AGENCE NATIONALE DE LA RECHERCHE ANR	**Programme ETUDES TRANSDICIPLINAIRES SUR L'AVENIR DE LA MEDITERRANEE**	Acronyme du projet :	ALMIRA
	AAP ETUDES TRANSDICIPLINAIRES SUR L'AVENIR DE LA MEDITERRANEE	**Edition 2012**	
	Document administratif et financier		

Fiche d'identité du projet

Acronyme :	ALMIRA		
Titre du projet : *En français*	Adaptation des mosaïques paysagères dans les agrosystèmes pluviaux Méditerranéens pour une gestion durable de la production agricole, des ressources en eau et en sol		
Titre du projet : *En anglais*	Adapting Landscape Mosaics of medIteranean Rainfed Agrosystems for a sustainable management of crop production, water and soil resources		
Durée du projet :	48	Mois	
Axes thématiques	Gestion durable des ressources (Principal)		
Déclinaison en sous-axes thématiques (et mots clés associés):	Gestion durable des ressources /écosystèmes continentaux méditerranéens		
Catégories R&D :	Recherche fondamentale	**Plateforme :**	*Non applicable pour cet Appel à Projets*
Projet transnational :	oui		
Disciplines dominantes :	*Non applicable pour cet Appel à Projets*		
Coopération internationale	*Non applicable pour cet Appel à Projets*		
Types de projets :	*Non applicable pour cet Appel à Projets*		
Mots-clés :	eau; environnement; ressources naturelles; changement climatique; Rainfed agrosystems, landscape patterns, evolution scenarii, water productivity, soil erosion;		

Temps d'implication du coordinateur de projet sur une année :			*Non applicable pour cet Appel à Projets*
Le projet a-t-il déjà été déposé lors d'une édition précédente ?			Oui
Si oui, en quelle année ?	2011	**Acronyme du projet**	ALMIRA - Appel d'offre ArimNet 2011

Le projet fait-il suite à un projet antérieur financé par l'ANR ?	Non
Acronyme du projet	

Récapitulatif : Partenariat, budget et main d'œuvre

	Sigle du partenaire	Coût Complet (€)	Aide Demandée (€)	Personnel permanent (pers/mois)	Personnel non permanent AVEC financement ANR demandé (pers/mois)	Personnel non permanent SANS financement ANR demandé (pers/mois)
Laboratoire d'étude des Interactions Sol - Agrosystème - Hydrosystème (Coordinateur)	LISAH	2 171 281,60	277 160,00	122,00	120,00	60,00
AGROCLIM	AGROCLIM	156 528,00	18 720,00	12,00	0,00	0,00
Bureau de Recherches Géologiques et Minières / Direction Eau Environnement et Ecotechnologies	BRGM / D3E	152 867,58	76 433,79	8,52	0,00	0,00
Institut de Recherche sur le Maghreb contemporain	IRMC	341 857,60	30 160,00	24,00	12,00	0,00
Systèmes d'Information à Référence Spatiale	SIRS	96 600,00	43 470,00	12,00	0,00	0,00
Institut National Agronomique de Tunisie	INAT	254 068,80	28 080,00	12,00	30,00	36,00
Institut National de Recherche en Génie Rural Eaux et Forêts	INRGREF	276 650,00	41 600,00	38,00	48,00	36,00
Institute of Agronomy & Veterinary Medicine Hassan II	IAV HASSAN II	520 864,00	83 980,00	40,00	30,00	36,00
Totaux	Totaux	3 970 717,58	599 603,79	268,52	240,00	168,00

Résumé (non confidentiel) du projet en **français**

Les agrosystèmes pluviaux méditerranéens (APMs) fournissent d'importants services agro-environnementaux et économiques tels que la production alimentaire, la conservation de l'emploi et du savoir-faire local, la livraison d'eau à l'aval ou la réduction de l'exode rural. Ces services ont des marges de progression importantes, ce qui rend les investissements dans de tels agrosystèmes fortement rentables. Dans le même temps, le changement climatique attendu, combiné avec les pressions démographiques et celles des marchés, menacent fortement les capacités futures des APMs à satisfaire les services susmentionnés.

Dans le but d'atténuer les pressions induites par le changement global, ALMIRA vise à explorer la modulation des mosaïques paysagères dans les APMs pour optimiser les services paysagers. Suivant les recommandations du groupe de réflexion IAASTD (2008), des avancées significatives sont possibles en raisonnant les organisations spatiales relatives à l'occupation du sol et aux systèmes de cultures. ALMIRA propose une triple conceptualisation des mosaïques paysagères en tant que i) réseaux d'éléments naturels et anthropiques qui intègrent les relations entre processus biophysiques et socio-économiques dans un bassin versant ressource, ii) structures qui impactent les flux dans le paysage, depuis l'échelle de la parcelle agricole jusqu'au bassin versant, avec des conséquences sur les fonctions paysagères et les services résultants, et iii) leviers d'action possible pour la gestion des bassins versants agricoles via la conciliation entre production agricole et conservation des ressources en sol et en eau.

Pour explorer ce nouveau levier, ALMIRA propose de concevoir, mettre en œuvre et tester une nouvelle approche de modélisation intégrée qui explicitement, i) inclut des innovations et des leviers d'action dans les scenarii prospectifs d'évolution du paysage, et ii) prend en compte les mosaïques paysagères et leurs processus associés, de la parcelle agricole à la petite région. Ceci nécessite de lever des verrous méthodologiques en rapport avec i) la conception de scénario d'évolution de paysage spatialement explicites, ii) le couplage des processus biophysiques impliqués dans l'hydrologie des bassins versants cultivés, iii) la cartographie numérique des propriétés de paysage et iv) l'évaluation économique du fonctionnement du paysage pour transcrire en services paysagers.

La nouvelle approche de modélisation intégrée est mise en œuvre et testée sur trois bassins versants situés en France, Maroc et Tunisie. Au delà des avancées significatives attendues dans les domaines méthodologiques, et de la compréhension du fonctionnement des paysages et des services résultants pour chacun des bassins versants considérés, il est attendu un réexamen des recommandations formulées précédemment aux échelles parcellaires et régionales, et l'identification de nouveaux leviers d'action à l'échelle intermédiaire des mosaïques paysagères pour améliorer la gestion des APMs.

ALMIRA rassemble des chercheurs français, marocains et tunisiens impliqués dans un large éventail de disciplines scientifiques : hydrologie, géographie physique, climatologie, pédologie, télédétection, statistiques spatiales, agronomie, agro-économie, sociologie et économie environnementale. Un des défis majeurs du projet est de bâtir et de conduire une approche transdisciplinaire reproductible qui puisse favoriser les convergences et les synergies entre toutes ces disciplines.

Résumé (non confidentiel) du projet en **anglais**

Mediterranean Rainfed Agrosystems (MRAs) provide various environmental and economic services of importance such as food production, preservation of employment and local knowhow, downstream water delivery or mitigation of rural exodus. These services have progression margins, thus making investments in such agrosystems highly profitable. In the meantime, expected climate change combined with demography and market pressures threaten MRA future abilities to satisfy the aforementioned services.

In the context of mitigating the pressures induced by global change, ALMIRA aims to explore the modulation of landscape mosaics within MRAs to optimize landscape services. Following recommendations from think-tank IAASTD (2008), significant advances are expected by reasoning spatial organizations of land uses and cropping systems. ALMIRA proposes a threefold conceptualization of landscape mosaics as i) networks of natural and anthropogenic elements that result from biophysical and socio-economic processes within a resource governance catchment, ii) structures that impact landscape fluxes from the agricultural field to the catchment extent, with consequences on the resulting functions and services, and iii) a possible lever for managing agricultural catchments by compromising on agricultural production and on preservation of soil and water resources.

To explore this new lever, ALMIRA proposes to design, implement and test a new Integrated Assessment Modelling approach that explicitly i) includes innovations and action means into prospective scenarii for landscape evolutions, and ii) addresses landscape mosaics and processes of interest from the agricultural field to the resource governance catchment. This requires tackling methodological challenges in relation to i) the design of spatially explicit landscape evolution scenarii, ii) the coupling of biophysical processes related to agricultural catchment hydrology, iii) the digital mapping of landscape properties and iv) the economic assessment of the landscape services.

The new Integrated Assessment Modelling approach is implemented and tested within three catchments located in France, Morocco and Tunisia. Beyond the obtaining of significant advances in the aforementioned methodological domains, and the understanding of landscape functioning and services for the considered catchments, outcomes are expected to help in revisiting former recommendations at the levels of agricultural field and resource governance catchment, and in identifying new levers that improve MRA management at the intermediate level of landscape mosaics.

ALMIRA gathers French, Moroccan and Tunisian researchers involved in a large range of scientific disciplines: hydrology, physical geography, climatology, pedology, remote sensing, spatial statistics, agronomy, agro-economy, sociology, agricultural and environmental economy. One of the major challenges of the project is to make all these disciplines converging towards a reproducible transdisciplinary approach.

Objectifs globaux, verrous scientifiques/techniques

ALMIRA aims to explore the modulation of landscape mosaics within MRAs as a new lever to compromise between agrienvironmental and socio-economical services while mitigating the pressures induced by global change. Landscape mosaics to be modulated include current features of cropping systems (field patterns and connectivities, crop rotations and management) but also innovations induced by public incentives and farmer decisions. To provide a proof-of-concept within the allocated time and grants, services to be considered are restricted to soil preservation, water production at the catchment outlet, crop production and resulting benefits (employment, knowhow).
The inclusion of landscape mosaics into the process of elaborating recommendations for the management of MRAs implies the necessity to tackle methodological challenges listed hereafter.

Linking local agricultural management with landscape functioning and services. This requires the integration of numerous processes that belong to different disciplines across sociology, economics, agronomy and biophysics. A new Integrated Assessment and Modelling must be developed to account for drivers of MRAs evolution and functioning, by including i) innovations and action means into prospective scenarii for landscape evolutions, and ii) explicit description of structures and functioning of landscape mosaics.

Characterizing influences of economic and environmental changes on landscape mosaics. This implies downscaling, at the agricultural field level, global change scenarii usually defined at the macroeconomic level. This requires i) to derive a quantified assumption from a scenario general description that is often narrative and ii) to product scenarii that explicit spatial representations of land use and cropping pattern changes. It is then necessary improving current Land Use Simulation Models by integrating simple representations of biophysical and farm decision processes, in order to better account for environmental constraints.

Characterizing the role of landscape mosaics and related connectivities for producing landscape services. To overcome the limitations of current distributed hydrological models in spatial resolution and in their ability to account for anthropogenic elements (e.g. field boundaries, terraces, drains...) that drive landscape services, it is necessary to develop a new Integrated Hydrological Process Model (IHPM) that explicitly accounts for anthropogenic elements, allows coupling a large range of processes with variable time steps and produces time-efficient simulations. This also requires the design of appropriate strategies for multicriteria and multi-site parameterisation / calibration / validation that rely on hydrological hard and soft monitoring.

Developing methods of landscape property mapping at the scale of landscape mosaics. Characterizing landscape patterns and connectivities, from the agricultural field to the extent of resource governance regions, requires a large amount of spatial data that are not available from current deliveries of spatial information. Emerging solutions are digital mapping methods that involve local observations, remote sensing, signal processing and spatial modelling. These methods still are questioned for their ability to reproduce spatial variabilities at the resolution of interest if applied to large extents.

Regulation measures for promoting sustainable landscape mosaics. Although producing agri-environmental benefits, improved land use and cropping practices are usually not attractive enough to be spontaneously adopted. By (i) assessing impacts of such changes on agricultural productivity and environmental resources and (ii) identifying the barriers to adoption of these changes, mechanisms of promotion can be designed such as Payments for Environmental Services (PES). These should be adapted to the modulation of landscape mosaics (e.g. spatially differentiated PES).

Programme de travail

ALMIRA is undertaken on three resource catchments that includes i) one of the main vineyards in France, ii) a typical area for extensive mixed farming in Tunisia and iii) a grazing / cropland area in Morocco. These agrosystems are common within the Mediterranean Basin, they are economically important for the corresponding countries, and they are considered as threatened areas by expected global change. Furthermore, these three catchments have been studied and monitored in the framework of several projects previously conducted by ALMIRA members. This makes the knowledge in biophysics and socio-economics available for the benefit of the transdisciplinary approach proposed here.

To strengthen the project feasibility, most of workpackages and tasks individually rely on a basic activity along with possible methodological developments. The basic activity allows ensuring each task is completed to provide the expected deliverables for further tasks. ALMIRA includes six workpackages (WP) and sixteen tasks (TK) that are clearly linked to each other. Four workpackages deal with the scientific topics covered by ALMIRA, listed hereafter.

WP1 aims to map the climate variables and the landscape properties that impact landscape functioning (TK 3.2 and 3.3) and drive farmer decisions (TK 2.1) at the selected spatial resolution (agricultural field) and spatial extent (few hundreds of sq.-km). It is organised into four tasks that involve climatology (TK 1.1), remote sensing (TK 1.2), spatial statistics (TK 1.3) and GIS technology (TK 1.4).

WP2 aims to develop landscape evolution scenarii. The first three tasks aim to i) identify the current land uses and the factors responsible for their spatial distribution (task 2.1), ii) develop a baseline scenario of landscape mosaic evolution (TK 2.2) and iii) identify possible changes and innovations in farming and land use practices (TK 2.3). A land use simulation model is finally documented with outputs from the three first tasks and from WP1, to establish contrasted scenarii of landscape mosaics (TK 2.4).

WP3 aims to design and implement a fine resolution Integrated Hydrological Processes Model to simulate landscape functioning, including runoff, erosive fluxes and crop functioning. The methodology has four tasks. TK 3.1 focuses on the development of IHPM. TK 3.2 and 3.3 deal with the development of a parametrisation strategy for IHPM on the basis of the spatiotemporal data of WP1 and other complementary data. TK 3.4 aims to i) obtain the IHPM simulations for the various scenarii defined in WP2 and ii) produce and use synthetic indicators for comparing and ranking WP2 scenarii in terms of landscape functioning.

WP 4 aims to assess the impact of landscape mosaics on landscape services, and to select mosaic scenarii that best compromise on landscape services. Landscape mosaics to be considered are those constructed in WP2. Landscape services are estimated by conducting economic valuations of landscape functioning as simulated with biophysical models in WP3. Trade-off on landscape services includes impacts on agricultural systems (TK 4.1) and environmental services (TK 4.2). Then, TK 4.3 compares scenarii using a multicriteria evaluation framework and identifies policy instruments which could be used to promote desirable scenarii. TK 4.4 synthesizes lessons learnt in the three catchments and derive more general policy recommendations for Mediterranean rainfed agricultural systems.

Two additional workpackages are devoted to scientific coordination and project organization (WP0) and to the dissemination of the project outcomes (WP5).

Retombées scientifiques, techniques, économiques...

Beyond the field, farm and region levels, IAASTD (2008) recommended to consider the landscape intermediate level and to introduce “new cropping patterns adapted to site-specific conditions”. Thus, significant advances are expected by reasoning spatial organizations of land uses and cropping systems: identifying new action levers should result in innovative recommendations from a spatial organization perspective, but may also lead to revise former recommendations at the finer and coarser spatial scales. ALMIRA outcomes, possible impacts and applications are the following.

For scientific communities, ALMIRA provides methodological advances and cognitive results about the functioning of Mediterranean Rainfed Agrosystems (MRA), including impact of cropping systems and of their spatial repartition. These methodological advances are disseminated through scientific papers in peer-reviewed journals, international congresses and workshops. They are also promoted within the international programs in which ALMIRA partners are involved (AIRD / JEAI, MISTRALS / SICMED, SOERE...). Also, it is planned organizing a special session in an international congress (e.g. ECOSUMMIT), for sharing experiences and lessons learnt from ALMIRA.

For the think-tank networks that are involved in the preparation of next recommendation rounds, the ALMIRA outcomes provide valuable materials to be confronted against other emerging solutions. Some ALMIRA scientists already served as think-tank members. They are expected to invite members of their respective think-tank networks to attempt important ALMIRA meeting (e.g. kick-off, intermediate and closure meetings), such as ALMIRA ideas can be forwarded for further recommendations.

For policy makers and stakeholders, the availability of new levers identified at the scale of landscape mosaics is expected to enrich the set of recommendations that have been proposed by the various think-tanks (Millennium Ecosystem Assessment, 2005; IAASTD, 2008; Green Morocco Plan, 2009). Addressing the

intermediate scale of landscape mosaics is also expected to provide more relevant diagnosis on the field- and farm- level innovations that have been formerly proposed. In this context, ALMIRA recommendations are proposed and discussed during participatory workshops with local and regional actors, since implementing recommendations devoted to the modulation of landscape mosaics must be adequately designed in accordance to local factors that drive acceptability, such as environmental constraints, economic pressures, public policies or cultural aspects. Additionally to the participatory workshops, ALMIRA outcomes are reported through articles in professional magazines.

For the local actors, the considerable amount of information to be gathered in the three studied catchments is exploited by the technical institutes (e.g. CRDA and GDA in Tunisia, agricultural chambers in France), and the vulgarisation centres (e.g. INGC in Tunisia and ENA centre in Morocco). This relies on existing collaborations with such structures.

For the student population, ALMIRA outcomes are valuable teaching materials when training future agricultural engineers and researchers. Project partners (IAV, INAT and LISAH) are already engaged and in their respective doctoral schools, as well as in “Mediterranean Office for Youth” program that aims to grant master students for helping PhD settlement and facilitate PhD exchanges.

Remarque : toutes les informations figurant ci-dessus à l’exception de celles relatives aux trois derniers champs ont vocation à être publiées si le projet est retenu pour financement (sous réserve d’une mise à jour si besoin). En déposant un dossier, les partenaires acceptent la publication de toutes ces informations.

Acronyme du projet : ALMIRA

Fiche Experts

Experts suggérés pour l'évaluation du projet

Nom	Prénom	Laboratoire/Entreprise	Email	Téléphone	Domaine d'expertise
Batelaan	Okke	Dept. of Hydrology and Hydraulic Engineering	elaan@vub.ac.be	+ 32 2 629 30 39	Groundwater resource management
Bormann	Helge	Department of Biology and Environmental	helge.bormann@uni-oldenburg.de	+49 271 740 2162	Hydrology
van Clooster	Marnik	UCL.	marnik.vanclooster@uclouvain.be	+ 32 1 047 37 10	Environmental sciences
Baudry	Jacques	INRA SAD-PAYSAGE	jacques.baudry@rennes.inra.fr	+ 33 2 23 48 56 21	Landscape ecology
ROUSSEAU	Alain	Centre Eau Terre Environnement	alain.rousseau@ete.inrs.ca	418 654-2621	Modélisation hydrologique
DOMON	Gerald	École d'architecture de paysage, Université de Montréal	gerald.domon@umontreal.ca	5143436298	Landscape and environment
Bogaert	Patrick	UCL.	patrick.bogaert@uclouvain.be	+ 32 1 047 36 82	Informatique et mathématiques appliquées

Experts non souhaités pour l'évaluation du projet

Nom	Prénom	Laboratoire/Entreprise	Email	Motifs

Commentaires

Fiche Partenaire No 1 : Identification et budget

Responsable scientifique et technique

Coordinateur de projet : Oui

Genre : Homme
Nom : JACOB
Tél : +216-2281-8191
Email : frederic.jacob@supagro.inra.fr
Date de naissance : 15/09/1970

Titre : Chargé de recherche
Prénom : Frédéric
Tél. portable : +216-2281-8191

Identification du partenaire

Nom complet du partenaire : Laboratoire d'étude des Interactions Sol - Agrosystème - Hydrosystème

Sigle du partenaire : LISAH

Catégorie de partenaire : Laboratoire public

Base de calcul pour l'assiette de l'aide : Coût marginal

Partenaire labellisé Institut Carnot ? Non **Si oui quel institut?**

Pour un laboratoire d'organisme public de recherche :

Type d'unité : UMR **Numéro d'unité :** 144

Tutelles Gestionnaires de financement : Institut de recherche pour le développement

Tutelles Hébergeantes : ECOLE NAT. SUP. AGRONOMIQUE MONTPELLIER

Autres tutelles : INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE - CENTRE DE MONTPELLIER

Pour une entreprise :

No Siret : **Effectif (si PME) :**

Adresse de réalisation des travaux	**N° Rue** :			
	Adresse :	2 place Pierre Viala		
	Complément d'adresse :			
	CP :	34060	**Ville** :	Montpellier
	Cedex :	1	**Pays** :	France

Acronyme du projet : ALMIRA

Demande financière (montant HT en €, incluant la TVA non récupérable)

Tâches	Equipements (€)	Personnels						Prestations de service externe (€)	Missions (€)	Autres dépenses de charges externes (€)	Dépenses sur facturation interne (€)	**Totaux (€)**
		Permanents		Non permanents avec financement ANR demandé		Non permanents sans financement ANR demandé						
		personnes.mois	Coût (€)	personnes.mois	Coût (€)	personnes. mois	Coût (€)					
Tâche 1	0,00	122,00	878 512,00	120,00	166 000,00	60,00	100 000,00	7 000,00	69 500,00	24 000,00	0,00	1 245 012,00
Totaux	0,00	122,00	878 512,00	120,00	166 000,00	60,00	100 000,00	7 000,00	69 500,00	24 000,00	0,00	1 245 012,00

Pour information : montant maxi des frais de gestion /frais de structure pris en compte par l'ANR = 10 660,00

Uniquement pour laboratoire d'organisme public ou fondation, financé au coût marginal. Indiquer le taux d'environnement : 80,00

Frais de gestion/ frais de structure (€)	10 660,00
Frais d'environnement (€)	915 609,60
Coût complet (€)	2 171 281,60
Coût éligible pour le calcul de l'aide : Assiette (€)	277 160,00
Taux d'aide demandée	100,00
Aide demandée (€)	277 160,00

Acronyme du projet : ALMIRA

Engagement du partenaire

Après avoir pris connaissance de l'ensemble du dossier de soumission et du règlement relatif aux modalités d'attribution des aides de l'ANR, je donne mon accord pour la participation au projet du partenaire désigné ci-dessus, dans les conditions décrites de répartition des tâches et de financement demandé, et garantis les informations données.

