegetation patterning under management practices would be published in “Ecohydrology” review.Results issued from the objective 3 should provide new insights on the effect of vegetation on hydraulic conductivity. It would interest a broad audience of ecologists and agronomists working on ecosystem services provided by vegetation on crop water supply and soil waterlogging.Overall methodology of the project would also be presented in international congress, such as HydroEco 2017 or EGU 2018.

Illustration(s)

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Structure and governance

The LISAH partner should take part of the project conception, implementation and management. The LISAH should also be in charge of the data sharing with other partners for specific analysis, especially the formatting of spatial databases for working with AMAP partners. Knowledges will be shared through scientific presentations in each laboratory, driven by the project manager who is also in charge of scientific animation for the LISAH laboratory.The G-EAU partner should participate to the design of experimentations in hydraulic flumes, the experiments in the fields considering hydraulics aspects. The AMAP partner should participate to the implementation of vegetation patterning in the AMAPStudio platform on the basis of the spatial databases exchanged by the LISAH.The coupling between modelling platforms would be managed by both the LISAH and G-EAU partners, sharing their scientific consultants in charge of each platform. The AMAPStudio platform should be used as a tool to aggregate vegetation patterns in 3D to be implemented in the two other platforms.

Illustration(s)

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OTHER USEFUL INFORMATION

Originality and innovativeness

The main exploratory character of the project is linked to the landscape object studied, the open channel network (drainage/irrigation) which is rarely studied toward its ecohydrological functioning of cultivated areas. That is the reason why specific experimental setups are needed for testing effects of flows on this objects (hydraulic flumes), on vegetation patterning (set of different vegetations), and on seed tracking. While most studies about hydraulics and vegetation interactions are related to river flood control, theproject is specifically dedicated to agricultural networks, which leads to consider their particular management and the related ecosystem services.Furthermore, the attempt to apply an ecohydrological approach in the project necessitates to merge different disciplines with strong backgrounds. Plant ecology was historically centered to the individual and the consideration of plant communities with all their diversity was always difficult to assess. On the contrary, in hydraulics and hydrology, vegetation is mostly considered through empirical parameters that would be identified, at most, through calibration of hydrological response. Crossing scales and knowledge in these disciplines is a key challenge of the project. Considering jointly two disciplines that have a lagrangian and eulerian approaches of a system is a risky task if we wanted to share a balanced view of the two disciplines.Finally, adding the management practices in the system, and considering an integrated view of the system, from the process to the ecosystem services is risky task if we wanted a parsimonious model, able to be used as a virtual laboratory for managing ecosystem services and disservices.

Project relevance to the Labex Agro

The project mostly focuses on agro-ecosystems, agri-environmental innovations and resource management. The principal attempt of the projet is to provide a modelling framework for a better management of linear channels in agricultural watersheds for ecological engineering purposes.The strong modifications of agricultural systems due to the human population increase lead to a drastic change in the role of each landscape component, the interfaces between agricultural fields being considered as a lever per se of the sustainability of the system. Among these interfaces, the open channels allowance is pregnant in every country for drainage or irrigation purposes. In many countries, these infrastructures are vital for agriculture by providing access to water and preventing from excess runoff or waterlogging. But open channels can also be viewed as agroecological infrastructures supplying multiple ecosystem services through the flow of biotic (fauna, flora) and abiotic (water, sediments) matters from the channel to the field, and inversely, these services being sometimes negatively interrelated.To that way, there is an attempt to manage ecologically the drainage and irrigation networks because they participate to the diminution of soil erosion, to the spread of biodiversity, etc that contribute to the resilience of the whole landscape. The best management practices rest on a better understanding of the biotic-abiotic processes in action under management practices, in order to optimize the trade-offs between services and disservices provided by drainage and irrigation networks. The project is based on the agroecological principle that we could drive ecological processes through a combination of management practices, provided that the inmost functioning of the system is known and correctly modeled.

Project trajectory and sustainability

For short term positioning, the project aims at linking the approaches of LISAH, G-EAU and AMAP laboratories considering drainage and irrigation networks for the two former, respectively. LISAH laboratory has developed a specific research project on the role of drainage ditches for phytoremediation (Project FIP-ONEMA coordinated by Cécile Dagès and Jean-Stéphane Bailly) and ecohydrology (Pari scientifique INRA coordinated by Fabrice Vinatier) with AMAP. G-EAU laboratory has developed original methods for considering water quality criteria and biomass management in hydraulic control methods (ANR Algequeau 2007-2011 coordinated by G. Belaud). On this topic, advanced fluid mechanics studies and extension to river systems are explored with the Fluid Mechanics Institute of Toulouse. The laboratories G-EAU and LISAH shared recently a desire to study ecosystem services assessment through biotic-abiotic processes coupling by supervising two PhD students (Jeanne Dollinger, LISAH and Ophelie Fovet, G-EAU). This scientific thematic has been reinforced by the recruitment of a PhD student, Gabrielle Rudi, AgroParisTech, to work on ecohydrology of drainage networks for years 2015-2018 by the two laboratories. The recruitment has been funded by ED GAIA and Supagro.For the long term positioning, the project aims at considering biodiversity as biophysical determinant of ecosystem services in the research conducted by the labs that were initially focused on abiotic processes. These actions will be reinforced by European collaborations with Italian and Spanish partners (Paolo Tarolli and Artemi Cerda) that worked on similar/cloth issues. To this end, a PhD sharing is planned with Italian partners through the Vinci program that supports exchanges between researchers (deadline february 2017).

Counterpart contribution, complementarities with other initiatiatives, leverage effect

Provide details of counterpart contribution by the partners involved

Name	Given name	Organization	Total months over project duration
Vinatier	Fabrice	LISAH - INRA	12 months
Bailly	Jean-Stéphane	LISAH - AgroParisTech	3 months
Belaud	Gilles	G-EAU - SupAgro	3 months
Caraglio	Yves	AMAP - CIRAD	1 months

Dagès	Cécile	LISAH - INRA	0.5 months
Dorchies	David	G-EAU - IRSTEA	0.5 months
Rudi	Gabrielle	LISAH - INRA (PhD)	6 months

Expected leverage effect
At the end of the project, we expected to create a consortium between the foreign partners that are implicated, especially Paolo Tarolli and Artemi Cerda, to propose an ERC Starting Grant in 2018 for Fabrice Vinatier on this subject. The ERC grant should employ the three laboratories (LISAH, G-EAU and AMAP) considered in this project.

EXPERTS

Identify 3 experts/education specialists who may be asked to evaluate your proposal

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Domain of expertise
Landscape ecology and agricultural systems and ecosystem services

ANNEXES

Financial table

- 02 2016-05 Financial Annex.xls

Gantt Chart

- 04 2016-05 Gantt Chart.xls

LogFrame
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CV of key partners involved

- CVs.pdf

Signature of the head of the research unit

- 06 Signature of the...h unit - LISAH.pdf

Other annexes