Pour un organisme public ou une fondation de recherche :

<table>
<tr><td colspan="2">Responsable scientifique et technique</td><td colspan="2">Directeur de laboratoire ou de l'unité d'accueil</td></tr>
<tr><td>Prénom :</td><td>Nom :</td><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2" rowspan="2">Signature :</td><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
<tr><td colspan="4">Je m'engage à envoyer une copie du dossier de soumission à chacune des tutelles du laboratoire ou de l'unité d'accueil.</td></tr>
</table>

Pour un partenaire autre (qu'organisme public ou fondation de recherche) :

<table>
<tr><td colspan="2">Représentant légal</td></tr>
<tr><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
</table>

Les informations personnelles transmises dans ces documents sont obligatoires et seront conservées en fichiers par l'ANR. Conformément à la loi n° 78-17 du 6 janvier 1978, relative à l'informatique, aux Fichiers et aux Libertés, les personnes concernées disposent d'un droit d'accès et de rectification des données personnelles les concernant. Les personnes concernées peuvent exercer ce droit en s'adressant à l'ANR, 212 rue de Bercy, 75012 PARIS.

Fiche Partenaire No 2 : Identification et budget

Responsable scientifique et technique

Coordinateur de projet : Non

Genre : Homme
Nom : HUARD
Tél : +33432722375
Email : frederic.huard@avignon.inra.fr
Date de naissance : 24/11/1964

Titre : Ingénieur de recherche (EPST)
Prénom : Frédéric
Tél. portable : +33626085342

Identification du partenaire

Nom complet du partenaire : AGROCLIM

Sigle du partenaire : AGROCLIM

Catégorie de partenaire : Laboratoire public

Base de calcul pour l'assiette de l'aide : Coût marginal

Partenaire labellisé Institut Carnot ? Non **Si oui quel institut?**

Pour un laboratoire d'organisme public de recherche :

Type d'unité : Autre **Numéro d'unité :** 1116

Tutelles Gestionnaires de financement : INSTITUT NATIONAL DE LA RECHERCHE EN AGRONOMIE (INRA)

Tutelles Hébergeantes : INSTITUT NATIONAL DE LA RECHERCHE EN AGRONOMIE (INRA)

Autres tutelles :

Pour une entreprise :

No Siret : **Effectif (si PME) :**

Adresse de réalisation des travaux	**N° Rue** :			
	Adresse :	INRA US 1116 AGROCLIM		
	Complément d'adresse :	Domaine Saint Paul CS 40509		
	CP :	84914	**Ville** :	Avignon
	Cedex :	9	**Pays** :	France

Acronyme du projet : ALMIRA

Demande financière (montant HT en €, incluant la TVA non récupérable)

Tâches	Equipements (€)	Personnels						Prestations de service externe (€)	Missions (€)	Autres dépenses de charges externes (€)	Dépenses sur facturation interne (€)	**Totaux (€)**
		Permanents		Non permanents avec financement ANR demandé		Non permanents sans financement ANR demandé						
		personnes.mois	Coût (€)	personnes.mois	Coût (€)	personnes. mois	Coût (€)					
Tâche 1	0,00	12,00	76 560,00	0,00	0,00	0,00	0,00	3 000,00	5 000,00	10 000,00	0,00	94 560,00
Totaux	0,00	12,00	76 560,00	0,00	0,00	0,00	0,00	3 000,00	5 000,00	10 000,00	0,00	94 560,00

Pour information : montant maxi des frais de gestion /frais de structure pris en compte par l'ANR = 720,00

Uniquement pour laboratoire d'organisme public ou fondation, financé au coût marginal. Indiquer le taux d'environnement : 80,00

Frais de gestion/ frais de structure (€)	720,00
Frais d'environnement (€)	61 248,00
Coût complet (€)	156 528,00
Coût éligible pour le calcul de l'aide : Assiette (€)	18 720,00
Taux d'aide demandée	100,00
Aide demandée (€)	18 720,00

Acronyme du projet : ALMIRA

Engagement du partenaire

Après avoir pris connaissance de l'ensemble du dossier de soumission et du règlement relatif aux modalités d'attribution des aides de l'ANR, je donne mon accord pour la participation au projet du partenaire désigné ci-dessus, dans les conditions décrites de répartition des tâches et de financement demandé, et garantis les informations données.

Pour un organisme public ou une fondation de recherche :

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<tr><td colspan="2">Responsable scientifique et technique</td><td colspan="2">Directeur de laboratoire ou de l'unité d'accueil</td></tr>
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<tr><td colspan="2" rowspan="2">Signature :</td><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
<tr><td colspan="4">Je m'engage à envoyer une copie du dossier de soumission à chacune des tutelles du laboratoire ou de l'unité d'accueil.</td></tr>
</table>

Pour un partenaire autre (qu'organisme public ou fondation de recherche) :

<table>
<tr><td colspan="2">Représentant légal</td></tr>
<tr><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
</table>

Les informations personnelles transmises dans ces documents sont obligatoires et seront conservées en fichiers par l'ANR. Conformément à la loi n° 78-17 du 6 janvier 1978, relative à l'informatique, aux Fichiers et aux Libertés, les personnes concernées disposent d'un droit d'accès et de rectification des données personnelles les concernant. Les personnes concernées peuvent exercer ce droit en s'adressant à l'ANR, 212 rue de Bercy, 75012 PARIS.

Fiche Partenaire No 3 : Identification et budget

Responsable scientifique et technique

Coordinateur de projet : Non

Genre : Femme
Nom : HERIVAUX
Tél : +334-6715-7971
Email : c.herivaux@brgm.fr
Date de naissance : 18/09/1980

Titre : Ingénieur (EPIC, entreprise)
Prénom : Cécile
Tél. portable : +336-2468-1790

Identification du partenaire

Nom complet du partenaire : Bureau de Recherches Géologiques et Minières / Direction Eau Environnement et Ecotechnologies

Sigle du partenaire : BRGM / D3E

Catégorie de partenaire : Divers public

Base de calcul pour l'assiette de l'aide : Coût complet

Partenaire labellisé Institut Carnot ? Oui **Si oui quel institut?** BRGM

Pour un laboratoire d'organisme public de recherche :

Type d'unité : Autre **Numéro d'unité :**

Tutelles Gestionnaires de financement : BRGM

Tutelles Hébergeantes : BRGM

Autres tutelles :

Pour une entreprise :

No Siret : **Effectif (si PME) :**

Adresse de réalisation des travaux	**N° Rue** :	1039		
	Adresse :	rue de Pinville		
	Complément d'adresse :			
	CP :	34000	**Ville** :	Montpellier
	Cedex :		**Pays** :	France

Acronyme du projet : ALMIRA

Demande financière (montant HT en €, incluant la TVA non récupérable)

Tâches	Equipements (€)	Personnels						Prestations de service externe (€)	Missions (€)	Autres dépenses de charges externes (€)	Dépenses sur facturation interne (€)	**Totaux (€)**
		Permanents		Non permanents avec financement ANR demandé		Non permanents sans financement ANR demandé						
		personnes.mois	Coût (€)	personnes.mois	Coût (€)	personnes. mois	Coût (€)					
Tâche 1	0,00	8,52	69 181,00	0,00	0,00	0,00	0,00	0,00	14 000,00	16 250,00	4 276,00	103 707,00
Totaux	0,00	8,52	69 181,00	0,00	0,00	0,00	0,00	0,00	14 000,00	16 250,00	4 276,00	103 707,00

Pour information : montant maxi des frais de gestion /frais de structure pris en compte par l'ANR = 49 160,58

Uniquement pour laboratoire d'organisme public ou fondation, financé au coût marginal. Indiquer le taux d'environnement : 0,00

Frais de gestion/ frais de structure (€)	49 160,58
Frais d'environnement (€)	0,00
Coût complet (€)	152 867,58
Coût éligible pour le calcul de l'aide : Assiette (€)	152 867,58
Taux d'aide demandée	50,00
Aide demandée (€)	76 433,79

Acronyme du projet : ALMIRA

Engagement du partenaire

Après avoir pris connaissance de l'ensemble du dossier de soumission et du règlement relatif aux modalités d'attribution des aides de l'ANR, je donne mon accord pour la participation au projet du partenaire désigné ci-dessus, dans les conditions décrites de répartition des tâches et de financement demandé, et garantis les informations données.

Pour un organisme public ou une fondation de recherche :

<table>
<tr><td colspan="2">Responsable scientifique et technique</td><td colspan="2">Directeur de laboratoire ou de l'unité d'accueil</td></tr>
<tr><td>Prénom :</td><td>Nom :</td><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2" rowspan="2">Signature :</td><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
<tr><td colspan="4">Je m'engage à envoyer une copie du dossier de soumission à chacune des tutelles du laboratoire ou de l'unité d'accueil.</td></tr>
</table>

Pour un partenaire autre (qu'organisme public ou fondation de recherche) :

<table>
<tr><td colspan="2">Représentant légal</td></tr>
<tr><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
</table>

Les informations personnelles transmises dans ces documents sont obligatoires et seront conservées en fichiers par l'ANR. Conformément à la loi n° 78-17 du 6 janvier 1978, relative à l'informatique, aux Fichiers et aux Libertés, les personnes concernées disposent d'un droit d'accès et de rectification des données personnelles les concernant. Les personnes concernées peuvent exercer ce droit en s'adressant à l'ANR, 212 rue de Bercy, 75012 PARIS.

Fiche Partenaire No 4 : Identification et budget

Responsable scientifique et technique

Coordinateur de projet : Non

Genre : Femme
Nom : GANA
Tél : 01 40 97 78 89
Email : alia_gana@yahoo.fr
Date de naissance : 02/10/1952

Titre : Directeur de recherche
Prénom : Alia
Tél. portable : 06 47 82 22 35

Identification du partenaire

Nom complet du partenaire : Institut de Recherche sur le Maghreb contemporain

Sigle du partenaire : IRMC

Catégorie de partenaire : Laboratoire public

Base de calcul pour l'assiette de l'aide : Coût marginal

Partenaire labellisé Institut Carnot ? Non **Si oui quel institut?**

Pour un laboratoire d'organisme public de recherche :

Type d'unité : USR **Numéro d'unité :** 3077

Tutelles Gestionnaires de financement : CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (CNRS)

Tutelles Hébergeantes : CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (CNRS)

Autres tutelles :

Pour une entreprise :

No Siret : **Effectif (si PME) :**

Adresse de réalisation des travaux	**N° Rue** :	20		
	Adresse :	rue Mohamed Ali Tahar		
	Complément d'adresse :	Mutuelleville		
	CP :	1002	**Ville** :	Tunis
	Cedex :		**Pays** :	Tunisie

Acronyme du projet : ALMIRA

Demande financière (montant HT en €, incluant la TVA non récupérable)

Tâches	Equipements (€)	Personnels						Prestations de service externe (€)	Missions (€)	Autres dépenses de charges externes (€)	Dépenses sur facturation interne (€)	**Totaux (€)**
		Permanents		Non permanents avec financement ANR demandé		Non permanents sans financement ANR demandé						
		personnes.mois	Coût (€)	personnes.mois	Coût (€)	personnes. mois	Coût (€)					
Tâche 1	0,00	24,00	167 832,00	12,00	12 000,00	0,00	0,00	9 000,00	8 000,00	0,00	0,00	196 832,00
Totaux	0,00	24,00	167 832,00	12,00	12 000,00	0,00	0,00	9 000,00	8 000,00	0,00	0,00	196 832,00

Pour information : montant maxi des frais de gestion /frais de structure pris en compte par l'ANR = 1 160,00

Uniquement pour laboratoire d'organisme public ou fondation, financé au coût marginal. Indiquer le taux d'environnement : 80,00

Frais de gestion/ frais de structure (€)	1 160,00
Frais d'environnement (€)	143 865,60
Coût complet (€)	341 857,60
Coût éligible pour le calcul de l'aide : Assiette (€)	30 160,00
Taux d'aide demandée	100,00
Aide demandée (€)	30 160,00

Acronyme du projet : ALMIRA

Engagement du partenaire

Après avoir pris connaissance de l'ensemble du dossier de soumission et du règlement relatif aux modalités d'attribution des aides de l'ANR, je donne mon accord pour la participation au projet du partenaire désigné ci-dessus, dans les conditions décrites de répartition des tâches et de financement demandé, et garantis les informations données.

Pour un organisme public ou une fondation de recherche :

<table>
<tr><td colspan="2">Responsable scientifique et technique</td><td colspan="2">Directeur de laboratoire ou de l'unité d'accueil</td></tr>
<tr><td>Prénom :</td><td>Nom :</td><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2" rowspan="2">Signature :</td><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
<tr><td colspan="4">Je m'engage à envoyer une copie du dossier de soumission à chacune des tutelles du laboratoire ou de l'unité d'accueil.</td></tr>
</table>

Pour un partenaire autre (qu'organisme public ou fondation de recherche) :

<table>
<tr><td colspan="2">Représentant légal</td></tr>
<tr><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
</table>

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Fiche Partenaire No 5 : Identification et budget

Responsable scientifique et technique

Coordinateur de projet : Non

Genre : Homme
Nom : SANNIER
Tél : 0320727666
Email : christophe.sannier@sirs-fr.com
Date de naissance : 24/08/1966

Titre : Ingénieur de recherche (EPST)
Prénom : Christophe
Tél. portable : 0646164079

Identification du partenaire

Nom complet du partenaire : Systèmes d'Information à Référence Spatiale

Sigle du partenaire : SIRS

Catégorie de partenaire : PME

Base de calcul pour l'assiette de l'aide : Coût complet

Partenaire labellisé Institut Carnot ? Non **Si oui quel institut?**

Pour un laboratoire d'organisme public de recherche :
Type d'unité : **Numéro d'unité :**

Tutelles Gestionnaires de financement :

Tutelles Hébergeantes :

Autres tutelles :

Pour une entreprise :
No Siret : 444.654.271.00 **Effectif (si PME) :** 47

Adresse de réalisation des travaux	**N° Rue** :	27		
	Adresse :	rue du Carrousel		
	Complément d'adresse :	Parc de la Cimaise I		
	CP :	59650	**Ville** :	Villeneuve d'Ascq
	Cedex :		**Pays** :	France

Acronyme du projet : ALMIRA

Demande financière (montant HT en €, incluant la TVA non récupérable)

Tâches	Equipements (€)	Personnels						Prestations de service externe (€)	Missions (€)	Autres dépenses de charges externes (€)	Dépenses sur facturation interne (€)	**Totaux (€)**
		Permanents		Non permanents avec financement ANR demandé		Non permanents sans financement ANR demandé						
		personnes.mois	Coût (€)	personnes.mois	Coût (€)	personnes. mois	Coût (€)					
Tâche 1	0,00	12,00	78 000,00	0,00	0,00	0,00	0,00	0,00	3 000,00	0,00	0,00	81 000,00
Totaux	0,00	12,00	78 000,00	0,00	0,00	0,00	0,00	0,00	3 000,00	0,00	0,00	81 000,00

Pour information : montant maxi des frais de gestion /frais de structure pris en compte par l'ANR = 53 250,00

Uniquement pour laboratoire d'organisme public ou fondation, financé au coût marginal. Indiquer le taux d'environnement : 0,00

Frais de gestion/ frais de structure (€)	15 600,00
Frais d'environnement (€)	0,00
Coût complet (€)	96 600,00
Coût éligible pour le calcul de l'aide : Assiette (€)	96 600,00
Taux d'aide demandée	45,00
Aide demandée (€)	43 470,00

Acronyme du projet : ALMIRA

Engagement du partenaire

Après avoir pris connaissance de l'ensemble du dossier de soumission et du règlement relatif aux modalités d'attribution des aides de l'ANR, je donne mon accord pour la participation au projet du partenaire désigné ci-dessus, dans les conditions décrites de répartition des tâches et de financement demandé, et garantis les informations données.

Pour un organisme public ou une fondation de recherche :

<table>
<tr><td colspan="2">Responsable scientifique et technique</td><td colspan="2">Directeur de laboratoire ou de l'unité d'accueil</td></tr>
<tr><td>Prénom :</td><td>Nom :</td><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2" rowspan="2">Signature :</td><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
<tr><td colspan="4">Je m'engage à envoyer une copie du dossier de soumission à chacune des tutelles du laboratoire ou de l'unité d'accueil.</td></tr>
</table>

Pour un partenaire autre (qu'organisme public ou fondation de recherche) :

<table>
<tr><td colspan="2">Représentant légal</td></tr>
<tr><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2">Préciser la fonction :</td></tr>
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Fiche Partenaire No 6 : Identification et budget

Responsable scientifique et technique

Coordinateur de projet : Non

Genre : Homme
Nom : MASMOUDI
Tél : +216 71 287 110 ext. 163
Email : masmoudi.med@inat.agrinet.tn
Date de naissance : 16/03/1959

Titre : Enseignant-chercheur/professeur
Prénom : Moncef
Tél. portable : +216 9534 1622

Identification du partenaire

Nom complet du partenaire : Institut National Agronomique de Tunisie

Sigle du partenaire : INAT

Catégorie de partenaire : Divers public

Base de calcul pour l'assiette de l'aide : Coût marginal

Partenaire labellisé Institut Carnot ? Non **Si oui quel institut?**

Pour un laboratoire d'organisme public de recherche :
Type d'unité : **Numéro d'unité :**

Tutelles Gestionnaires de financement : INSTITUT DE RECHERCHE SUR LE DEVELOPPEMENT

Tutelles Hébergeantes : INSTITUT DE RECHERCHE SUR LE DEVELOPPEMENT

Autres tutelles :

Pour une entreprise :
No Siret : **Effectif (si PME) :**

Adresse de réalisation des travaux	**N° Rue** :	43, Avenue Charles Nicolle		
	Adresse :			
	Complément d'adresse :			
	CP :	01082	**Ville** :	Tunis- Mahrajène
	Cedex :		**Pays** :	Tunisie

Acronyme du projet : ALMIRA

Demande financière (montant HT en €, incluant la TVA non récupérable)

Tâches	Equipements (€)	Personnels						Prestations de service externe (€)	Missions (€)	Autres dépenses de charges externes (€)	Dépenses sur facturation interne (€)	**Totaux (€)**
		Permanents		Non permanents avec financement ANR demandé		Non permanents sans financement ANR demandé						
		personnes.mois	Coût (€)	personnes.mois	Coût (€)	personnes. mois	Coût (€)					
Tâche 1	0,00	12,00	66 216,00	30,00	21 000,00	36,00	50 000,00	0,00	6 000,00	0,00	0,00	143 216,00
Totaux	0,00	12,00	66 216,00	30,00	21 000,00	36,00	50 000,00	0,00	6 000,00	0,00	0,00	143 216,00

Pour information : montant maxi des frais de gestion /frais de structure pris en compte par l'ANR = 1 080,00

Uniquement pour laboratoire d'organisme public ou fondation, financé au coût marginal. Indiquer le taux d'environnement : 80,00

Frais de gestion/ frais de structure (€) 1 080,00

Frais d'environnement (€) 109 772,80

Coût complet (€) 254 068,80

Coût éligible pour le calcul de l'aide : Assiette (€) 28 080,00

Taux d'aide demandée 100,00

Aide demandée (€) 28 080,00

Acronyme du projet : ALMIRA

Engagement du partenaire

Après avoir pris connaissance de l'ensemble du dossier de soumission et du règlement relatif aux modalités d'attribution des aides de l'ANR, je donne mon accord pour la participation au projet du partenaire désigné ci-dessus, dans les conditions décrites de répartition des tâches et de financement demandé, et garantis les informations données.

Pour un organisme public ou une fondation de recherche :

<table>
<tr><td colspan="2">Responsable scientifique et technique</td><td colspan="2">Directeur de laboratoire ou de l'unité d'accueil</td></tr>
<tr><td>Prénom :</td><td>Nom :</td><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2" rowspan="2">Signature :</td><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
<tr><td colspan="4">Je m'engage à envoyer une copie du dossier de soumission à chacune des tutelles du laboratoire ou de l'unité d'accueil.</td></tr>
</table>

Pour un partenaire autre (qu'organisme public ou fondation de recherche) :

<table>
<tr><td colspan="2">Représentant légal</td></tr>
<tr><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2">Préciser la fonction :</td></tr>
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Fiche Partenaire No 7 : Identification et budget

Responsable scientifique et technique

Coordinateur de projet : Non

Genre : Femme
Nom : MEKKI
Tél : +216-7171-9630 ext 447
Email : insaf.mekki@laposte.net
Date de naissance : 01/04/1972

Titre : Chargé de recherche
Prénom : Insaf
Tél. portable : +216-2285-2727

Identification du partenaire

Nom complet du partenaire : Institut National de Recherche en Génie Rural Eaux et Forêts

Sigle du partenaire : INRGREF

Catégorie de partenaire : Divers public

Base de calcul pour l'assiette de l'aide : Coût marginal

Partenaire labellisé Institut Carnot ? Non **Si oui quel institut?**

Pour un laboratoire d'organisme public de recherche :
Type d'unité : **Numéro d'unité :**

Tutelles Gestionnaires de financement : INSTITUT DE RECHERCHE SUR LE DEVELOPPEMENT

Tutelles Hébergeantes : INSTITUT DE RECHERCHE SUR LE DEVELOPPEMENT

Autres tutelles :

Pour une entreprise :
No Siret : **Effectif (si PME) :**

Adresse de réalisation des travaux	**N° Rue** :		
	Adresse :	rue Hedi Karray	
	Complément d'adresse :		
	CP :	02080	**Ville** : Ariana
	Cedex :		**Pays** : Tunisie

Acronyme du projet : ALMIRA

Demande financière (montant HT en €, incluant la TVA non récupérable)

Tâches	Equipements (€)	Personnels						Prestations de service externe (€)	Missions (€)	Autres dépenses de charges externes (€)	Dépenses sur facturation interne (€)	**Totaux (€)**
		Permanents		Non permanents avec financement ANR demandé		Non permanents sans financement ANR demandé						
		personnes.mois	Coût (€)	personnes.mois	Coût (€)	personnes. mois	Coût (€)					
Tâche 1	0,00	38,00	121 200,00	48,00	21 000,00	36,00	50,00	0,00	19 000,00	0,00	0,00	161 250,00
Totaux	0,00	38,00	121 200,00	48,00	21 000,00	36,00	50,00	0,00	19 000,00	0,00	0,00	161 250,00

Pour information : montant maxi des frais de gestion /frais de structure pris en compte par l'ANR = 1 600,00

Uniquement pour laboratoire d'organisme public ou fondation, financé au coût marginal. Indiquer le taux d'environnement : 80,00

Frais de gestion/ frais de structure (€) 1 600,00

Frais d'environnement (€) 113 800,00

Coût complet (€) 276 650,00

Coût éligible pour le calcul de l'aide : Assiette (€) 41 600,00

Taux d'aide demandée 100,00

Aide demandée (€) 41 600,00

Acronyme du projet : ALMIRA

Engagement du partenaire

Après avoir pris connaissance de l'ensemble du dossier de soumission et du règlement relatif aux modalités d'attribution des aides de l'ANR, je donne mon accord pour la participation au projet du partenaire désigné ci-dessus, dans les conditions décrites de répartition des tâches et de financement demandé, et garantis les informations données.

Pour un organisme public ou une fondation de recherche :

<table>
<tr><td colspan="2">Responsable scientifique et technique</td><td colspan="2">Directeur de laboratoire ou de l'unité d'accueil</td></tr>
<tr><td>Prénom :</td><td>Nom :</td><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2" rowspan="2">Signature :</td><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
<tr><td colspan="4">Je m'engage à envoyer une copie du dossier de soumission à chacune des tutelles du laboratoire ou de l'unité d'accueil.</td></tr>
</table>

Pour un partenaire autre (qu'organisme public ou fondation de recherche) :

<table>
<tr><td colspan="2">Représentant légal</td></tr>
<tr><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
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Fiche Partenaire No 8 : Identification et budget

Responsable scientifique et technique

Coordinateur de projet : Non

Genre : Homme
Titre : Enseignant-chercheur/maître de conférence
Nom : CHIKHAOUI
Prénom : Mohamed
Tél : +212 537 771 745 Ext 1107
Tél. portable : +212 674 173 237
Email : mchikhaoui@gmail.com
Date de naissance : 13/09/1974

Identification du partenaire

Nom complet du partenaire : Institute of Agronomy & Veterinary Medicine Hassan II

Sigle du partenaire : IAV HASSAN II

Catégorie de partenaire : Divers public

Base de calcul pour l'assiette de l'aide : Coût marginal

Partenaire labellisé Institut Carnot ? Non **Si oui quel institut?**

Pour un laboratoire d'organisme public de recherche :

Type d'unité : **Numéro d'unité :**

Tutelles Gestionnaires de financement : INSTITUT DE RECHERCHE SUR LE DEVELOPPEMENT

Tutelles Hébergeantes : INSTITUT DE RECHERCHE SUR LE DEVELOPPEMENT

Autres tutelles :

Pour une entreprise :

No Siret : **Effectif (si PME) :**

Adresse de réalisation des travaux	**N° Rue** :	Department of Natural Resources & Environment		
	Adresse :	Institut Agronomique & Vétérinaire Hassan II		
	Complément d'adresse :	BP 6202-Instituts,		
	CP :	10101	**Ville** :	Rabat
	Cedex :		**Pays** :	Maroc

Acronyme du projet : ALMIRA

Demande financière (montant HT en €, incluant la TVA non récupérable)

Tâches	Equipements (€)	Personnels						Prestations de service externe (€)	Missions (€)	Autres dépenses de charges externes (€)	Dépenses sur facturation interne (€)	**Totaux (€)**
		Permanents		Non permanents avec financement ANR demandé		Non permanents sans financement ANR demandé						
		personnes.mois	Coût (€)	personnes.mois	Coût (€)	personnes. mois	Coût (€)					
Tâche 1	0,00	40,00	179 380,00	30,00	30 000,00	36,00	50 000,00	23 250,00	27 500,00	0,00	0,00	310 130,00
Totaux	0,00	40,00	179 380,00	30,00	30 000,00	36,00	50 000,00	23 250,00	27 500,00	0,00	0,00	310 130,00

Pour information : montant maxi des frais de gestion /frais de structure pris en compte par l'ANR = 3 230,00

Uniquement pour laboratoire d'organisme public ou fondation, financé au coût marginal. Indiquer le taux d'environnement : 80,00

Frais de gestion/ frais de structure (€)	3 230,00
Frais d'environnement (€)	207 504,00
Coût complet (€)	520 864,00
Coût éligible pour le calcul de l'aide : Assiette (€)	83 980,00
Taux d'aide demandée	100,00
Aide demandée (€)	83 980,00

Acronyme du projet : ALMIRA

Engagement du partenaire

Après avoir pris connaissance de l'ensemble du dossier de soumission et du règlement relatif aux modalités d'attribution des aides de l'ANR, je donne mon accord pour la participation au projet du partenaire désigné ci-dessus, dans les conditions décrites de répartition des tâches et de financement demandé, et garantis les informations données.

Pour un organisme public ou une fondation de recherche :

<table>
<tr><td colspan="2">Responsable scientifique et technique</td><td colspan="2">Directeur de laboratoire ou de l'unité d'accueil</td></tr>
<tr><td>Prénom :</td><td>Nom :</td><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2" rowspan="2">Signature :</td><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
<tr><td colspan="4">Je m'engage à envoyer une copie du dossier de soumission à chacune des tutelles du laboratoire ou de l'unité d'accueil.</td></tr>
</table>

Pour un partenaire autre (qu'organisme public ou fondation de recherche) :

<table>
<tr><td colspan="2">Représentant légal</td></tr>
<tr><td>Prénom :</td><td>Nom :</td></tr>
<tr><td colspan="2">Préciser la fonction :</td></tr>
<tr><td colspan="2">Signature :</td></tr>
</table>

Les informations personnelles transmises dans ces documents sont obligatoires et seront conservées en fichiers par l'ANR. Conformément à la loi n° 78-17 du 6 janvier 1978, relative à l'informatique, aux Fichiers et aux Libertés, les personnes concernées disposent d'un droit d'accès et de rectification des données personnelles les concernant. Les personnes concernées peuvent exercer ce droit en s'adressant à l'ANR, 212 rue de Bercy, 75012 PARIS.

TABLEAUX RECAPITULATIFS

Récapitulatif des dénominations des partenaires

	Sigle du partenaire	Nom complet du partenaire
Partenaire 1	LISAH	Laboratoire d'étude des Interactions Sol - Agrosystème - Hydrosystème
Partenaire 2	AGROCLIM	AGROCLIM
Partenaire 3	BRGM / D3E	Bureau de Recherches Géologiques et Minières / Direction Eau Environnement et Ecotechnologies
Partenaire 4	IRMC	Institut de Recherche sur le Maghreb contemporain
Partenaire 5	SIRS	Systèmes d'Information à Référence Spatiale
Partenaire 6	INAT	Institut National Agronomique de Tunisie
Partenaire 7	INRGREF	Institut National de Recherche en Génie Rural Eaux et Forê
Partenaire 8	IAV HASSAN II	Institute of Agronomy & Veterinary Medicine Hassan II

Acronyme / Acronym	**ALMIRA**		
Titre du projet	Adaptation des mosaïques paysagères dans les agrosystèmes pluviaux méditerranéens pour une gestion durable de la production agricole, des ressources en eau et en sol		
Proposal title	Adapting Landscape Mosaics of medIterranean Rainfed Agrosystems for a sustainable management of crop production, water and soil resources.		
Axe(s) thématique(s) / theme(s) *Ou* **Projet pluridisciplinaire / multidisciplinary proposal**	☐ 1 ☑ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☑ OUI ☐ NON		
Type de recherche / Type of research	☑ Recherche Fondamentale / Basic Research ☐ Recherche Industrielle / Industrial Research ☐ Développement Expérimental : Experimental Development		
Coopération internationale (si applicable) / International cooperation (if applicable)	Le projet propose une coopération internationale / International cooperation with : ☐ avec un ou des pays spécifiquement mentionnés dans l'appel à projets / countries explicitly cited in the call for proposal ☑ autres pays / other countries		
Aide totale demandée / Grant requested	599604 €	**Durée du projet / Project duration**	48 months

1. RESUME DE LA PROPOSITION DE PROJET / EXECUTIVE SUMMARY

Mediterranean Rainfed Agrosystems (MRAs) provide various environmental and economic services of importance such as food production, preservation of employment and local knowhow, downstream water delivery or mitigation of rural exodus. These services have progression margins, thus making investments in such agrosystems highly profitable. In the meantime, expected climate change combined with demography and market pressures threaten MRA future abilities to satisfy the aforementioned services.

In the context of mitigating the pressures induced by global change, ALMIRA aims to explore the modulation of landscape mosaics within MRAs to optimize landscape services. Following recommendations from think-tank IAASTD (2008), significant advances are expected by reasoning spatial organizations of land uses and cropping systems. ALMIRA proposes a threefold conceptualization of landscape mosaics as i) networks of natural and anthropogenic elements that result from biophysical and socio-economic processes within a resource governance catchment, ii) structures that impact landscape fluxes from the agricultural field to the catchment extent, with consequences on the resulting functions and services, and iii) a possible lever for managing agricultural catchments by compromising on agricultural production and on preservation of soil and water resources.

To explore this new lever, ALMIRA proposes to design, implement and test a new Integrated Assessment Modelling approach that explicitly i) includes innovations and action means into prospective scenarii for landscape evolutions, and ii) addresses landscape mosaics and processes of interest from the agricultural field to the resource governance catchment. This requires tackling methodological challenges in relation to i) the design of spatially explicit landscape evolution scenarii, ii) the coupling of biophysical processes related to agricultural catchment hydrology, iii) the digital mapping of landscape properties and iv) the economic assessment of the landscape services.

The new Integrated Assessment Modelling approach is implemented and tested within three catchments located in France, Morocco and Tunisia. Beyond the obtaining of significant advances in the aforementioned methodological domains, and the understanding of landscape functioning and services for the considered catchments, outcomes are expected to help in revisiting former recommendations at the levels of agricultural field and resource governance catchment, and in identifying new levers that improve MRA management at the intermediate level of landscape mosaics.

ALMIRA gathers French, Moroccan and Tunisian researchers involved in a large range of scientific disciplines: hydrology, physical geography, climatology, pedology, remote sensing, spatial statistics, agronomy, agro-economy, sociology, agricultural and environmental economy. One of the major challenges of the project is to make all these disciplines converging towards a reproducible transdisciplinary approach.

2. CONTEXTE, POSITIONNEMENT ET OBJECTIFS DE LA PROPOSITION / CONTEXT, POSITION AND OBJECTIVES OF THE PROPOSAL

2.1. CONTEXTE ET ENJEUX ECONOMIQUES ET SOCIETAUX / CONTEXT, SOCIAL AND ECONOMIC ISSUES

Development policies in Mediterranean countries have mainly focused on areas of high agricultural potential and irrigated farming. However, it is increasingly admitted that investments in less favourable farm areas and rainfed agricultural areas have greater impacts on both sustainable management of natural resources and improvement of rural livelihoods (Ruben et al., 2003). This is all the more crucial for France, Morocco and Tunisia that rainfed agrosystems cover 87%, 85% and 92% of the cultivated areas, respectively (Lahmar, 2006).

Mediterranean Rainfed Agrosystems (MRAs) provide various services such as food production, biodiversity conservation, soil carbon sequestration, preservation of employment and local knowhow, downstream water delivery or mitigation of rural exodus (Millennium Ecosystem Assessment, 2005). Such services are of importance, given their environmental and economic contributions to the society. For instance, the Tunisian government recently initiated long term investments in grain production, subsequently to the 2008 food crisis that emphasized the Tunisian dependency on global agricultural markets (Gana, 2012). In the meantime, it is necessary preserving soil and water quantitative resources on which rely MRAs, by mitigating soil losses and improving water use efficiency.

Most climate models forecast dramatic changes that will affect natural resources within Mediterranean areas. In the meantime, increasing demography and market pressures are expected to induce important land use changes. These driving forces threaten MRA abilities to satisfy the aforementioned services while preserving soil and water resources. Several think-tanks (Millennium Ecosystem Assessment, 2005; IAASTD, 2008; Green Morocco Plan, 2009) have proposed recommendations to mitigate the consequences of these driving forces, including innovations at the field level (water saving techniques, supplemental irrigation, conservation tillage), at the farm level (crop rotations optimizing limited precipitations, introducing high value crops, modulation of planting and harvest dates) and at regional level (educational programs in rural areas, market regulations).

Beyond the field, farm and region levels, IAASTD (2008) recommended to consider the landscape intermediate level and to introduce "new cropping patterns adapted to site-specific conditions". Thus, significant advances are expected by reasoning spatial organizations of land uses and cropping systems: identifying new action levers should result in innovative recommendations from a spatial organization perspective, but may also lead to revise former recommendations at the finer and coarser spatial scales.

Further, implementing recommendations devoted to the modulation of landscape mosaics must be adequately designed in accordance to local factors that drive acceptability, such as environmental constraints, economic pressures, public policies or cultural aspects.

2.2. POSITIONNEMENT DU PROJET / POSITION OF THE PROJECT

In the context of mitigating the pressures induced by global change, ALMIRA aims to explore the modulation of landscape mosaics within MRAs as a new lever to compromise on agrienvironmental and socioeconomic services related to agricultural production and to preservation of soil and water resources. In recent past, an increasing attention has been paid to landscape mosaics and to the services induced by landscape functioning.

Landscape mosaics have been investigated mainly in ecology. Instances are the CGIAR project "Integrating Livelihoods and Multiple Biodiversity Values in Landscape Mosaics" that aims to facilitate allocations of land use rights; and the FP7 BIO_SOS project that develops tools for the monitoring of NATURA 2000 sites. Landscape mosaics are nowadays considered as a forefront study object, and the AGU Fall Meeting 2012 setup a session on "Connectivity across Watersheds and Effects on Downstream Waters" that is motivated by "the regulator's ability to protect various types of aquatic resources" and by "a sense of urgency […] to advance science on a number of topics, including the connectivity of small, transiently connected aquatic resources within a watershed…" (AGU, 2012).

Landscape functioning has been studied for the implications in terms of environmental and economic services. Instances are FP7 projects such as CLAIM to support the Common Agricultural Policy in improving landscape valuation for rural societies; VOLANTE to advance knowledge in land system science and to improve land resource management; or FACEPA to analyse production costs in European agriculture.

Nevertheless, and according to the best of our knowledge, there is neither project nor literature material that addresses the modulation of landscape mosaics for optimizing environmental and economic services. This issue is the core of the ALMIRA proposal.

To reach the aforementioned aim, ALMIRA requires the implementation of a spatially explicit Integrated Modelling Assessment that involves the characterisation of landscape biophysical properties, the modelling of landscape mosaic evolution and of landscape functioning, as well as the economic valuation of landscape functioning. For this, ALMIRA benefits from methodological outcomes of recent and ongoing projects.

Design and implementation of an Integrated Modelling Assessment uses knowledge acquired during RTRA AGROPOLIS LANDMOD "Integrative ecosystems and landscape modelling" and FP6 SEAMLESS. Both projects developed conceptual and computerized frameworks for integrated modelling of agricultural systems, in relation to environmental issues.

The characterization of landscape properties uses knowledge acquired with ANR DIGISOL-HYMED that uses forefront observation technologies for the fine scale mapping of surface / subsurface soil properties, in the framework of the GlobalSoilMap.net program. It also uses knowledge from Earth observation programs devoted to the monitoring of land surface processes (e.g. ESA / EEA Corine Land Cover, NASA Landsat and ASTER). Climate forcing is characterised using knowhow developed during ANR CLIMATOR. The database that gathers various types of data is setup following the INSPIRE directive nomenclature.

The design of landscape evolution scenarii uses knowledge from GESSOL3-SP3A that explores spatial distributions of innovative agricultural practices for the preservation of soil functions. It also uses knowledge from LACCAVE, a project of the INRA ACCAF meta-program that explores possible adaptation strategies to climate change for the French wine growing sector.

The modelling of landscape functioning uses knowledge acquired with i) FP6 DIMAS that addressed the modelling of crop yield response to water availability, ii) ANR CHLORDEXHO that improved the consideration of spatial discontinuities within distributed hydrological modelling, and iii) ANR MESOEROS that improved the modelling of soil erosion / sedimentation within watersheds at different spatiotemporal scales.

The economic valuation of landscape functioning relies on knowledge from ANR SERENA that aims to incorporate environmental service concept in rural policy provisions. It also uses knowledge from international and French regional research projects that investigated the value of services provided by groundwater resources: ANR ARENA Groundwater, FP6 AQUAMONEY, FP6 AQUATERRA and FP6 BRIDGE-WFD.

The ALMIRA partners participated to most of the projects listed above, and their involvements into other projects have allowed studying various compartments and processes within the MRAs to be studied in ALMIRA: water harvesting with hilly lakes (FP4-INCO HYDROMED); functioning of vegetation in water limited situations (FP5-INCO-MED IRRIMED); understanding the spatiotemporal dynamic of soil water storage in relation to land use (AIRD JEAI JASMIN); continuous monitoring of water, erosive and biogeochemical fluxes (French-Tunisian long term environmental research observatory OMERE); as well as productivity increasing and employment improvement in high-growth sectors like fruit tree production (Millennium Challenge Corporation – Morocco Compact). The ALMIRA partners are also involved into international programs such as MISTRALS / SICMED that addresses the evolution of Mediterranean anthropo-ecosystems within rural and peri-urban areas; and the TERENO-MED network of global change observatories within the Mediterranean Basin.

ALMIRA fits most of the objectives presented in the TRANSMED call for proposal.

- By simulating landscape functioning according to landscape evolution driven by global change, ALMIRA addresses the evolution of Mediterranean rainfed agrosystems, with implications for agricultural economics, agricultural policies, and management of soil and water resources. Thus, ALMIRA fits the TRANSMED objective #1 that aims to increase knowledge and understanding of Mediterranean region evolution.
- Through economic valuation of landscape functioning as driven by mosaic evolution, ALMIRA fits the TRANSMED objective #2 that aims to encourage interdisciplinary studies and systemic analysis. Indeed, ALMIRA involves bio-physics, socioeconomics and integrated modelling. A main challenge is making these disciplines converging toward a transdisciplinary approach for better managing the considered MRAs.
- ALMIRA partnership involves scientists from universities and research institutes in France, Tunisia and Morocco. Further, ALMIRA partners have collaborated for long

thanks to successful projects funded by competitive calls (e.g. FP4-INCO, FP5-INCO-MED, FP6, ANR, EGIDE/PRAD, RTRA AGROPOLIS, MISTRALS-SICMED, and AIRD-JEAI). This long past collaboration has resulted in joint publications and databases about socioeconomic and biophysical processes within the considered MRAs. It has also resulted in the co-management of the aforementioned French-Tunisian long term environmental observatory OMERE. It is expected to be strengthened with ALMIRA, through the integration, into a systemic analysis of the considered MRAs, of previous project outcomes about biophysical and socioeconomic processes. Thus, the transnational dimension of ALMIRA fits the TRANSMED objective #3 that aims to encourage research collaboration between Mediterranean rims.

- The involvement of the research institutions to which belong the Tunisian and Moroccan partners of ALMIRA fits the TRANSMED objective #4 that aims to initiate exploratory programs within the partner countries. These research institutions (INAT, IAV) have funded support programs for methodological steps to be integrated into ALMIRA systemic approach. They also host within their doctoral schools PhD students who benefit from grant recently captured by ALMIRA partners via competitive calls for proposals. Further, ALMIRA partners are already engaged in the "Mediterranean Office for Youth" program that aims to grant master students for helping PhD settlement and facilitate PhD exchanges.

ALMIRA addresses most of the scientific questions identified in the TRANSMED thematic axis #2 "sustainable resource management".

- By simulating landscape functioning related to water fluxes in accordance to mosaic evolution, ALMIRA addresses the impact of global change on hydrological cycle.
- By modulating landscape mosaics to compromise on agrienvironmental and socioeconomic services, ALMIRA addresses landscape planning and resources management in a context of multiple uses.
- By focusing on the intermediate scale of landscape mosaic rather than on field or regional scales, ALMIRA explores original paths for developing sustainable agriculture.
- By assessing agrienvironmental and socioeconomic services within resource governance catchments, ALMIRA addresses the design of new strategies for land / water management and agricultural production at the territory scale.
- By assessing agrienvironmental and socioeconomic services within agricultural catchments in relation to agricultural production and to preservation of soil and water resources, ALMIRA addresses the interactions between vegetation, soils and waters.
- Finally, by assessing the socioeconomic and institutional aspects of MRA functioning, ALMIRA addresses the multiple dimensions of the sustainability of natural resource management and their complex interactions.

It is finally worth noting the first ALMIRA version was one of the 14 proposals amongst 86 preselected by the FP7/ANR ARIMNet 2011 call for proposals, although it was not selected finally because of financial restrictions and changes in priorities by the Mediterranean

funding countries (personal communication, ARIMNet national contact point). As compared to the first version submitted to ARIMNet 2011, this second version submitted to TRANSMED was improved by i) accounting for the comments from the ARIMNet 2011 reviewer panel, ii) maturating several methodological steps and project organization issues, and iii) clarifying each partner contribution. Then, this improved version is supported by funding programs such as MISTRALS / SICMED and LABEX AGRO, and the corresponding support letters were included in the annex document – Section 4.

2.3. ÉTAT DE L'ART / STATE OF THE ART

Following recommendations from IAASTD (2008), significant advances are expected by reasoning spatial organizations of land uses and cropping systems. The basic idea is optimizing landscape functioning to compromise on agricultural production and on preservation of soil and water resources. The involved concepts to be discussed are landscape mosaics, landscape functioning and resulting landscape services.

The concept of landscape mosaic has been first defined in landscape ecology as the arrangement of landscape elements that together form a distinctive pattern (Forman, 1995; Brady et al., 2009). In cultivated landscapes, the constituent elements have natural origins (climate, geomorphology and pedology) and anthropogenic origins (field size and boundaries, ditches, crop types). Their spatial arrangement and connectivities, so-called landscape mosaics, integrate i) biophysical constraints such as topography, pedology and climate, ii) farmer management of cropping systems to ensure farm viability under a given socio-economic context, and iii) public policies about soil and water conservation infrastructures that aim to optimize the management of regional resources.

An abundant literature in landscape ecology (Forman, 1995), spatial hydrology (Schröder, 2006; Braken and Croke, 2007; Moreno-de las Heras et al., 2012) and landscape pedology (Sommer, 2006) reported the impact of spatial arrangements and connectivities of landscapes elements onto landscape functions like runoff, soil erosion, soil water storage, vegetation growth, species habitation. These functions can be next translated into landscape services (e.g. downstream blue water production, soil preservation, food production, species conservation) when valued by the local actors (Termorshuizen and Opdam, 2009).

Spatial allocations within "resource governance regions" can be optimized by accounting for the diversity and spatial dependencies of natural resources (Brunckhorst et al., 2006). As an example, crop production could be maximized by adapting the arrangement of cropping systems to pedogical and climatic situations, as it has been done at the field level with precision agriculture (Bramley, 2009). Further, any reasoning of landscape mosaics should be a tradeoff between the possibly antagonist landscape services of interest.

Regarding the elements discussed above, ALMIRA proposes a threefold conceptualization of landscape mosaics as i) networks of elements that result from biophysical and socio-economic processes, ii) structures that impact landscape fluxes with consequences on resulting functions and services, and iii) a possible lever for managing agricultural catchments by compromising on economic and environmental issues through landscape

services. Further, the inclusion of landscape mosaics into the process of elaborating recommendations for the management of MRAs requires understanding the evolutions of landscape mosaics and their influence on the services of interest. This implies the necessity to tackle methodological challenges listed hereafter.

Linking local agricultural management with landscape functioning and services. This requires the integration of numerous processes that belong to different disciplines across sociology, economics, agronomy and biophysics. A comprehensive framework to perform this integration has been provided by recent research on Integrated Assessment and Modelling (IAM, van Ittersum et al., 2008; Nelson et al., 2009). However, it is necessary improving IAM to account for first order drivers of MRAs evolution and functioning, by including i) innovations and action means into prospective scenarii for landscape evolutions, and ii) explicit description of structures and functioning of landscape mosaics from the agricultural field to the extent of resource governance catchment.

Characterizing influences of economic and environmental changes on landscape mosaics. This implies downscaling, at the agricultural field level, global change scenarii usually defined at the macroeconomic level (e.g. IPPC emission scenarii, World Water Vision…). A key methodological question is how to derive a quantified assumption from a scenario general description that is often narrative (Alcamo, 2008; Kok and van Delden, 2007; Shackley and Deanwood, 2003). A second difficulty is related to the production, at the agricultural field level, of different scenarii that explicit spatial representations of land use and cropping pattern changes. It is then necessary improving current Land Use Simulation Models (e.g. Castelazzi et al., 2010; Verburg et al., 2002) by integrating simple representations of biophysical and farm decision processes, in order to better account for environmental constraints.

Characterizing the role of landscape mosaics and related connectivities for producing landscape services. Numerous distributed hydrological models were devoted to study the impact of land-use change on water fluxes, erosive fluxes, and vegetation functioning (e.g. Arnold et al., 1998). However, these models have several limitations. On the one hand, they do not involve either spatial resolution in adequacy to landscape mosaics or temporal sampling appropriate to sub-daily timescale processes. On the other hand, they do not account for anthropogenic elements within rural catchments (e.g. field boundaries, terraces, drains...) that can significantly drive landscape functioning and resulting services. Promising results were recently obtained with new distributed models that account for anthropogenic elements (Gumiere et al., 2011; Colin et al., 2012; Levavasseur et al., 2012). However, such models require i) the prior development of adequate tools for both coupling processes with variable time steps and conducting time-consuming simulations (e.g. OpenFLUID; http://www.umr-lisah.fr/openfluid) and ii) the design of appropriate strategies for multicriteria and multi-site parameterisation / calibration / validation procedures (Moussa and Chahinian, 2009) that rely on hydro-meteorological data series (e.g. ORE OMERE; http://www.umr-lisah.fr/omere/) and on hydrological soft monitoring (Crabit et al., 2011).

Developing methods of landscape property mapping at the scale of landscape mosaics. Characterizing landscape patterns and connectivities, from the agricultural field to the extent of resource governance catchment, require data that are not available from current deliveries of spatial information. Although worldwide products are available at fine resolution (a three arc/s resolution Digital Elevation Model at the global level, a 250 m resolution annual update of land cover), spatial data on climate variables and soil properties are available at kilometric resolution only (FAO, 2009). Further, data sets about landscape hydrological discontinuities (field boundaries, ditches) or land use detailed nomenclatures (agricultural practices) are lacking. Emerging solutions are digital mapping methods that involve local observations, remote sensing, signal processing and spatial modelling (Lagacherie et al., 2007; Bonnardot and Cautenet, 2009; Baret and Buis, 2008).These methods still are questioned for their ability to reproduce spatial variabilities at the resolution of interest (about 100 m) if applied to large extents (Sanchez et al., 2009).

Setting regulation measures for promoting sustainable landscape mosaics. Although producing local and global agrienvironmental benefits, improved land use and cropping practices are usually not attractive enough to be spontaneously adopted. By i) assessing impacts of such changes on agricultural productivity (e.g. crop production, employment) and environmental resources (e.g. water production, soil preservation) and ii) identifying the barriers to adoption of these changes, mechanisms of promotion can be designed. One of these mechanisms consists of implementing incentive mechanisms for specific practices that generate environmental services (Payment for Environmental Services – PES). Existing concepts on environmental services are mainly related to biodiversity conservation, forest and water protection (Engela et al., 2008); and more recently to labelling farm products (Dedeire, 2011). These concepts should be adapted to the modulation of landscape mosaics. The difficulty lies in the fact that the effective provision of environmental services is often related to a specific spatial organization rather than to the occurrence of actors who adopt specific practices. This raises the issue of spatially differentiated PES (Wunscher et al., 2008), to be considered along with the consequences on poverty alleviation (Pagiola et al., 2005).

2.4. OBJECTIFS ET CARACTERE AMBITIEUX /NOVATEUR DU PROJET / OBJECTIVES, ORIGINALITY AND NOVELTY OF THE PROJECT

In the context of mitigating the pressures induced by global change, ALMIRA aims to explore the modulation of landscape mosaics within MRAs as a new lever to compromise on agrienvironmental and socioeconomic services related to agricultural production and to preservation of soil and water resources (Figure 1). Landscape mosaics to be modulated include current features of cropping systems (field patterns and connectivities, crop rotations and management) but also innovations induced by public regulations and farmer decisions.

The overall objective discussed above requires implementing an Integrated Assessment Modelling (IAM) that encompasses biophysical and agro-socioeconomic processes. The IAM prior requests to be improved by including i) innovations and action means into prospective

scenarii for landscape evolutions, and ii) explicit description of landscape mosaic functioning from the agricultural field to the resource governance catchment. These two improvements drive the methodological developments to be conducted during ALMIRA, in order to overcome the difficulties identified in Section 2.3:

- the design of landscape evolution scenarii driven by socioeconomic drivers;
- the coupling of biophysical processes related to catchment hydrology: runoff and erosion, infiltration and water balance, crop water consumption;
- the characterization of landscape properties that drive water and erosive fluxes;
- the economic valuation of the landscape functioning to be translated into the landscape services of interest, which are related to agricultural production and to preservation of soil and water resources.

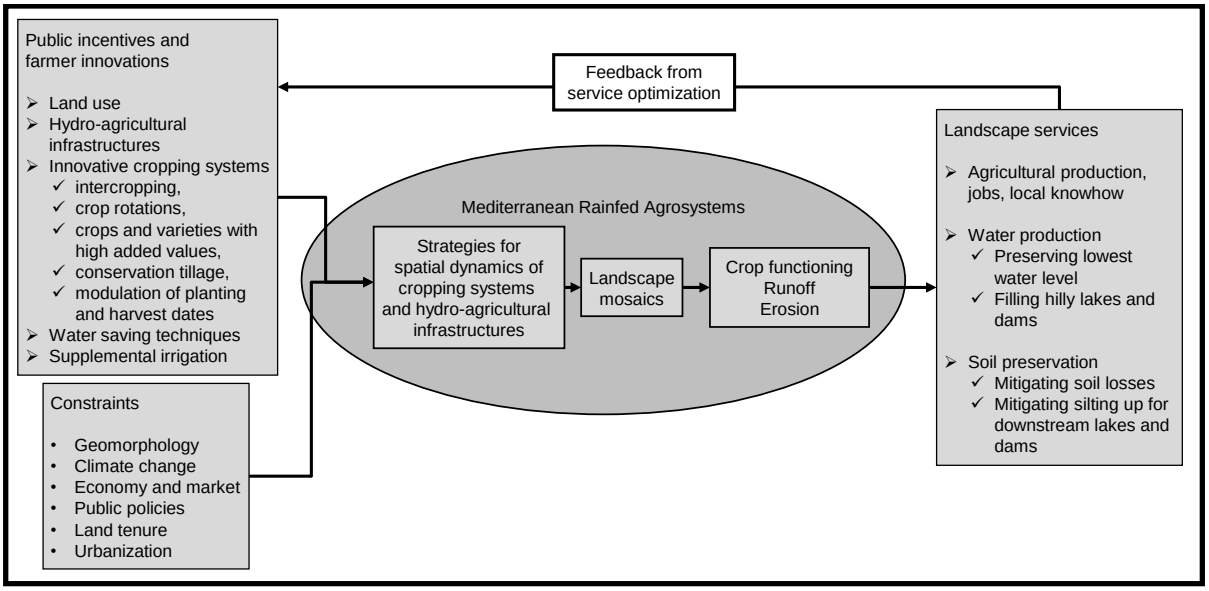

Figure 1: overview of the problematic to be addressed by ALMIRA, i.e. modulation of landscape mosaics as a lever for optimizing landscape services.

The innovative character of ALMIRA has thematic, disciplinary, methodological and societal dimensions, discussed hereafter.

- In the context of managing soil and water resources within agricultural catchments, the thematic novelty relies on considering the intermediate scale of landscape mosaics. Thus, new insights are expected for both the understanding of agricultural catchment functioning and the optimization of related services.
- ALMIRA consists of building a transdisciplinary approach for both setting future scenarii of landscape mosaics and quantifying the economic values of their functioning. On the one hand, agronomy and socioeconomics focus on designing scenarii of landscape mosaics and quantifying economic values of landscape services. On the other hand, biophysics focuses on characterising both pattern of landscape properties and functioning of landscape mosaics. These disciplines are fully interdependent within ALMIRA. Thus, landscape mosaics depend upon both socioeconomic drivers (farm size

and strategies, public regulations) and biophysical constraints (topography that drives field size and access, pedology that drives land use).

- The methodological novelty of ALMIRA relies on several investigations (detailed in Section 3.3) devoted to overcome the difficulties identified in Section 2.3. Beyond these methodological developments, a challenge that is transverse to the project is characterizing at fine spatiotemporal resolutions the numerous processes related to the structures, the evolutions and the functioning of landscape mosaics. ALMIRA is expected to provide methodological advances and cognitive results about the functioning of MRAs, including the impact of cropping systems and of their spatial distribution.
- From a societal perspective, a key innovation for the benefit of policy makers and stakeholders is to revisit and enrich the set of recommendations that have been formerly proposed by various think-tanks. By diagnosing the involved processes from the perspective of landscape mosaics, it is expected both to critically analyse the existing recommendations and to identify new action levers.

3. PROGRAMME SCIENTIFIQUE ET TECHNIQUE, ORGANISATION DU PROJET / SCIENTIFIC AND TECHNICAL PROGRAMME, PROJECT ORGANISATION

3.1. PROGRAMME SCIENTIFIQUE ET STRUCTURATION DU PROJET / SCIENTIFIC PROGRAMME, PROJECT STRUCTURE

In the context of mitigating the pressures induced by global change, ALMIRA aims to explore the modulation of landscape mosaics within MRAs as a new lever to compromise on agrienvironmental and socioeconomic services related to crop production and to preservation of soil and water resources. As an initial step, ALMIRA proposes to develop the required methodological tool, and to use it for a feasibility demonstration. Several choices are set to provide a proof-of-concept with the allocated time and grants.

- Amongst various landscape services of importance, such as ecological services related to biodiversity, those to be considered in ALMIRA are restricted to soil preservation by mitigating erosion, water delivery at the catchment outlet for downstream users, and crop production including resulting benefits (employment, knowhow).
- A non-iterative approach includes a priori choices for several methodological steps, to be revisited at the end of the project through a posteriori recommendations.
- Optimizing landscape services consists of selecting, amongst a typology of landscape mosaic scenarii, those that best compromise on the landscape services of interest.
- Landscape services are quantified in relative values rather than in absolute values, by considering differences in landscape services from one landscape mosaic scenario to another.
- Any sensitivity analysis on the Integrated Modelling Assessment (IAM) has to be conducted beyond ALMIRA, once the proof-of-concept is demonstrated.
- To strengthen the project feasibility, most of the workpackages and / or tasks individually rely on a basic activity along with possible methodological developments to

be detailed in Section 3.3. The basic activity allows ensuring each task is completed to provide the expected deliverables for further tasks. Then, the interest of any methodological development is quantified by comparing the corresponding outputs against those obtained with the basic activity.

Site	Trends in agricultural production	Main actions	Degradation	Downstream consequences
Lebna, Tunisia Extent: 200 km² Climate: sub-humid (rainfall 550 mm/year)	**Current**: cereals, beans, livestock, olive orchards, vineyard **Evolution**: intensification of existing productions	Water use efficiency, crop management, water harvesting	Soil loss (15t/ha/an)	Silting of dams and lakes, water resource genesis
Peyne, France Extent: 80 km² Climate: sub-humid (rainfall 650 mm/year)	**Current:** vineyard, cereals **Evolution**: input waning, local irrigation, abandonment, crop diversification	Water use efficiency	Soil loss (10t/ha/an)	Water contamination, minimum level of water discharge
Tleta, Morocco Extent: 180 km² Climate: sub-humid gradient (rainfall 300 to 1300 mm/year)	**Current:** cereals, livestock **Evolution:** conversion from livestock to crops, olive orchard introduction, urban development	Water use efficiency, landscape pattern change	Soil loss (35t/ha/an)	Dam silting, water resource genesis, water resource quality

Table 1: study area presentation, including current and expected agricultural productions, current actions for resource management and main agrienvironmental concerns.

The study area is a set of three catchments that includes i) one of the main vineyards in France, ii) a typical area for extensive mixed farming in Tunisia and iii) a grazing / cropland area in Morocco (Table 1). These agrosystems are common within the Mediterranean Basin, they are economically important for the corresponding countries, and they are considered as threatened areas by expected global change.

This set of three catchments depicts variability in terms of landscape mosaics and related services. In France and Tunisia, the landscape mosaics have slightly evolved over the last decades. The French vineyards have experienced agricultural abandonment induced by market difficulties. The Tunisian agrosystems have experienced agricultural intensification based on water harvesting techniques. In Morocco, the landscape mosaics have experienced drastic land use changes induced by conversion to tree farming and by urban development. Such changes in mosaic have induced redistribution of soil and water fluxes, including runoff, evapotranspiration and erosion. They have also induced changes in management due to emerging opportunities and constraints at farm and regional scales.

To make ALMIRA a valuable contribution, it is necessary considering this set of three catchments. Indeed, it embraces a large panel of socioeconomic and agrienvironmental situations within MRAs, and a large panel of expected changes. These large panels allow addressing the influence of spatial structures on landscape services in a large extent. Indeed, significant differences are expected from one catchment to another when accounting for landscape mosaics to identify new action levers and to propose new recommendations.

From the perspective of project feasibility, we note that these three catchments have been studied and monitored in the framework of various programs (Environmental Regional Observatories, public policy benchmarks, Trans-Mediterranean research such as the SICMED-MISTRALS program). This makes the knowledge in biophysics and socioeconomics available for the benefit of the transdisciplinary approach proposed here.

Finally, the time period for simulations spreads over 2020-2060. This choice is considered as a trade-off that accounts for i) realistic scenarii about agricultural evolutions, and ii) significant changes in climate forcing. Crop rotations are set over five year cycles.

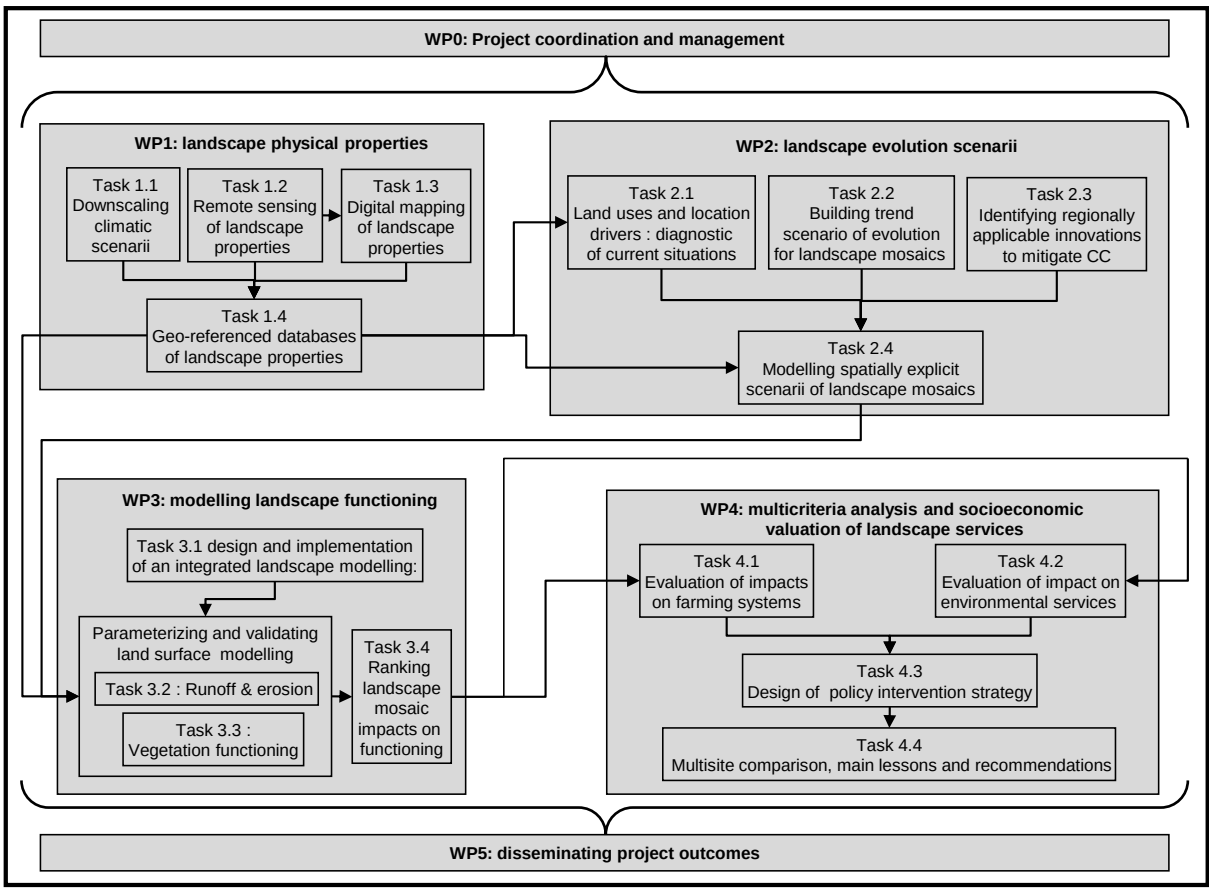

Figure 2: flowchart of ALMIRA and related workpackages, including links between tasks.

ALMIRA includes six workpackages and sixteen tasks that are clearly linked to each other (see Figure 2). We define four workpackages in relation to the involved thematics, along with two additional workpackages that aims to increase the project efficiency in terms of animation and dissemination.

- Workpackage WP0 is devoted to scientific coordination and project organization.
- Workpackage WP1 designs and uses methods to characterize climatic scenarii and to characterize the landscape properties that drive soil and water fluxes. This involves climatology, remote sensing, spatial statistics and GIS technology.

- Workpackage WP2 aims to formulate spatially explicit scenarii of landscape mosaics from the agricultural field to the resource governance catchment, including structures, patterns and connectivities modulated by cropping systems. Landscape evolution is forecast by including innovations in cropping systems.
- Workpackage WP3 develops a process based modelling approach to simulate landscape functioning, including runoff, erosive fluxes and crop functioning.
- Workpackage WP4 relies on outputs from the three previous WP, to translate landscape functioning into landscape services through an economic valuation, to analyse landscape services in accordance to the foreseen evolutions, and to identify new action levers for the management of Mediterranean Rainfed Agrosystems.
- Workpackage WP5 aims to disseminate the project outcomes through various means.
- WP1 to WP4 are presented hereafter. WP0 and WP5 are presented in Section 3.2 and 4, respectively.

3.2. MANAGEMENT DU PROJET / PROJECT MANAGEMENT

To ensure the project transverse structure over the three countries, we nominated a project coordinator from France along with two deputy coordinators from Tunisia and Morocco, who are in charge of animating ALMIRA (WP0) and disseminating outcomes (WP5). The project transverse structure is also strengthened by nominating a binational pair of co-managers for each scientific workpackage (WP1 to 4). Such a co-leadership helps avoiding both a focus on a given study site and a country based compartmentalization of activities.

The governance committee includes the project coordinator, the deputy coordinators and the workpackage co-managers. This committee is responsible for WP0 tasks, including i) the respect of Gantt chart and deliverables, ii) the respect of financial plan, iii) the management of possible conflicts and delays, iv) the organisation of the project meetings (a kick-off meeting, intermediate meetings and a closure meeting), and v) information exchanges between workpackages / tasks on the one hand, and between the three catchments on the other hand. He gathers twice a year throughout the project duration by using videoconferencing, after workpackage managers checked for progresses with leaders of related tasks and deliverables. For daily animation and monitoring, a part time (75%) project manager ensures the multiple steps are going on.

Throughout ALMIRA duration, project calendar with milestones and key events are indicated through the web site intranet channel. Information exchanges between project partners rely on communication networks that have been used for several years by ALMIRA partners, including visiting periods in the framework of ongoing projects, the attempting of the long term partners to the annual seminaries of the LISAH laboratory, as well as standard events like project kick-off and closure meeting.

The project coordinator, deputy coordinators, workpackage co-managers, task and deliverable leaders are identified in Section 3.3 (Table 2), Section 3.4 (Table 4) and Section 5.3 (Table 5).

3.3. DESCRIPTION DES TRAVAUX PAR TACHE / DESCRIPTION BY TASK

Following Section 3.1, we present here the structuration of each workpackage into the related tasks. For each workpackage and task, we detail the objectives, the strategy and the outputs, and we indicate the persons in charge. When applicable, potential risks and solutions are discussed by differentiating the basic activities that ensure each task is completed from the possible methodological contributions. Partners involved in each workpackage and task are listed in Table 2. Deliverables with scientists in charge are detailed in Section 3.4 (Table 4).

3.3.1 WP1 - LANDSCAPE PHYSICAL PROPERTIES (CO-MANAGERS: P. LAGACHERIE @ LISAH AND M. CHIKHAOUI @ IAV)

WP1 aims to map the climate variables and the landscape properties that impact landscape functioning (Task 3.2 and 3.3) and drive farmer decisions (Task 2.1 and 2.3) at the selected spatial resolution (agricultural field) and spatial extent (few hundreds of sq.-km). It is organised into four tasks that involve climatology (Task 1.1), remote sensing (Task 1.2), spatial statistics (Task 1.3) and GIS technology (Task 1.4).

WP1 largely benefits from high quality and often innovative spatial datasets that were collected over the three catchments during former projects. This allows fulfilling the minimum requirements in spatial datasets for next WPs (basic activity), while testing new signal processing (Task 1.2) and digital mapping algorithms (Task 1.3) in view of increase mapping precision or decrease mapping costs for some key landscape properties (methodological contributions).

3.3.1.1 TASK 1.1: DOWNSCALING OF CLIMATE SCENARII (LEADER: F. HUARD @ AGROCLIM)

Task 1.1 aims to spatially downscale the long term climate series from the ARPEGE model, in order to represent the climate local variability within the three catchments. In the basic activity, downscaling is performed using a standard statistical approach without any local information. When possible, a more elaborated approach uses the quantile-quantile downscaling (Déqué, 2007) at each location, thanks to timely shorter secondary series derived from routine meteorological stations, ANTILOPE radar data and/or meteorological measurements to be punctually collected. Next, regression-kriging is used to interpolate the corrected long term series by accounting for the landscape parameters that drive climate local variations. The regression-kriging is beforehand calibrated using the meteorological measurements punctually collected, where a spatial strategy allows capturing first order influences (e.g. topography, soil type, open waters). Finally, the daily climatic series are timely downscaled at an hour step by using stochastic approaches.

3.3.1.2 TASK 1.2: REMOTE SENSING OF SURFACE LANDSCAPE PROPERTIES (LEADER: C. GOMEZ @ LISAH)

Task 1.2 consists of using recent remote sensing approaches for the mapping of surface properties that are key drivers for water and erosive fluxes across the landscape mosaics (evapotranspiration, water retention, infiltration, runoff, erodibility) while being unavailable

from current maps at fine spatial resolution and catchment extent. These properties are parcel boundaries, detailed land use (e.g. tilled and non-tilled fields) and topsoil properties.

Parcels boundaries and detailed land use classification are inferred by following an object-oriented approach that relies on a segmentation algorithm for prior delineation of individual parcels and on multi-scale textural classifiers. Following recent successes in mapping some topsoil properties (e.g. clay content, CaCO3 content, pH…) over bare soil surfaces by using airborne hyperspectral images (Ouerghemmi et al, 2011; Gomez et al., 2012), methodological developments are conducted to extend such mapping to i) partially vegetated soil surfaces by means of source separation algorithms and ii) to larger areas by using remote sensing data at coarser spatial and spectral resolutions that are available at lower costs from spaceborne sensors.

3.3.1.3 TASK 1.3: DIGITAL MAPPING OF LANDSCAPE PROPERTIES (LEADER: J.-S. BAILLY @ LISAH)

Task 1.3 aims to develop the digital mapping of key landscape properties that are estimated imprecisely by current maps and that cannot be fully documented from remote sensing techniques, namely deep soil properties that influence water retention (soil depth, texture, porosity), and ditch network features that drive catchment hydraulics and capacities of erosion prevention (planar geometry and section).

Geo-statistical methods (Hengl et al., 2007; Bailly et al., 2006; Levavasseur, 2012) are first used to map these landscape properties from i) observations available at few locations within the catchments and ii) a set of correlated landscape variables. Methodological developments are conducted for i) increasing mapping precision by using the spatial layers produced by Task 1.2. as new correlated landscape variables, ii) scaling at the parcel level and iii) estimating uncertainties on mapping. Finally, the water retention properties which cannot be directly mapped by the aforementioned approaches are inferred from locally-calibrated pedotransfer functions using geo-statistical estimates of soil primary properties (mainly soil texture).

3.3.1.4 TASK 1.4: GEO-REFERENCED DATABASE OF LANDSCAPE PROPERTIES (LEADER: C. SANNIER @ SIRS)

Task 1.4 aims to gather and organise the spatial data required by further WPs into a comprehensive geo-referenced database with easy access for project partners. The database includes baseline data formerly collected over the three catchments by ALMIRA partners; the spatial layers obtained from well-tried remote sensing techniques (e.g. coarse nomenclature land use class); as well as data provided by previous WP1 tasks. For each catchment, the data gathering and transfer to the database is ensured by a site correspondent (see contributors of Task 1.4 in Table 2). The database includes an INSPIRE compliant metadabase to optimize data use by other WPs.

3.3.2 WP2 - LANDSCAPE EVOLUTION SCENARII (CO-MANAGERS: A. GANA @ IRMC AND M. EL AMRANI @ ENA)

The overall objective of WP 2 is to develop landscape evolution scenarii. The first three tasks aim to i) identify the current land uses and the location factors responsible for their spatial distribution (Task 2.1), ii) develop a baseline scenario of landscape mosaic evolution (Task 2.2) and iii) identify possible changes and innovations in farming and land use practices (Task 2.3). A spatially explicit land use simulation model is finally documented with outputs from the three first tasks, to establish contrasted scenarii of landscape mosaics (Task 2.4).

3.3.2.1 TASK 2.1: LAND USES AND LOCATION FACTORS: DIAGNOSTIC OF CURRENT SITUATIONS (LEADER: A. BIARNÈS @ LISAH)

Task 2.1 aims to build the reference situation. This means identifying i) the diversity of land use, including cropping systems related to crop production and animal farming, and ii) the determinants of their spatial distribution. The main location factors to be considered include socio-economic, institutional, technical and environmental aspects at different spatial scales: regional scale (markets, public policies, etc.), local level (institutional arrangement such as farm organizations, user associations), farm level (farming systems) and field scale (environmental characteristics). The methodological approach combines quantitative and qualitative i) descriptions of land uses and potential location factors and ii) analysis of their relationships. It is mainly based on i) the use of geo-referenced data gathered in WP1, ii) the use of available regional databases on farms, agricultural practices and spatial distribution of agricultural production. When possible, it relies on data collected within the selected watersheds through questionnaire surveys and interviews conducted with farmers, representatives of farmer associations, and representative of local and regional agricultural services.

3.3.2.2 TASK 2.2: BUILDING TREND SCENARIO OF EVOLUTION FOR LANDSCAPE MOSAICS (LEADER: C. HÉRIVAUX @ BRGM)

Task 2.2 aims to i) identify drivers that may influence landscape mosaics, ii) understand how they may undergo changes and iii) develop a baseline scenario that describes, at the 2030-2040 time horizon, the most probable resulting evolutions for agricultural systems, for land use main forms and for their spatial organizations. A four-steps methodological approach is implemented: i) identification of drivers influencing landscape mosaics at the catchment scale, ii) analysis of potential evolution of driving factors based on a review of existing literature and on interviews with selected experts; iii) construction of a baseline scenario describing in a narrative format possible future developments of agriculture, and iv) evaluation of the possible impacts of this scenario in terms of landscape mosaics at the regional level. When possible, a participatory approach based on scenario workshops with institutional representatives, experts and farmers is implemented in order to co-construct landscape mosaics scenario (steps iii and iv). Otherwise, a simplified approach is implemented based on the review of existing studies and interviews with key stakeholders. The final output consists of a series of simplified graphic representations (art work, not GIS)

of possible future landscape mosaics associated with the baseline scenario, to be next used in task 2.4.

3.3.2.3 TASK 2.3: IDENTIFYING REGIONALLY APPLICABLE INNOVATIONS TO MITIGATE CC (LEADER: H. BAHRI @ INRGREF)

Task 2.3 aims to identify i) the possible farming and land management innovative practices and ii) the constraints (technical, economic, regulatory and cultural) associated to their implementation. The basic identification of innovations is based on results from task 2.1 and a literature review. When possible, this identification is deepened by conducting a series of interviews with agricultural experts and farmers, especially to identify current strategies deployed by farmers to adapt to climatic changes. A farm survey is then conducted to analyse farmer perceptions and acceptability of potential innovations, and to confront the latter with farmer traditional know-how and technical practices. A multicriteria analysis is finally carried out to i) compare the different innovations that can be foreseen and ii) identify innovations to be considered in Task 2.4 as changes in land use and in farming systems.

3.3.2.4 TASK 2.4: MODELLING SPATIALLY EXPLICIT SCENARII OF LANDSCAPE MOSAICS (LEADER: F. VINATIER @ LISAH)

Task 2.4 aims to integrate outcomes from Task 2.1, 2.2, and 2.3 in a spatially explicit model of land use change. The model simulates changes in composition (i.e. crop allocation and management in time and space), and structure (i.e. geometries of fields and ditches networks) of landscape over four decades. The findings of tasks 2.1 and 2.2 define the global input of crop allocation and management in time. The findings of task 2.1 and spatial data provided by WP1 help determining the interrelations between landscape elements and the modification of their geometry. In the absence of data, the basic activity considers a random distribution of element within landscape and a fixed geometry of linear elements. The methodological development is based on probabilistic modelling of crop allocation and landscape architecture. The validity of the supposed interrelations is verified using the pattern-oriented modelling approach. The reliability of the obtained scenarii of landscape mosaic evolution is finally verified using knowledge provided by task 2.1 and 2.3.

3.3.3 WP3 - MODELLING LANDSCAPE FUNCTIONING (CO-MANAGERS: R. MOUSSA @ LISAH AND M. MASMOUDI @ INAT)

WP 3 aims to characterize the impact of changes in landscape mosaics on landscape functioning related to runoff, erosion and crop production. First, the SWAT model is used for the basic activity on the three catchments. This model is adequate when considering daily time step to compare the hydrologic responses of the three catchments. However, SWAT is not adapted to simulate fast runoff dynamics and high erosion rates that are recurring in the Mediterranean region with short-duration high-intensity rainfall events. Moreover, the SWAT spatial discretization is based on sub-catchments and cannot account for fields and connectivities within agricultural catchments. Hence, the methodological development of WP 3 consists of designing and implementing an Integrated Hydrological Processes Model

(labelled IHPM) that makes use of models already developed by the ALMIRA scientists: i) the OpenFLUID modelling and simulation platform to simulate short time processes (e.g. 1 minute) and to account for spatial discontinuities in agricultural basins (Fabre et al., 2010), ii) the GeoMHYDAS catchment digital representation that allows representing spatial structures within agricultural landscapes such as land-use patterns, connectivities and discontinuities (Lagacherie et al., 2010), iii) the MHYDAS distributed hydrological model for simulating water and erosion in farmed catchments (Moussa et al., 2002; Gumiere et al., 2011), and iv) the AQUACROP model that simulates the responses of crop yields to water availability (Aloui et al., 2012). The main difficulty is designing an adapted parameterization and calibration procedure for the IHPM integrated model.

The methodology has four tasks. Task 3.1 focuses on the development of IHPM by using the formalism of the OpenFLUID platform. Tasks 3.2 (focused on hydrological processes) & 3.3 (focused on vegetation functioning) deal with the parameterisation strategy of SWAT and IHPM on the basis of the spatiotemporal data from WP1 and other complementary data. Task 3.4 aims to i) obtain the SWAT and IHPM simulations for the various scenarii defined in WP2 and ii) produce and use synthetic indicators for comparing and ranking WP2 scenarii in terms of landscape functioning.

3.3.3.1 TASK 3.1: DESIGNING AND IMPLEMENTING AN INTEGRATED LANDSCAPE MODEL (LEADER: J.-C. FABRE @ LISAH)

This task aims to i) design the IHPM to simulate the main processes (including runoff, water flux in ditches, erosion, vegetation) involved in integrative landscape functioning and the variable time-step adapted to the main processes, and ii) building adapted digital representations using high spatial resolution data.

The outputs are: i) global design of the IHPM, including both processes and landscapes representations; ii) development through the OpenFLUID software environment of adapted simulation functions for the IHPM simulating landscape functioning; iii) OpenFLUID improvements for better handling of variable time steps.

3.3.3.2 TASK 3.2 AND 3.3: PARAMETERISING LAND SURFACE MODELLING (LEADER: D. RACLOT @ LISAH AND R. ZITOUNA @ INRGREF)

These tasks aim to i) define the parameters for SWAT and IHPM, and ii) develop a calibration and validation strategy for both models. The difficulty to be overcome when using spatially distributed models is the over-parameterisation problem. First, the soil hydrodynamic properties, the land-use and the channel network topology are estimated on the basis of the WP1 and WP2 results. Second, we propose to combine multi-source data on landscape functioning to i) intensify control and validation data, ii) better constrain the model, and iii) avoid over-parameterisation. Multisource data include: i) long series of hydrological measurements, ii) remotely sensed information, iii) bathymetry based information about sediment deposits in widespread reservoirs and erosion data based on plant unearthing-burying measurements. These data are completed using i) soft monitoring which has proved to be an efficient data source at un-gauged internal sites for estimating

surface water redistributions, and ii) very high spatial resolution DEM build from a photogrammetric process applied to low altitude images for describing fine soil redistributions inside catchments. Third, the optimal set of parameters calibrated for one process (runoff, erosion or vegetation functioning) can be different from that calibrated for another process. Hence, we use the Pareto ranking to define multi-objective and multi-criteria calibration procedure.

The outputs are: i) the development of procedures for the spatiotemporal distribution of SWAT and IHPM parameters, ii) complementary soft-monitoring hydrologic data, and iii) the development of a multi-criteria (model variables and parameters to be constrained), multi-objective (measurements to be fitted by model simulations), multi-site (several points within each catchment) and multi-process (runoff versus erosion versus vegetation functioning) approach for IHPM calibration and validation. In a lesser extent, we note the biophysical modelling of urbanized areas within each catchment relies on literature materials.

3.3.3.3 TASK 3.4: RANKING LANDSCAPE MOSAIC IMPACT ACCORDING TO LANDSCAPE FUNCTIONING (LEADER: F. COLIN @ LISAH)

This task aims to i) simulate the impacts on water, erosion and vegetation functioning of the land-use scenarii established in WP2 using SWAT and IHPM; and ii) compare and rank these scenario with regard to the simulated impacts at different spatial and temporal scales. The methodology is threefold: i) chaining the land use change model (Task 2.4) with SWAT and IHPM on the basis of the parameterisation strategies established in Task 3.2 and 3.3, ii) selecting and analysing relationships between synthetic indicators of landscape structures and properties at various scales and simulations of vegetation functioning, water and erosion fluxes, and iii) ranking the land-use scenarii with regard to these indicators.

The outputs are, for each land use scenario as defined by WP2, i) a set of simulations of SWAT (basic activity) and a set of IHPM simulations when possible; and ii) the synthetic indicators that rank land use scenario for each of the studied impact.

3.3.4 WP4 - MULTICRITERIA ANALYSIS OF LANDSCAPE MOSAIC IMPACTS ON LANDSCAPE SERVICES (CO-MANAGERS: J.-D. RINAUDO @ BRGM AND M. SABIR @ ENFI)

WP 4 aims to assess the impact of landscape mosaics on landscape services, and to select mosaic scenarii that best compromise on landscape services. Landscape mosaics to be considered are those constructed in WP2. Landscape services are estimated by conducting economic valuations of landscape functioning as simulated with biophysical models in WP3. Trade-off on landscape services includes impacts on agricultural systems (Task 4.1) and environmental services (Task 4.2). Then, Task 4.3 compares scenarii using a multicriteria evaluation framework and identifies policy instruments which could be used to promote desirable scenarii. Task 4.4 synthetizes lessons learnt in the three catchments and derive more general policy recommendations for Mediterranean rainfed agricultural systems.

3.3.4.1 TASK 4.1: ECONOMIC VALUATION OF LANDSCAPE SERVICES FOR FARMING SYSTEMS (LEADER: H. AMAMI @ INRGREF)

This task aims at characterizing the technical and socio-economic impact on farming systems of landscape mosaic scenarii. The analysis relies on a series of semi-structured interviews with agricultural experts and a limited number of farmers. It describes how scenarii may affect farm economic profitability, labour organization, farming practices and, in the longer term, social organisation at different scales. In each case study, the analysis considers a typology of farms. It highlights both positive and negative impacts which are then assessed in economic terms (costs and benefits). The task allows identifying scenarii that improve agricultural welfare and those for which cost born by farmers are greater than benefits, justifying further investigations on Payments for Ecological Services.

3.3.4.2 TASK 4.2: ECONOMIC VALUATION OF ENVIRONMENTAL LANDSCAPE SERVICES (LEADER: J.-D. RINAUDO @ BRGM)

Concerning Environmental Services (ES), the task consists of describing how changes in landscape mosaics affect soil and water related environmental services such as downstream water delivery and erosion reduction. This requires identifying the socioeconomic actors that benefit from these ES (including those located downstream the catchment) and assessing the costs (or benefits) associated to a reduction (or an increase) of the service levels. The originality of this task lies in the merging of simulations from integrated biophysical models with economic evaluation approaches to assess various scenarii of agricultural landscape management. A quantitative economic valuation based on interviews with representatives of the main types of beneficiaries is completed on one specific basin.

3.3.4.3 TASK 4.3: DESIGN OF POLICY INTERVENTION STRATEGY (LEADER: A. GANA @ IRMC)

Task 4.3 merge results of the two previous tasks through a multicriteria analysis (MCA) that aims to compare and rank the different scenarii of agricultural landscape management and related practices. This analysis is conducted at catchment/regional level, considering a large number of criteria (social, economic, environmental) that determine the sustainability of farming systems. Different methods are investigated to conduct this analysis, including computer based tools like the DEXiPM model (which can be used in a participatory framework) and more qualitative approaches that rely on the mobilization of experts and (lay) farmer knowledge. Task 4.3 also investigates policy instruments that could be used to promote the adoption of innovative farm practices, in particular by looking for win-win cooperative agreements between farmers, Environmental Services (ES) providers and recipients. Results of this task contribute to the growing literature on Payment for ES.

3.3.4.4 TASK 4.4: MULTISITE COMPARISON, LESSONS LEARNT AND POLICY RECOMMENDATIONS (LEADER: N. BEN MECHLIA @ INAT)

Results obtained in the three case studies are compared and recommendations for Mediterranean rainfed agricultural systems proposed, considering the diversity of case study contexts. The comparative analysis focuses on the impacts of the main innovations

considered in the three catchments and on policy instruments that can be used to promote the development of specific practices. This task also produces a critical analysis of the transdisciplinary integrated modelling approaches used in the catchments.

3.3.5 LISTING OF INVOLVED PARTNERS AND RELATED SCIENTISTS

Table 2 above details the partners involved in each workpackage (WP) and task (TK). Project coordinator and deputy coordinators are in charge of WP0 and WP5. Workpackages are co-managed by scientists who are seasoned in their respective fields of expertise. Task leaders were selected for their deep knowledge and strong skills in the fields of interest. We finally note Task 4.4, which is an integrative task at the project scale, requires selecting significantly experienced researchers such as those listed below.

WP	Task	Co-managers / Leader(s)	Contributors	
0		LISAH: F. Jacob; INRGREF: I. Mekki; IAV: M. Chikhaoui		
1		LISAH: P. Lagacherie; IAV: M. Chikhaoui		
1	1.1	AGROCLIM: F. Huard	COSTEL: H. Quenol	
1	1.2	LISAH: C. Gomez	LISAH: W. Ouerghemmi, N. Chehata, M. Rabotin	
			INRGREF: I. Mekki	IAV: M. Chikhaoui
1	1.3	LISAH: J.-S. Bailly	LISAH: P. Lagacherie	
1	1.4	SIRS: C. Sannier	LISAH: P. Lagacherie INRGREF: I. Mekki	IAV: M. Chikhaoui
2		IRMC: A. Gana; ENA: M. El Amrani		
2	2.1	LISAH: A. Biarnès	IRMC: A. Gana ENA: M. El Amrani	INRGREF: H. Bahri
2	2.2	BRGM: C. Hérivaux	BRGM: J.-D. Rinaudo INRGREF: H. Amami	ENFI: A. Khattabi
2	2.3	INRGREF: H. Bahri	LISAH: A. Biarnès SYSTEM: C. Gary	IRMC: A. Gana ENA: M. El Amrani
			IAV: M. Naimi, A. Bouaziz	
2	2.4	LISAH: F. Vinatier	LISAH: A. Biarnès ENA: M. El Amrani	INRGREF: H. Bahri
3		LISAH: R. Moussa ; INAT: M. Masmoudi		
3	3.1	LISAH: J.-C. Fabre	LISAH: M. Rabotin, D. Raclot, F. Colin, L. Prévot	
3	3.2	LISAH: D. Raclot	INRGREF : I. Mekki IAV: M. Chikhaoui	INRA: R. Moussadek
			LISAH: R. Moussa, O. Planchon	
3	3.3	INRGREF: R. Zitouna	LISAH: F. Jacob, L. Prévot, C. Montes SYSTEM : C. Gary INAT : M. Masmoudi, N. Ben Mechlia, N. Boudhina	
3	3.4	LISAH: F. Colin	LISAH: F. Vinatier, R. Moussa, D. Raclot INRGREF : R. Zitouna	
4		BRGM: J.-D. Rinaudo; ENFI: M. Sabir		
4	4.1	INRGREF: H. Amami	SYSTEM : C. Gary ENA: M. El Amrani	INRGREF: H. Amami ENFI: A. Khattabi
4	4.2	BRGM: J.-D. Rinaudo	BRGM: C. Hérivaux INRGREF: H. Amami	ENFI: A. Khattabi
4	4.3	IRMC: A. Gana	BRGM: C. Hérivaux, J.-D. Rinaudo	
			INRGREF: H. Amami	ENFI: M. Sabir
4	4.4	INAT : N. Ben Mechlia	LISAH: M. Voltz, Y. Le Bissonnais, J.-P. Lhomme	
			SYSTEM : C. Gary INRGREF : A. Zairi	IAV: M. Naimi ENFI: M. Sabir
5		LISAH: F. Jacob; INRGREF: I. Mekki; IAV: M. Chikhaoui and M. Naimi		

Table 2: partners involved in each workpackage and task

3.4. CALENDRIER DES TÂCHES, LIVRABLES ET JALONS / TASKS SCHEDULE, DELIVERABLES AND MILESTONES

Risks and solutions were presented in Section 3.3, when defining for each task the basic activity to ensure task finalization and the methodological developments that constitute the contributions of ALMIRA. We list below milestones and deliverables for each workpackage and task.

	Month																
Month	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51
WP0	KM	GM1	LS1	GM2		GM3	LS2	GM4		GM5	LS3	GM6		GM7	LS4	CM	GM8
Task 1.1				D1.1													
Task 1.2								D1.3									
Task 1.3								D1.4									
Task 1.4					D1.2												
Task 2.1							D2.1			D2.4							
Task 2.2							D2.2			D2.5							
Task 2.3							D2.3			D2.6							
Task 2.4						D2.7			D2.8					D2.9			
Task 3.1						D3.1											
Task 3.2									D3.2							D3.4	
Task 3.3																	
Task 3.4												D3.3					
Task 4.1														D4.1			D4.4
Task 4.2														D4.2 D4.3			D4.5
Task 4.3																	D4.6
Task 4.4																D4.7	
WP5		D5.1		D5.2							D5.2					D5.3	

Table 3: Gantt charts. Milestones and deliverables are defined below.

Milestones:

- KM: Kick-off meeting (one).
- CM: Closure meeting (one).
- LS: LISAH yearly seminary that includes LISAH partners (four).
- GM: governance committee meeting, every six months (eight).

No[1]	Deliverable name	Task	Lead participant	Nature[2]	Dissemination level[3]
D1.1	High spatiotemporal climatic series	1.1	F. Huard (AGROCLIM)	Databases / site	INTERNAL (INT)
D1.2	Geo-referenced databases	1.4	C. Sannier (SIRS)	Databases / site	INT
D1.3	Methodologies in remote sensing	1.2	C. Gomez (LISAH) M. Chikhaoui (IAV)	4 submitted papers and communications	PUBLIC (PUB)
D1.4	Methodologies in digital soil and landscape mapping	1.3	J.-S. Bailly (LISAH) P. Lagacherie (LISAH)	4 submitted papers and communications	PUB
D2.1 D2.2 D2.3	Landscape evolution scenarii. D.2.1:Lebna, D.2.2:Tleta, D.2.3:Peyne	2.1 2.2 2.3	H. Bahri (INRGREF) M. Naimi (IAV) A. Biarnes (LISAH)	Synthesis reports / site	INT

D2.4	Land uses and location factors	2.1	A. Biarnes (LISAH) A. Gana (IRMC)	Submitted paper and communication	PUB
D2.5	Trend scenario of evolution for landscape mosaics	2.2	C. Hérivaux (BRGM)	Submitted paper and communication	PUB
D2.6	Regionally applicable innovations for CC	2.3	H. Bahri (INRGREF)	Submitted paper and communication	PUB
D2.7	Modelling spatially explicit scenarii of landscape mosaics	2.4	F. Vinatier (LISAH)	Software	PUB
D2.8				Databases / site	
D2.9				Submitted paper and communication	
D3.1	IHPM Implementation	3.1	J.-C. Fabre (LISAH)	Software	INT
D3.2	Sets of measured and calibrated and SWAT IHPM parameters	3.2 3.3	D. Raclot (LISAH) R. Moussadek (INRA) R. Zitouna (INRGREF)	Database	INT
D3.3	Ranking of landscape scenarii in terms of landscape functioning	3.4	F. Colin (LISAH)	Databases / Site	INT
D3.4	Methodological advances in IHPM	3.1 3.2 3.3	R. Moussa (LISAH)	3 submitted papers and communications	PUB
D4.1 D4.2 D4.3	Evaluations of landscape mosaic impacts and design of policy intervention strategy. 1: Lebna, 2: Tleta, 3: Peyne	4.1 4.2 4.3	A. Khattabi (ENFI) H. Amami (INRGREF)	Synthesis reports / Site	INT
D4.4	Impacts on farming systems of landscape mosaic scenarii	4.1	C. Gary (SYSTEM) H. Amami (INRGREF)	Submitted paper and communication	PUB
D4.5	Evaluation of environmental services	4.2	M. Sabir (ENFI)	Submitted paper and communication	PUB
D4.6	Design of policy instruments and interventions	4.3	A. Gana (IRMC) J.-D. Rinaudo (BRGM)	Submitted paper and communication	PUB
D4.7	Comparative analysis targeting policy makers	4.4	M. Sabir (ENFI) N. Ben Mechlia (INAT) M. Voltz (INRA)	Synthesis Report	PUB
D5.1	Project Web site	WP5	I. Mekki (INRGREF)	Web site	PUB, INT
D5.2	Project information for agricultural actors	WP5	F. Jacob (LISAH)	Leaflets for participatory workshops	PUB
D5.3	Project outcomes for stakeholder and policy makers	WP5	M. Naimi (IAV)	Articles in professional magazines	PUB

Table 4: list of deliverables along with dissemination levels. We also indicate related workpackages and tasks, as well as scientists in charge.

4. STRATEGIE DE VALORISATION, DE PROTECTION ET D'EXPLOITATION DES RESULTATS / DISSEMINATION AND EXPLOITATION OF RESULTS. INTELLECTUAL PROPERTY

Dissemination and exploitation strategy of ALMIRA outcomes addresses six targets with the development of specific tools for each of them. The dissemination levers rely on the some of the deliverables listed above. These levers are used by the project coordinator and two deputy coordinators who are in charge of WP 5 that concentrates the dissemination actions.

- The international research community. Dissemination involves usual materials such as articles in peer-reviewed journals, international congress proceedings, midterm and final project reports for funders. It is planned organizing a special session in an international congress (e.g. ECOSUMMIT), for sharing experiences and lessons learnt.

- The student population who benefits from ALMIRA outcomes as teaching materials. Project partners (IAV, INAT and LISAH) are already engaged and in their respective doctoral schools, as well as in "Mediterranean Office for Youth" program that aims to grant master students for helping PhD settlement and facilitate PhD exchanges.
- The national stakeholders and policy makers. First dissemination lever is the organization of participatory seminaries in the framework of WP 2 and 4. Second dissemination lever is articles in professional magazines to report ALMIRA outcomes.
- The local farmers and extension services. The information to be gathered in the three catchments is made available to technical institutes, vulgarisation centres and farmers; to better cope with the expected transformation of the local agrosystems.
- Experts involved in think-tanks. Some ALMIRA scientists (e.g. A. Gana) already served as think-tank members. They are expected to invite members of their respective think-tank networks to attempt ALMIRA closure meeting, such as ALMIRA outcomes can be forwarded for further think-tank recommendations.
- The wide public. The setup of the web site provides a pivotal access point for several users to obtain specific information and to enable a continuous archiving of information. The project website is publicised to intermediaries, and to other stakeholders through policy briefs, conferences, workshops, professional publications, research reports. All formats (reports and scientific results) are available on the project web site.

ALMIRA results and possible impacts and applications are threefold.

For scientific communities, ALMIRA provides methodological advances and cognitive results about the functioning of Mediterranean Rainfed Agrosystems (MRA), including impact of cropping systems and of their spatial repartition. These methodological advances are disseminated through scientific papers, international congresses and workshops. They are also promoted within the international programs in which ALMIRA partners are involved (AIRD / JEAI, MISTRALS / SICMED, SOERE…).

For policy makers, the experiment of the new levers provided by scaling the problem to landscape mosaics is expected to enrich the set of policy responses that have been proposed by the various think-tanks (Millennium Ecosystem Assessment, 2005; IAASTD, 2008; Green Morocco Plan, 2009). Addressing the intermediate scale of landscape mosaics is also expected to provide more relevant diagnosis on the field- and farm-level innovations that have been formerly proposed. In this context, ALMIRA recommendations are proposed and discussed during participatory workshops with local and regional actors.

For the local actors, the considerable amount of information to be gathered in the three studied catchments is exploited by the technical institutes (e.g. CRDA and GDA in Tunisia, agricultural chambers in France), and the vulgarisation centres (e.g. INGC in Tunisia and ENA centre in Morocco). This relies on existing collaborations with such structures.

Dissemination activities are compatible with the protection of intellectual property rights, confidentiality obligations and the legitimate interests of the owner(s) for the results. The project coordinator and the two deputy coordinators regulate the management of the

knowledge and the intellectual property rights implied by ALMIRA outcomes. Thus, ALMIRA partners setup a prior agreement upon a detailed structure of the project and partnership, to ensure appropriate confidentiality obligations are in place; and to ensure partner have joint access rights to the results to be used for the intended purposes.

5. DESCRIPTION DU PARTENARIAT / CONSORTIUM DESCRIPTION

5.1. DESCRIPTION, ADEQUATION ET COMPLEMENTARITE DES PARTENAIRES / PARTNERS DESCRIPTION & RELEVANCE, COMPLEMENTARITY

We describe here how/why the proposal has a clear added value of being carried out on a transnational basis; including transnational impact of the proposed project, added value for the Mediterranean participating countries and cross border problems. We also describe the specific integration of participants in the transnational consortium structure.

The ALMIRA transnational partnership was setup through a careful selection of complementary research partners that allow conducting transdisciplinary project over the three study catchments in France, Morocco and Tunisia. The consortium includes eight partners and five subcontractors that are experienced in studying semiarid agricultural landscapes devoted to agricultural production and sustainable use of natural resources. The partners and subcontractors represent top research organisations, documented by several high level publications and successful project implementations. They were selected for their expertise in rainfed agriculture, along with complementary expertise in hydrology, soil science, environmental science, agronomy, sociology and economy. All partners and subcontractors have experience in action research and transdisciplinary studies. Thus, the ALMIRA challenge is realistic thanks to i) the past experiences of the involved researchers and ii) the quality of the data and tools already available at the project start. ALMIRA partners and subcontractors also provide sound relations with local farmers as well as with relevant stakeholders, for the benefit of ALMIRA feasibility and outcome dissemination.

The transnationality of the ALMIRA partnership is beneficial in several aspects, detailed hereafter.

- It allows working with a same scientific approach on three catchments that display different agricultural and environmental contexts. This allows to
    - build a more generic approach that can account for the variety of landscapes, cropping systems and spatial structures found in the three catchments;
    - reach the same overall objectives with local declensions in terms of observation and modelling tools,
    - ensure a better impact of the ALMIRA recommendations, by enlarging the representativeness of the study area.
- It ensures that a critical mass of researcher is available in each scientific discipline.
- It allows developing and sharing common methodologies which are out of reach for each of the individual research groups. To this aim, it is worth to point out that each

workpackage is managed by transnational groups of researcher from different scientific disciplines, in order to favour exchanges about concepts and methods. Moreover, trans-nationality is strengthened with the nomination of one project coordinator along with two deputy coordinators who come from the three involved countries.

- The ALMIRA project relies on balancing between research institutes and universities. This ensures a good connection to ongoing international and national research activities in improving rainfed agriculture, as well as in ensuring an immediate transfer to academic education and national stakeholders. Further, the inclusion of an SME for complex data management allows strengthening the technological capabilities of private sector through technical solicitations from forefront research.

We present hereafter the project partners, including their investigation domains, their skills and their project cultures.

PARTNER 1: UMR LISAH, Montpellier, France. LISAH research theme is the study of the spatial organization and hydrology of agricultural landscapes. Main specific objectives are: i) to increase basic understanding for processes about water, erosive and pollutant transports in soils and farmed catchments as a function of spatiotemporal variabilities, both natural and anthropogenic, ii) to develop new methods and tools for detecting and preventing risks to soil and water resources under constrains of flooding events, and iii) to define sustainable management strategies for rural landscapes. UMR LISAH has studied, for more than ten years, Mediterranean Rainfed Agrosystems located in France, Morocco and Tunisia. These investigations have strongly relied on trans-Mediterranean partnerships that involved research institutes, universities and graduate school. This has relied on coordinating four ANR projects and three EU FP5/6 projects.

Within ALMIRA, LISAH is responsible for project coordination and co-management of four of the six WP (WP0, WP1, WP3 and WP5). It is responsible for investigations within the Peyne catchment, France. LISAH is involved in remote sensing of landscape surface properties (Task 1.2), digital mapping of landscape properties (Task 1.3), development of a geospatial database (Task 1.4), diagnosis of the current situation and identification of location factors for land use (Task 2.1), identification of applicable innovations (Task 2.3), setting of landscape mosaic scenarii (Task 2.4), development and application of the Integrated Hydrological Processes Model (WP 3), and synthetizing lessons learnt and setting recommendations (Task 4.4).

LISAH subcontractor: UMR SYSTEM, Montpellier, France. SYSTEM gathers scientists in agronomy and ecology dedicated to the study and design of multifunctional and low input (pesticides, fertilizers) cropping systems in Mediterranean and tropical areas.

UMR System participates to the ALMIRA project in the context of the "La Peyne" catchment. In Task 2.3, it contributes to the identification of agronomic innovations that could mitigate the consequences of climate change on grapevine development and yield formation and that can be included in scenarios of technical changes. In Task 3.3, it

contributes to the calibration and assessment of vegetation modelling. In Task 4.1, it performs the agro-economical evaluation of the proposed agronomic innovations. In Task 4.4, it contributes to synthetizing lessons learnt and setting recommendations.

PARTNER 2: AGROCLIM, Avignon, France. AGROCLIM is an INRA unit of service for general interest with agro-climatic vocation. Its mission is to give to the scientific community simple or elaborated data and tools that relate climate with agro-environmental data. AGROCLIM is specialized in the data processing and the agronomic impacts studies of climate.

Within ALMIRA, AGROCLIM is involved in Task 1.1, including i) the downscaling of climate scenario, ii) the production of scenarii of climate change on the different areas of the study, iii) using global climate models and downscaling methods, iv) using and treatment of automatic meteorological stations.

AGROCLIM subcontractor: COSTEL, Rennes, France. UMR LETG / COSTEL is one of the components of UMR CNRS 6554 LETG. The team researches use a modelling approach at several scales, contributing to the experimentation / modelling of complex systems, from the global atmospheric models to the local models at fine scale via regional models. The team manages several networks of climatic observations in areas strongly exposed to the climate changes: vineyards, Amazonia, urban surfaces.

Within ALMIRA, COSTEL is involved in the production of downscaled climatic scenarii (Task 1.1). The role in this project is to install a network of weather sensors to analyse the spatiotemporal climate variability. The initial data punctually obtained are spatially distributed using geostatistics methods. We then integrate the climate change scenarios in order to carry out local simulations of future climate for the Peyne wine region.

PARNER 3: BRGM/D3E, Montpellier, France. BRGM/D3E is a French public institute acting as National Geological Survey. This multidisciplinary unit includes a team of six agro-economists specialised in water resources, agricultural and environmental economics who have developed an expertise in four major domains: i) economic evaluation of water resource management policies; ii) microeconomic modelling of water user behaviour with a focus on agriculture; iii) tools to support integrated river basin planning; and iv) scenario development and foresight in the water sector. The team is currently coordinating the Water Cap & Trade project (Era Net IWMR net) and the ANR CEPS "SHIVA" project. It has also contributed economic research conducted in four ANR projects and eight FP 5/6 projects.

Within ALMIRA, BRGM/D3E contributes to management of WP2 and WP4. It proposes a methodology for development of economic scenario (Task 2.2). It is more involved in Task 4.1 (impact of landscape mosaic on farming systems), Task 4.2 (economic evaluation of environmental services) and Task 4.3 (trade-off between landscape services).

PARTNER 4: IRMC, Tunis, Tunisia. IRMC (French acronym for Research Institute on Contemporary Maghreb, CNRS USR 3077) is a regional research centre in the humanities

and the social sciences. Headquartered in Tunis, IRMC is devoted to contribute to the development of research in social sciences in the Maghreb countries. It is one of the 27 French research institutes abroad (IFRE). IRMC is under both the Ministry of Foreign and European Affairs and the National Centre for Scientific Research (CNRS). IRMC gathers 10 researchers and 9 research associates. Among the various research themes and programs of IRMC, the transformation of rural economies and societies in the Maghreb countries constitutes an important focus. As of 1 September 2012, Alia GANA, research director at CNRS, joined the IRMC team and is in charge of developing interdisciplinary collaboration with regional institutions specialized in biophysical research.

Within ALMIRA, IRMC co-manages WP 2, and is involved in i) the diagnosis of the current land use (Task 2.1), ii) the identification of applicable innovations (Task 2.3), and iii) the proposal of policy intervention strategies (Task 4.3).

IRMC subcontractor: ENA, Meknes, Morocco. ENA is a public institution for high-level agronomic training that was funded in 1942. It is placed under the Ministry of Agriculture and Marine fishery. Its main tasks are i) training of agricultural engineers especially in areas relating to agriculture, ii) preparing young people for integration into working life and iii) scientific and technological research and dissemination of knowledge related to agriculture and agribusiness.

ENA is represented in ALMIRA by the engineering development department. Professor Mohamed El Amrani, head of the aforementioned department, investigates the socioeconomic features of farming systems, including innovation acceptability. ENA is involved in the agro-socio-economic diagnosis of the current situation (Task 2.1), the identification of applicable innovations (Task 2.3), the setting of landscape mosaic scenarii (Task 2.4) and the impact of landscape mosaics (Task 4.1).

PARTNER 5: SIRS, Lille, France. SIRS is a French independent private company established in 1989 and specialised in geographical information production derived from remotely sensed imagery as input to geographical information systems. Over the last 20 years, SIRS has acquired extensive experience in the development of operational services and manage large-scale geographical information production projects over extended geographical areas. There are currently about 50 staff working for SIRS. Main activities are: land cover/use mapping, habitat cartography (Natura 2000), crop inventory and controls, defence geographic data production, forestry inventory and cartography, tree management. SIRS R&D department is currently involved in two ANR VMCS projects as WP manager and three FP7 projects as WP manager in the Environment and Space themes.

Within ALMIRA, SIRS is mainly involved in Task 1.4 for the development of a harmonised geospatial database.

PARTNER 6: INAT, Tunis, Tunisia. INAT is a high education and research institute part of the University of Carthage. Presently, it has a faculty staff of about 150 (mainly with training and research assignments), and a student population of over 1500. The research activities of

our team cover agro-climatology, water management and irrigation cereals and horticultural crops. The team has participated in several national and international research projects as well as in many extension activities related to water use and water saving. Within the FP6 DIMAs project, the team was in charge of calibrating the AQUACROP modelling for Tunisian cereals, in order to characterise response of crop yield to water availability. The team members involved in ALMIRA are currently members of the AIRD / JEAI JASMIN.

INAT has the co-responsibility of WP3. It is involved in i) the parameterization of the vegetation functioning modules of the Integrated Hydrological Processes Model (WP3), and ii) the synthesis of lessons learnt and the setting of recommendations.

PARTNER 7: INRGREF, Tunis, Tunisia. INRGREF is a major Tunisian Research centre of formal character. It is a legal entity and has economic autonomy, and is placed under the legal restraint of the Ministry of Agriculture and Environment. The Institute principal activities focus on research to address rural engineering and agricultural water management. It was involved in several studies on the following topics: agricultural water resources management and processes, water and soil conservation, agriculture mechanics, renewable energies applications in rural areas and forestry research. INRGREF coordinated and participated in large projects on sustainable soil and water management, including the biophysical (hydrology, bioclimatology) and socioeconomic (cropping systems, agro-economy) dimensions. A special focus is the soil conservation and water harvesting strategies for effective agricultural management options both in rainfed and irrigated systems. Some INRGREF scientists involved in ALMIRA are currently members of the AIRD / JEAI JASMIN.

INRGREF is responsible for: i) project coordination in Tunisia, ii) co-management of WP0 and WP5. It is responsible for investigations within the Lebna catchment, Tunisia. INRGREF is involved in remote sensing of landscape properties (Task 1.2), development of a geospatial database (Task 1.4), agronomic diagnosis of the current situation (Task 2.1), setting of agro-economic scenarii at the regional level (Task 2.2), identification of applicable innovations (Task 2.3), setting of landscape mosaic scenarii (Task 2.4), application of the Integrated Hydrological Processes Model (WP 3), agro-socio-economic and environmental evaluation of landscape scenarii (Task 4.1 and 4.2), proposals for policy intervention strategies (Task 4.3), and the synthesis of lessons learnt and the setting of recommendations (Task 4.4).

PARTNER 8: IAV HASSAN II, Rabat. IAV Soil and water conservation laboratory was created early 80s. Since its creation the laboratory contributed to education, research and development in the area of soil resources management and degradation. The laboratory team has been involved in research in the field of soil erosion, hydrology and soil management; and has recently recruited a scientist in digital soil mapping and remote sensing. The soil and water conservation laboratory has equipment to provide basic physic-chemical analyses in the lab and in the field and two fast computers with the required software to process natural

resource data (remote sensing, GIS, statistics and geostatistics, modelling software (crops, soil, and water).

Within ALMIRA, IAV is responsible for i) project coordination in Morocco, ii) co-management for three of the six workpackages (WP0, WP1 and WP5). It is responsible for investigations within the Tleta catchment, Morocco. IAV is involved in remote sensing of landscape surface properties (Task 1.2), development of a geospatial database (Task 1.4), identification of applicable innovations (Task 2.3), application of the Integrated Hydrological Processes Model (WP 3), and the synthesis of lessons learnt and the setting of recommendations (Task 4.4).

IAV subcontractor 1: ENFI, Salé, Morocco. ENFI is a Moroccan public institution, started in 1968 and educates high level decision makers on Forestry and Natural resources, at both the national and regional levels (Maghreb countries, Sahel countries, French-speaking African countries, and Arabic countries). It contributes also to the development of research and development strategies of the Forest Service. It is involved in many research and development programs dealing with terrestrial natural ecosystems, wetlands, coastal zones and how they are impacted by human activities or by natural phenomena. The ENFI Team has a competence on terrestrial natural ecosystems management, forestry science education and practice, livelihoods analysis, and erosion.

Within ALMIRA, ENFI is co-responsible of WP4. It is involved in i) the setting of economic scenario at regional level (Task 2.2), agro-socio-economic and environmental evaluation of landscape scenarii (Task 4.1 and 4.2), proposals for policy intervention strategies (Task 4.3), and the synthesis of lessons learnt and the setting of recommendations (Task 4.4).

IAV subcontractor 2: INRA, Rabat, Morocco. INRA is a public research institute. INRA has become a cornerstone for specialised scientific communities such as agronomy, animal production and health, soil and water management, plant breeding, etc. to develop innovations and know-how for the benefit of the society. INRA can offer practical answers to agricultural, water and environmental questions in a context of sustainable development.

Within ALMIRA, INRA is involved in the modelling of landscape functioning (Task 3.2).

5.2. QUALIFICATION DU COORDINATEUR DU PROJET / QUALIFICATION OF THE PROJECT COORDINATOR

Frederic Jacob received his PhD degree in remote sensing in 1999 and his HDR (French certification for research management) in 2005, both from Toulouse III University, France. He was a PhD student and a post-doc at INRA Avignon, France, from 1997 to 2000, a visiting scientist at USDA/ARS/HRSL, MD, USA, from 2001 to 2002, and a researcher lecturer at the Purpan Graduate School of Agriculture, Toulouse, France, from 2003 to 2006. He has been a research scientist at IRD since 2007, as a member of LISAH joint research unit.

Frederic Jacob has served as an associate editor for IEEE-GRSL (2011 JCR rank 7/22 in remote sensing) since 2004, as a project reviewer for funding agencies (FP7, CONICYT, European Space Agencies) since 2004, as a scientific committee member for French Space Agency MISTIGRI mission since 2009, and as a member of the IEEE-IGARSS Technical Program Committee since 2012. He has acted as a supervisor / advisor for two post-docs, five PhD students and ten MSc students. He has authored 45 first rank publications, including five book chapters, two review articles, one white book, and 37 publications in international peer reviewed journals (H-index is 12 in WoS, 14 in Scopus and 15 in Google Scholar).

Frederic Jacob has managed several projects since 2005, involving about 500k€. These projects have mainly focused on improving modelling tools for agricultural decision support in relation to environmental issues. Most of them have implied partnerships with countries from the Mediterranean southern rim, especially with Tunisia.

Frederic Jacob is posted at INRGREF Tunis for a two year period. He serves as the official representative of the LISAH Laboratory to the Tunisian research institutions, and as the AIRD correspondent for the Tunisian JASMIN team who is involved in ALMIRA.

5.3. QUALIFICATION, RÔLE ET IMPLICATION DES PARTICIPANTS / QUALIFICATION AND CONTRIBUTION OF EACH PARTNER

The following table presents the staff members who undertake the work. Annex document - Section 1 provides the resumes and thus informing about the partners skills.

Partenaire / partner	Nom / Name	Prénom / First name	Emploi actuel / Position	Discipline* / Field of research	Personne. mois** / PM	Rôle/Responsabilité dans le projet / Contribution to the project 4 lignes max
LISAH	Jacob	Frédéric	CR1	Vegetation functioning and remote sensing	16	Partner contact person Coordination project Contributor TK 3.1, 3.3 Co-management WP0 and WP5
	Lagacherie	Philippe	IR0	Digital soil mapping	8	Co-management WP1 Contributor TK 1.3, 1.4
	Gomez	Cécile	CR1	Soil remote sensing	8	Leader TK 1.2
	Ouerghemmi	Walid	PhD	Signal processing for remote sensing	4	Contributor TK 1.2
	Bailly	Jean-Stéphane	MCF	Geostatistics of landscape elements	4	Leader TK 1.3
	Chehata	Nesrine	CR1	Image processing for remote sensing	8	Contributor TK 1.2
	Biarnès	Anne	CR1	Spatialization of cropping systems	12	Leader TK 2.1 Contributor TK 2.3, 2.4
	Vinatier	Fabrice	CR2	Landscape modelling	8	Leader TK 2.4 Contributor TK 3.4
	Moussa	Roger	DR2	Hydrological modelling	12	Co-management WP3 Contributor TK 3.2, 3.4
	Fabre	Jean-Christophe	IE2	Software engineering for integrated modelling	4	Leader TK 3.1
	Rabotin	Mickaël	IE2	Geomatics	8	Contributor TK 1.2, TK 3.1
	Raclot	Damien	CR1	Erosion modelling	8	Leader TK 3.2 Contributor TK 3.1, 3.4

	Colin	François	MCF	Hydrological modelling	8	Leader TK 3.4 Contributor TK 3.1
	Planchon	Olivier	DR2	Erosion and photogrammetry	4	Contributor TK 3.2
	Prévot	Laurent	CR1	SVAT and vegetation modelling	4	Contributor TK 3.1, 3.3
	Montes	Carlo	PhD	SVAT modelling and remote sensing	8	Contributor TK 3.3
	Voltz	Marc	DR1	Hydrology	2	Contributor TK 4.4
	Le Bissonnais	Yves	DR1	Erosion	2	Contributor TK 4.4
	Lhomme	Jean-Paul	DR1	Crop production	2	Contributor TK 4.4
SYSTEM subcontractor for LISAH	Gary	Christian	DR2	Cropping systems Vegetation modelling	8	Contributor TK 2.3, 3.3, 4.1, 4.4
AGROCLIM	Huard	Frédéric	IR2	Climatology	8	Partner contact person Leader TK 1.1
COSTEL subcontractor for AGROCLIM	Quénol	Hervé	CR1	Climatology	4	Contributor TK 1.1
BRGM	Herivaux	Cécile	IR2	Agro-economy	3.6	Partner contact person Leader TK 2.2 Contributor TK 4.2, 4.3
	Rinaudo	Jean-Daniel	DR2	Agro-economy	4.92	Co-management WP4 Leader TK 4.2 Contributor TK 2.2, 4.3
IRMC	Gana	Alia	DR2 CNRS	Sociology/ economy Social systems of farm production	12	Partner contact person Co-management WP2 Leader TK 4.3 Contributor TK 2.1, 2.3
ENA subcontractor for IRMC	El Amrani	Mohamed	PROF	Agro-economy Social systems of farm production	12	Co-management WP2 Contributor TK 2.1, 2.3, 2.4, 4.1
SIRS	Sannier	Christophe	Head R & D	Spatial database	12	Leader TK 1.4
	SIRS engineer		IE1			Contributor TK 1.4
INAT	Masmoudi	Moncef	PROF	Vegetation modelling and crop production	8	Partner contact person Co-management WP3 Contributor TK 3.3
	Ben Mechlia	Netij	PROF	Vegetation modelling and crop production	4	Leader TK 4.4 Contributor TK 3.3
	Boudhina	Nissaf	PhD	Vegetation modelling and crop production	12	Contributor TK 3.3
INRGREF	Mekki	Insaf	CR1	Remote sensing and hydrology	16	Partner contact person Co-management WP0 and WP5 Contributor TK 1.2, 1.4, 3.2
	Zitouna	Rim	CR2	SVAT and vegetation modelling	8	Leader TK 3.3 Contributor TK 3.4
	Zairi	Abdelaziz	DR1	Blue water use	2	Contributor TK 4.4
	Bahri	Haithem	CR1	Cropping systems	8	Leader TK 2.3 Contributor TK 2.1, 2.4
	Amami	Hacib	CR2	Agro-economy	4	Leader TK 4.1 Contributor TK 2.2, 4.2, 4.3
IAV	Chikhaoui	Mohamed	MCF	Remote sensing and hydrology	16	Partner contact person Co-management WP0, WP1 Contributor TK 1.2, 1.4, 3.2
	Naimi	Mustapha	PROF	Agronomy	8	Co-management WP5 Contributor TK 2.3, 4.4

	Bouaziz	Ahmed	PROF	Agronomy	4	Contributor TK 2.3
ENFI subcontractor for IAV	Sabir	Mohamed	PROF	Agro-economy	4	Co-management WP4 Contributor TK 4.3, 4.4
	Khattabi	Abdelattif	PROF	Agro-economy	4	Contributor TK 2.2, 4.1, 4.2
INRA subcontractor for IAV	Moussadek	Rached	CR2	Soil tillage and erosion	4	Contributor TK 3.2

Table 5: partner staff involved in ALMIRA. TK means Task. WP means workpackage. Position nomenclature is the following. DR1 means first class research director, PROF means professor, DR2 means second class research director, CR1 means first class research scientist, MCF means assistant professor, CR2 means second class research scientist, IR0 means exceptional class research engineer, IR1 means first class research engineer, IR2 means second class research engineer, IE1 means first class engineer, IE2 means second class engineer, PhD means doctoral student.

6. JUSTIFICATION SCIENTIFIQUE DES MOYENS DEMANDES / SCIENTIFIC JUSTIFICATION OF REQUESTED RESSOURCES

Following recommendations from the ANR contact point, and in accordance with expected AIRD funding, we assign budget requests to non-French partners. We provide hereafter the overview of requested grants for ALMIRA (Table 6). In order to better estimate the total project cost, we also provide the cost of partner staff implications (Table 7), and the financial supports from the ALMIRA partners (Table 8).

For temporary staff, post-doc and engineer profiles are detailed in the Annex document – Section 2 and 3. In order to scientifically strengthen partner countries, the temporary staffs to be supervised within Tunisian and Moroccan institutes are hired by promoting the returns in native countries for young scientists currently working in Europe, North America or Asia.

Table 6: Grant request

Partner	Detailed expenses	Total	Without overhead
PARTNER 1: LISAH MONTPELLIER		277160,00	266500,00
Non permanent staff granted by ANR - 36 months project manager (part-time 75%) located with project coordinator in Tunisia ==> 36000€ - 6 months of software engineer for design and implementation of integrated modeling with OpenFLUID framework (TK 3.1). Supervision by LISAH. Located @ LISAH ==> 25000€ - 18 months of post-doc for implementing IHPM (TK 3.2 & 3.3) and establishing indicators of landscape services in relation to evolution scenarii (TK 3.4). Supervision by LISAH. Located @ LISAH ==> 75000€ - 60 MSc.Months (MM) ==> 60*500€ = 30000€ Supervision by LISAH / BRGM / IRMC. Located @ LISAH -> 6MM for spatializing geometry of ditch networks (TK 1.3); -> 18 MM for data collection (interviews of farmer, stakeholders and institutionals) and analysis to diagnosis current land use (TK 2.1); -> 18 MM for data collection (interviews of farmer, stakeholders) for characterizing innovative practices that are acceptables by actors (TK 2.3); -> 8 MM for numerical setting of landscape scenarii (TK 2.4); -> 12 MM for economic impact of changes in mosaics on farming system (TK 4.1)	166000,00		
Subcontracting - Web site ==> 4000€	7000,00		

- UMR SYSTEM MONTPELLIER: expertise on modeling : visiting periods for modeling issues in TK 3.2 and 3.3 ==> 3000€			
Missions - Field missions for data collection: 1000 € to collect data for digital soil mapping validation (TK 1.2); 14000 € for actor interviews (TK 2.1, 2.3, 4.1); 15000 € for collecting reference data (hydrology and photogrammetry) devoted to validation of biophysical model (TK 3.2); - Visiting periods (coordination) in Morocco and Tunisia ==> 6000€ - Visiting periods (supervision) in Morocco and Tunisia for TK 1.2, 1.3, 2.1, 3.2, 3.3, 3.4 ==> 5000€ - 2.5 days kickoff meeting (travels, 3 hotel nights, conference room) ==> 15000€ Closure meeting to be funded by other calls for proposals (AIRD, LABEX AGRO that supports the ALMIRA proposal - see support letter in annex document - Section 4) - International congresses for 9 task leaders ==> 9*1500€	69500,00		
Other external costs - Equipment for soft monitoring of water flows by limnology (TK 3.2) ==> 10000€ - Computer facilities (3 cluster nodes for simulation of landscape functioning) ==> 10000€ - Tools for result disseminations: articles in professional magazines and leaflets in participative workshops ==> 4000€	24000,00		
Overheads 4%	10660,00		
PARTNER 2: AGROCLIM AVIGNON		18720,00	18000,00
Subcontracting - LETG / COSTEL --> Field missions to install and maintain automatic weather stations ==> 1000€ --> Visiting periods in Morocco and France for scientific exchanges ==> 2000€	3000,00		
Missions - Visiting periods in Morocco and Tunisia for scientific exchanges ==> 2000€ - Field missions in Peyne, Lebna, Tleta for installing and maintaining automatic weathre stations ==> 3000€	5000,00		
Other external costs ==> 10000€ - Automatic weather stations : datalogger + rain gauge (in some case + humidity and temperature sensor + radiation sensor), to be setup on the watershed. - Portable Personal Computer to program the datalogger and download data. - Purchase of Radar Data from Meteo-France.	10000,00		
Overheads 4%	720,00		
PARTNER 3: BRGM MONTPELLLIER		76433,79	51853,50
3.6 researcher.month for TK 2.2 + methodological development + inter-watershed harmonization + publication 4.92 researcher.month for TK 4.2 & 4.3+ WP4 coordination + methodological development + inter-watershed harmonization + publication	69181,00		
Mission: **WP2** : 3 x 1 week missions in Morocco (1500€/mission) for Interviews and scenario workshop + 500 € for field trip in Peyne case study. **WP 4** : 3 x 1 week missions in Morocco (1500€/mission) for Interviews and scenario workshop + 500 € for field trip in Peyne case study + Project meetings : 2 * 500 € + International congresses for 2 task leaders (1500€ / congress)	14000,00		
External costs: - 12 MSc.Months (1250€/month for salary, taxes and Accommodation subsidies) for TK 4.2 & 4.3 - Consumables:Purchase of books, software or computer accessories - organization of workshops with farmers / stakeholders in the Tleta case study	16250,00		
Internal costs: computers for MSc students	4276,00		
Overheads: computed following ANR recommendations (agreement with BRGM) = 68% for personal cost, 40% for internal expenses, 7% for external costs (travel & subsistence)	49160,58		

PARTNER 4: IRMC TUNIS		30160,00	29000,00
Non permanent staff granted by ANR - 12 Post-Doc.Months to characterize current land use / practices and forecast acceptable changes (TK 2.1; TK 2.3). Supervision by IRMC and ENA. Located @ IRMC Tunis	12000,00		
ENA subcontracting - 12 MM for data collection (interviews of farmer, stakeholdersand institutionals) and analysis to diagnosis current land use (TK 2.1) and for data collection (interviews of farmer, stakeholders) for characterizing innovative practices that are acceptables by actors (TK 2.3); Supervision by ENA / IRMC. Located @ ENA ==> 3000€ - Visiting periods for supervising in Morocco @ IAV and Tunisia @ IRMC ==> 3000€ - Field missions for TK 2.1; 2.3 =1500€ - International congresses for 1 task leader ==> 1500€	9000,00		
Missions - Field missions for actor interviews in TK 2.1; 2.2; 2.3 ==> 5000€ - Visiting periods in Morocco and France ==> 1500€ - International congresses for 1 task leader ==> 1500€	8000,00		
Overheads 4%	1160,00		
PARTNER 5: SIRS LILLE		43470,00	36450,00
12 engineer.month for TK 1.4	78000,00		
Visiting periods	3000,00		
Overheads 20%	15600,00		
PARTNER 6: INAT TUNIS		28080,00	27000,00
Non permanent staff granted by ANR - 18 post-doc.months for IHPM implementation (TK 3.3). Supervision by INAT / LISAH – located @ INAT ==> 18000€ - 12 MSc.Months for vegetation functioning. Supervision by INAT / LISAH. Located @ INAT ==> 3000€	21000,00		
Missions - Field missions for experiment on vegetation functioning (TK 3.3) ==> 3000€ - International congresses for 2 task leaders ==> 3000€	6000,00		
Overheads 4%	1080,00		
PARTNER 7: INRGREF TUNIS		41600,00	40000,00
Non permanent staff granted by ANR - 12 months Engineer for SWAT implementation and simulation analysis (TK 3.2; 3.3; 3.4). Supervision by INRGREF / LISAH – located @ INRGREF ==> 12000€ - 36 MSc.Months (MM) ==> 36*250 = 9000€ 9 MM for remote sensing of land use change (TK 1.2); 9 MM for setting economic scenarii at regional scale (TK 2.2); 9 MM for economical impact of changes in mosaics on farming system (TK 4.1) 9 MM for economical impact of changes in mosaics on environmental services (TK 4.2) Supervision by INRGREF / LISAH / IRMC. Located @ INRGREF	21000,00		
Missions - Field missions for actor interviews in TK 2.2; 4.1, 4.2 ==> 10000€ - Visiting periods (coordination) in France and Morocco ==> 6000€ - International congresses for 2 task leaders ==> 3000€	19000,00		
Overheads 4%	1600,00		
PARTNER 8: IAV RABAT		83980,00	80750,00
Non permanent staff granted by ANR - 12 months Engineer for SWAT implementation and simulation analysis (TK 3.2; 3.3; 3.4) Supervision by IAV / LISAH – located @ IAV ==> 12000€ - 18 months Post-doc for high resolution digital soil mapping of soil properties	30000,00		

by synergistic use of multispectral / hyperspectral remote sensing and soil legacy data (TK 1.2 & 1.3). Supervision by IAV / LISAH – Located @ IAV (8 months) and LISAH (10 months) ==> 18000€			
Subcontracting - Soil analysis (200 samplings as legacy for digital soil mapping in Morocco) ==> 5000€ - ENFI SALE 9 months MSc for expert interview and literature compilation (TK 4.4). Supervision by ENFI. Located @ ENFI ==> 2250€ Visiting periods in France and Tunisia ==> 4000€ Field missions for expert interview (TK 4.4) ==> 1500€ International congresses for 1 task leader ==> 1500€ - INRA RABAT Field mission for experiment on infiltration and erosion impacted by new agricultural practices (TK 3.3) ==> 7500€ International congresses for 1 task leader ==> 1500€	23250,00		
Missions - Visiting periods @ LISAH for Post-Doc (10 months) ==> 19000€ - Field missions @ for calibration / validation of hyper-spectral / multispectral remote sensing (TK 1.2) ==> 1000€ - Visiting periods (coordination) in France and Tunisia ==> 6000€ - International congresses for 1 task leader ==> 1500 €	27500,00		
Overheads 4%	3230,00		
TOTAL	599603,79	599603,79	549553,50

Table 7: costs of partner staff implications

PARTNER	SCIENTIST SURNAME AND NAME	RESEARCH INSTITUTE	GRADE	PERSON MONTH	MONTH COST	COST/ PERSON	COST/ LAB	LAB PERSON MONTH
1: LISAH	FREDERIC JACOB	IRD	CR1	16	6902	110432	878512	122
	PHILIPPE LAGACHERIE	INRA	IR0	8	9582	76656		
	CECILE GOMEZ	IRD	CR1	8	6902	55216		
	JEAN-STEPHANE BAILLY	AGRO-PARISTECH	MCF	4	6902	27608		
	NESRINE CHEHATA	IRD	CR1	8	6902	55216		
	ANNE BIARNES	IRD	CR1	12	6902	82824		
	FABRICE VINATIER	INRA	CR2	8	5143	41144		
	ROGER MOUSSA	INRA	DR2	8	8468	67744		
	JEAN-CHRISTOPHE FABRE	INRA	IE2	4	5078	20312		
	MICHAEL RABOTIN	IRD	IE2	8	5078	40624		
	DAMIEN RACLOT	IRD	CR1	8	6902	55216		
	FRANCOIS COLIN	MONTPELLIER SUPAGRO	MCF	8	6902	55216		
	OLIVIER PLANCHON	IRD	DR2	4	8468	33872		
	LAURENT PREVOT	INRA	CR1	4	6902	27608		
	MARC VOLTZ	INRA	DR1	2	11036	22072		
	YVES LE BISSONNAIS	INRA	DR2	2	8468	16936		
	JEAN-PAUL LHOMME	IRD	DR1	2	11036	22072		
	SUBCONTRACTOR @ SYSTEM CHRISTIAN GARY	INRA	DR2	8	8468	67744		
2: AGROCLIM	FREDERIC HUARD	INRA	IR2	8	6119	48952	76560	12
	SUBCONTRACTOR @ COSTEL	CNRS	CR1	4	6902	27608		

	HERVE QUENOL							
3: BRGM	CECILE HERIVAUX	BRGM	CR1	3,6	7890	14202	14202	3,6
	JEAN-DANIEL RINAUDO	BRGM	ING	4,92	8287	20386,02		
4: IRMC	ALIA GANA	CNRS	DR2	12	8468	101616	167832	24
	SUBCONTRACTOR @ ENA MOHAMED EL AMRANI	ENA	PROF 1	12	5518	66216		
5: SIRS	CHRISTOPHE SANNIER	SIRS	R&D HEAD	12	6500	42900	42900	12
6: INAT	MONCEF MASMOUDI	INAT	PROF 1	8	5518	44144	66216	12
	NETIJ BEN MECHLIA	INAT	PROF 1	4	5518	22072		
7: INRGREF	INSAF MEKKI	INRGREF	CR1	16	3451	55216	121200	38
	RIM ZITOUNA	INRGREF	CR2	8	2571,5	20572		
	ABDELAZIZ ZAIRI	INRGREF	DR1	2	5518	11036		
	HACIB AMAMI	INRGREF	CR2	8	2571,5	20572		
	HAITHEM BAHRI	INRGREF	CR1	4	3451	13804		
8: IAV	MOHAMED CHIKHAOUI	IAV	MCF	16	3451	55216	179380	40
	MUSTAPHA NAIMI	IAV	PROF 1	8	5518	44144		
	BOUAZIZ AHMED	IAV	PROF 1	4	5518	22072		
	SUBCONTRACTOR @ INRA RACHID MOUSSADEK	INRA	CR1	4	3451	13804		
	SUBCONTRACTOR @ ENFI MOHAMED SABIR	ENFI	PROF 1	4	5518	22072		
	SUBCONTRACTOR @ ENFI ABDELATIF KHATTABI	ENFI	PROF 1	4	5518	22072		

Table 8: partner owned grants for supporting ALMIRA

PARTNER 1: LISAH GRANTS IN K€	3020
HUMAN RESOURCES – 24 MONTH PHD STUDENT (CARLO MONTES 2012-2014) AND 36 MONTH AIRD PHD STUDENT (NESRINE INOUBLI 2013-2015)	100
ENVIRONMENTAL RESEARCH OBSERVATORY – ORE CONTINUOUS OBSERVATIONS SYSTEM (HYDROLOGY, EROSION, METEO, AGRONOMY)	800
PUNCTUAL OBSERVATION SYSTEMS (ENERGY AND WATER BALANCE STATIONS, PHOTOGRAMMETRY AND GROUND BASED REMOTE SENSING, AGRONOMY, PEDOLOGY)	400
DATABASE OF CONTINUOUS OBSERVATIONS WITH THE AFOREMENTIONED ORE CONTINUOUS OBSERVATIONS SYSTEM	700
DATABASE OF PUNCTUAL OBSERVATIONS WITH THE AFOREMENTIONED PUNCTUAL OBSERVATION SYSTEMS	300
OPENFLUID MODELING PLATFORM DATA PROCESSING CODES FOR REMOTE SENSING, PHOTOGRAMMETRY, EDDY-COVARIANCE AND GEOSTATISTICS	500
20 NODE CLUSTER FOR DATA PROCESSING AND SIMULATIONS WITH THE OPENFLUID MODELING PLATFORM	150
ONGOING PROJECTS FOR MISSIONS, OPERATING AND FURNISHING (RTRA 2009-2013, MISTRALS 2011-2013, MISTRALS 2012-2014)	70
PARTNER 6: INAT GRANTS IN K€	105
HUMAN RESOURCES – 36 MONTH AIRD PHD STUDENTS (NISSAF BOUDHINA 2013-2015)	50
DATABASE OF PUNCTUAL OBSERVATIONS (WATER BUDGET, PEDOLOGY, AGRONOMY)	20
FAO – AQUACROP MODEL	10
ONGOING PROJECTS FOR MISSIONS, OPERATING AND FURNISHING (RTRA 2009-2013, MISTRALS 2011-2013, MISTRALS 2012-2014, AIRD / JEAI 2012-2014)	25
PARTNER 7: INRGREF GRANTS IN K€	110
HUMAN RESOURCES – 36 MONTH AIRD PHD STUDENTS (REQUESTED FOR ISLEM HAJJI 2014-2016)	50

DATABASE OF PUNCTUAL OBSERVATIONS (ENERGY BUDGET, WATER BUDGET, REMOTE SENSING LAND USE, PEDOLOGY)	20
ONGOING PROJECTS FOR MISSIONS, OPERATING AND FURNISHING (RTRA 2009-2013, MISTRALS 2011-2013, MISTRALS 2012-2014, AIRD / JEAI 2012-2014)	25
DATA PROCESSING CODES (EDDY-COVARIANCE, GEOSTATISTICS, GIS)	15
PARTNER 8: IAV GRANTS IN K€	370
Human ressources: 36 month PhD student (Abderrahim El Boukhari 2013-2015) and 2 MSc students	50
Database of soil physiccochemical properties, soil surface characteristics and soil hydrodynamic properties	30
ASTER / LANDSAT / IKONOS satellite imageries	35
Digital elevation model from remote sensing data and topographic maps	20
Multitemporal land use maps	10
Hydrological records and bathymetry data	40
Missions on existing projects (MCC 2009-2013, Fertility Map 2010-2014, AIRD/JEAI 2012-2014)	30
GIS and remote sensing data processing Softwares	50
High performance computer	10
Direct drilling machine (subcontractor INRA)	10
Rainfall simulator (subcontractor INRA)	15
Automatic weather station (subcontractor INRA)	10
Missions on existing projects (MCC 2009-2013, Fertility Map 2010-2014, AIRD/JEAI 2012-2014) (subcontractor INRA)	30
Lanscape characterisation database (subcontractor ENFI)	10
Missions on existing projects (MCC 2009-2013, Fertility Map 2010-2014, AIRD/JEAI 2012-2014) (subcontractor ENFI)	20

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ALMIRA – ANNEX DOCUMENT

SECTION 1: BIOGRAPHIES AND RESUMES

SECTION 2: POSTDOCTORAL PROFILES

SECTION 3: ENGINEER PROFILES

SECTION 4: SUPPORT LETTER FROM FUNDING STRUCTURES.

SECTION 1: BIOGRAPHIES AND RESUMES: PROJECT COORDINATOR - FRANCE

Frederic Jacob received his PhD degree in remote sensing in 1999 and his HDR (French certification for research management) in 2005, both from Toulouse III University, France. He was a PhD student and a post-doc at INRA Avignon, France, from 1997 to 2000, a visiting scientist at USDA/ARS/HRSL, MD, USA, from 2001 to 2002, and a researcher lecturer at the Purpan Graduate School of Agriculture, Toulouse, France, from 2003 to 2006. He has been a research scientist at IRD since 2007, as a member of LISAH joint research unit.

Frederic Jacob has served as an associate editor for IEEE-GRSL (2011 JCR rank 7/22 in remote sensing) since 2004, as a project reviewer for funding agencies (FP7, CONICYT, European Space Agencies) since 2004, as a scientific committee member for French Space Agency MISTIGRI mission since 2009, and as a member of the IEEE-IGARSS Technical Program Committee since 2012. He has acted as a supervisor / advisor for two post-docs, five PhD students and ten MSc students. He has authored 45 first rank publications, including five book chapters, two review articles, one white book, and 37 publications in international peer reviewed journals (H-index is 12 in WoS, 14 in Scopus and 15 in Google Scholar).

Frederic Jacob has managed several projects since 2005, involving about 500k€. These projects have mainly focused on improving modelling tools for agricultural decision support in relation to environmental issues. Most of them have implied partnerships with countries from the Mediterranean southern rim, especially with Tunisia.

Frederic Jacob is posted at INRGREF Tunis for a two year period. He serves as the official representative of the LISAH Laboratory to the Tunisian research institutions, and as the AIRD correspondent for the Tunisian JASMIN team who is involved in ALMIRA.

Publications relevant to the project

R. Zitouna-Chebbi, L. Prévot, F. Jacob, R. Mougou, M. Voltz, 2012. Assessing the consistency of eddy covariance measurements under conditions of sloping topography within a hilly agricultural catchment. Agricultural and Forest Meteorology, 164, 123-135.

J.P. Lhomme, C. Montes, F. Jacob, L. Prévot, 2012. Evaporation from Heterogeneous and Sparse Canopies: On the Formulations Related to Multi-Source Representations. Boundary-Layer Meteorology, 144, 243-262.

M. Galleguillos, F. Jacob, L. Prévot, A. French, P. Lagacherie, 2011. Comparison of two temperature differencing methods to estimate daily evapotranspiration over a Mediterranean vineyard watershed from ASTER data. Remote Sensing of Environment 115 (6), 1326–1340.

D. Courault, F. Jacob, et al., 2009. Influence of agricultural practices on micrometerological spatial variations at local and regional scales. International Journal of Remote Sensing, 30, 1183-1205.

F. Jacob, T. Schmugge, et al., 2008. Modeling and inversion in thermal infrared remote sensing over vegetated land surfaces. In: Advances in Land Remote Sensing: System, Modeling, Inversion and Application (S. Liang Ed.), 245-292, Springer.

SECTION 1: BIOGRAPHIES AND RESUMES: DEPUTY COORDINATOR – TUNISIA

Insaf MEKKI
CR INRGREF
Date of birth: 01/04/72
Place of Birth: Siliana (Tunisia)
Education
2003 : Ph.D thesis in water sciences in continental environmental studies, University of Montpellier II. Ph.D dissertation: Analysis and modelling of water flows variability at the scale of a cultivated watershed of a Mediterranean semi-arid small hill reservoir (Oued Kamech, Cap Bon, Tunisia).
2000: Professionnel Master "Application of remote sensing and GIS techniques for Oued Lebna catchment natural resources evaluation". IAO, Florence, Italy.
1995: Agronomic Engineer, National Agronomic Institute of Tunisia.
Research experience
- Research fellow, department of water and rural engineering, on land and water resources management at the National Research Institute for Rural Engineering, Water, and Forestry (INRGREF).
- Research fields: agronomy, hydrology, soil science, water and land management.
- 6 papers published in international journals, 11 communications in symposiums proceedings.
- Co-supervision of 2 Ph.D students and 4 MSc.
Experience in international research projects
-2012-2012: "JEAI JASMIN" is an AIRD grant for the establishment of a young research group: coordination.
- 2011-2014: "EAU4FOOD: Sustainable water resources management (WRM) and soil fertility conservation for food production in Africa-SICA (Africa)". Projet FP7. KBBE-2010.1.-2-03. Coordinator: Dr. Jochen Froebrich, (ALTERRA), Netherlands.
- 2004-2009: "SIRMA" is a program of research on water saving in irrigated systems in North Africa. The project is funded by the French Ministry of Foreign affairs. Coordinator: Dr. Sami Bouarfa, AFEID, France.
- 2000-2003: "Hydromed" is a program of research on hill reservoirs in the semi-arid zone of the Mediterranean periphery. It was sustained by the European Commission in the framework of the INCO-DC. Coordinator: Dr. Jean Albergel, IRD, Tunisia.
Experience in national research projects
- 1998- 1999: « On-Farm Water Husbandry in WANA » Grants from ICARDA.
National Coordinator: Prof. Netij Ben Mechlia, INAT, Tunisia.
- 1999-2000: « Apple and Peach trees water requirements and deficit irrigation». PNM P98EAU06 grants from Tunisian Research Secretariat. Coordinator: Prof. Netij Ben Mechlia, INAT, Tunisia.
Recent publications relevant to the project
-Mekki, I., Jacob, F., Marlet, S., Ghazouani, W. Management of groundwater resources in relation to oases sustainability – the case of the Nefzawa region in Tunisia. The Journal of Environmental Management (accepted, in revision).
-Mekki, I., J. Albergel, N. Ben Mechlia, and M. Voltz. 2006. Assessment of overland flow variation and blue water production in a farmed semi-arid water harvesting catchment. Physics and Chemistry of the Earth 31 pp: 1048-1061.
-Ghazouani, W., Marlet, S., Mekki, I. and A. Vidal. 2009. Farmers' perceptions and engineering approach in the modernization of a community-managed irrigation scheme. A case study from an oasis of the Nefzawa (South of Tunisia). Irrigation and Drainage 58 pp: S285-S296.
- Ghazouani, W., Marlet, S., Mekki, I., Harrington, L.W., Vidal, A. 2011. Farmers' practices and community management of irrigation: Why do they not match in Fatnassa oasis. Irrigation and Drainage.doi: 10.1002/ird.626.

Mohamed CHIKHAOUI DERNE
IAV Hassan II PO. Box. 6202, Madinat Al Irfane, Rabat, Morocco
Date of birth : 13/09/74 Tel : +212 (0) 6 74 17 32 37
Place of Birth : Oujda (Morocco) mchikhaoui@gmail.com

PhD thesis and HDR

- 2005 : Ph.D thesis in Remote Sensing, Sherbrooke University, Canada.
- 1998 : MSc in Soil Physics, Institut Agronomique et Vétérinaire Hassan II, Rabat, Morocco.
- 1996 : BSc in Agricultural Engineering, Institut Agronomique et Vétérinaire Hassan II, Rabat, Morocco

Research experience

- Research topics : Soil degradation Mapping; hydrology and water quality modelling, remote sensing environmental assessment
- 6 papers published in international journals.
- Supervision of 5 Ph D students and 22 MSc.
- Reviewer for Remote Sensing of Environment, Journal of Environmental Management, Télédétection journal and Cahiers d'Agricultures journal.

Experience in national and international project

- National research projects
  - 2000-2003 "Mapping clay fraction of the surface horizon of soils in the Rif region of Morocco" (funded by NATO). Member of the management.
  - 2003-2005 "Lithological characterization in the Moroccan high atlas with ASTER data and ground spectra" (funded by Natural Sciences and Engineering Research Council of Canada" Member of the management
  - 2010-now "Soil erosion modelling by using Remote sensing and GIS"(funded by MCC project) Co-management.
- International research projects
  - 2008-2010 "Increasing ecosystem resilience in a future climate through an improved understanding of agricultural pollution mechanisms" (funded by Natural Sciences and Engineering Research Council of Canada) : coordination
  - 2008-2010 "Increasing ecosystem resilience in a future climate through an improved understanding of agricultural pollution mechanisms" (funded by Ouranos) : coordination.
  - 2006-2008 "New policy and decision making tools for water quality management" (funded by Max Bell Foundation)

Recent publications relevant to the project

Chikhaoui, M., Bonn, F. et Merzouk, A. (2004). Cartographie de la fraction argileuse du sol dans le Rif marocain à l'aide du capteur ASTER et de l'analyse géostatistique. Revue Internationale de Géomatique**,** volume 14, n°3-4/2004, p.359-377.

Chikhaoui, M., Bonn, F., Bokoye, A. I. and Merzouk, A. (2005). A spectral index for land degradation mapping using ASTER data: application to a semi arid Mediterranean catchment. *International Journal of Applied Earth Observation and Geoinformation*.

Chikhaoui, M., Bonn, F., Bokoye, A. I. et Merzouk, A. (2006). Comparaison des capteurs ASTER et ETM+ pour la cartographie de la dégradation des sols à l'aide de l'indice LDI. *Journal canadien de télédétection*. vol. 32, p. 74-83.

Chikhaoui, M., Bonn, F., Merzouk, A., Lacaze, B. et Mejjati, M. (2007) Étude de la dégradation des sols par l'approche SAM et les indices spectraux à partir des données ASTER. *Revue Télédétection*, vol. 1234, p. 349-363.

Chikhaoui, M., Merzouk, A., Lacaze, B. et Madramootoo, C.A. (2010) Étude de la dégradation des sols en milieu semi-aride à l'aide de l'approche neuronale de données multisources. Revue Télédétection, vol. 9, p. 139-150.

El Bahri M., Haboudane, D., Sabir, M., Chilasse, L., et Chikhaoui. M. (2012) Caractérisation de l'état de dégradation des sols du bassin versant de Zagota (Maroc) à l'aide d'indicateurs spectraux. Revue Marocaines des Sc. Agronomiques et Vétérinaires, vol. 1, 59-62.

SECTION 1: BIOGRAPHIES AND RESUMES: WORKPACKAGE 1 CO-MANAGER

Philippe Lagacherie is Senior Research Scientist at the Laboratory for studies of interaction between soil agrosystems and hydrosystems (LISAH), a joint research unit from INRA (National Institute of Agricultural Research), IRD (the French Research Institute for Development) and SupAgro (International Centre of Agronomical sciences teaching) located in Montpellier (France).

He is the leader of the research team "spatial organization and functioning of the cultivated landscapes". He trained as an Agronomist and completed his PhD in soil science in 1992. He obtained his senior scientist degree (HDR) from Montpellier 2 University in 2002 for his researches on digital soil mapping methods.

Dr Philippe Lagacherie has been involved since the late 1980's in research dealing with Digital Soil Mapping. He developed several DSM methods that associated soil surveyor knowledge, GIS, geostatistics, and fuzzy logic.

He organised the first international workshop on Digital Soil mapping in Montpellier (2004) and is the co-editor of the first book on Digital Soil Mapping published in 2006. He has been nominated in the editorial board of Geoderma and of International Journal of Applied Earth Observation and Geoinformation.

Dr Philippe Lagacherie has also conducted since 1997 three research projects for evaluating the changes of soil properties caused by tillage practices and their hydrological impacts.

Publications relevant to the project

Bailly, J. S., Levavasseur, F., Lagacherie, P., 2011. A spatial stochastic algorithm to reconstruct artificial drainage networks from incomplete network delineations. International Journal of Applied Earth Observation and Geoinformation, 13(6), 853–862.

Ciampalini, R., Lagacherie, P., Gomez, C., Grünberger, O., Hamrouni M.H., Mekki, I., Richard, A., 2012. Detecting, correcting and interpreting the biases of measured soil profile data: A case study in the Cap Bon Region (Tunisia). Accepted in Geoderma.

Gomez, C., Lagacherie, P., Coulouma, G., 2012. Regional predictions of eight common soil properties and their spatial structures from hyperspectral Vis–NIR data. Geoderma, 189-190, 176–185.

Lagacherie, P., McBratney, A.B., Voltz., M., 2007 Digital Soil Mapping :an introductory perspective. Developments in Soil Science, vol. 31. Elsevier Amsterdam 400 pages Amsterdam, Elsevier.

Lagacherie, P., Bailly, J. S., Monestiez, P., Gomez, C., 2012. Using scattered hyperspectral imagery data to map the soil properties of a region. European Journal of Soil Science, 63(1).

SECTION 1: BIOGRAPHIES AND RESUMES: WORKPACKAGE 2 CO-MANAGER

Alia GANA is research professor at the CNRS and member of the Research Institute of Contemporary Maghreb (IRMC) in Tunis. Holding a PhD in rural and environmental sociology (Cornell University), she has done extensive research on issues such as social systems of farm production, agricultural policies, rural and farm livelihoods, governance of natural resources. Her empirical work covers a variety of rural and farm communities in the Mediterranean region (France, Spain, Morocco, Tunisia, Algeria and Egypt) and is mainly carried out within the framework of international and multidisciplinary teams (social sciences and biophysical sciences). Her professional career has included work at the Rural Economy Department of INRA Tunisia, at the Department of rural and environmental sociology, Cornell University, and at the CNRS research unit LADYSS.

Her most recent research activities have taken place in the framework of the following projects: "Biophysical and socioeconomic approach of water management in the Cap Bon region, Tunisia (Mistrals program)", ANR PATERMED (Patrimoines et terroirs méditerranéens), coordination of the project Water crises and perception of environmental risks related to farm irrigation in the Mediterranean(Algeria, Spain, France, Morocco, Portugal, Tunisia), coordination of the research Women's cooperatives and the sustainable management of Argan tree production in Morocco(CNRS, EU), coordination of the project Gender and water management in the Maghreb countries"(Algeria, Morocco, Tunisia).

From 2006 to 2009, she has been member of the expert Panel in charge of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD). In 2010, she participated in the assessment of ICARDA's Water and Land Research Program. She also conducted a research on water user's associations in the framework of the evaluation study of the Tunisian Investment Program in the Water Sector (IPWS). She is currently involved in a research program of the Tunisian Observatory of the Democratic Transition (OTTD), where she looks at farmers' mobilizations and forms of collective action. She is involved in several international research networks devoted to the analysis of current transformation of agri-food systems. She is member of the executive board of the research committee on the sociology of food and agriculture (RC40, International Sociological Association) and member of the scientific committee of Agropolis foundation.

Selected publications:

Gana A. 2012. Poverty Alleviation through Microcredit: The Impact of the Oued Sbaihya Project on The Sustainable Management of Natural Resources and Rural Women's Empowerment in Tunisia,Journal of Law and Public Policy Volume 22, Issue 3.

Gana A. 2012. The Rural and Agricultural Roots of the Tunisian Revolution: When Food Security Matters, International Journal of Sociology of Agriculture & Food, Vol. 19, No. 2, pp. 201–213

Gana A. 2011. "Perception of Risks and Socio-Institutional Changes in the Management of Water Resources: A Comparative Approach of Local Dynamics in Four Mediterranean Countries", in Water Policy and Law in the Mediterranean. An Evolving Nexus, Publications of the University of Novi Sad, UNESCO IHP-PCCP, 18-41.

Latiri K., Gana A., Shideed K. 2009. "Historical and current perspectives of agricultural knowledge, science and technology in Central and West Asia and North Africa", in Agriculture at the crossroads, IAASTD, Volume 1, Island Press, Washington, p. 27-82.

Gana A., M. Streith. 2008. Restructurations agricoles au Sud et à l'Est, Autrepart, A. Colin, IRD. 271p.

Mohamed EL AMRANI, enseignant-chercheur. Ecole Nationale d'Agriculture de Meknès, Maroc.

Pr Mohamed El Amrani, de profil agro-socio-économiste, est né le 24 juin 1966 à Larache au Maroc. Il fut initialement diplômé en tant qu'ingénieur agronome de l'ENA de Meknès spécialisé en sciences de la vulgarisation et développement en 1992, il obtint un doctorat en sciences agronomiques et ingénierie biologique option économie et sociologie rurale à la Faculté Universitaire des Sciences Agronomiques de Gembloux, Belgique en 2001.

Pr Mohamed EL AMRANI est enseignant-chercheur à l'Ecole Nationale d'Agriculture de Meknès au Maroc depuis 1992. Il assure la fonction de chef du département d'ingénierie du développement et coordonateur pédagogique de la filière ingénierie du développement de l'ENA depuis 2008. Ses principales qualifications se rapportent aux études et analyses diagnostic agro-socio-économiques et la maitrise des méthodes et outils participatifs, la conception des outils d'enquêtes et les méthodes d'analyses des données socio-économiques.

Il a coordonné plusieurs projets de recherche se rapportant au développement durable et la gestion des ressources naturelles principalement la gestion sociale et institutionnelle de l'eau d'irrigation à l'échelle nationale et internationale notamment dans le cadre de la coopération Maroc/Andalousie et Maroc/Portugal. Il fut chercheur associé au LADYSS du CNRS, Paris Nanterre, de 2004 à 2009 sur des programmes de recherche liés à la crise hydraulique, au risque et à l'inégalité en méditerranée.

Il a aussi travaillé en tant que consultant pour de nombreux bureaux d'études sur les aspects agro-socio-économiques et pour la FAO au Maroc et en Tunisie sur les questions liées à la gestion et l'économie de l'eau d'irrigation entre 2007 et 2010.

Quelques publications en relation avec la problématique du projet :

- EL AMRANI et al. 2012. "Le savoir écologique de deux populations habitant l'arganeraie (Essaouira)". in revue Secheresse, Volume 23, Numero 2 P67-77.

- Faysse N. et El AMRANI 2012. The formulation and implementation of policies to face groundwater overuse in Morocco: which supporting coalitions?. Co-auteur de l'article. In Irrigation and drainage Revue. Published online in Wiley Online Library (wileyonlinelibrary.com)

- Gana A. et EL AMRANI 2006. Crise hydraulique au Maghreb : raréfaction de la ressource ou problèmes de gestion ? **Article publié dans la revue Géocarrefour sur « LA PENURIE D'EAU (2) : DONNEE NATURELLE OU QUESTION SOCIALE ? » P37-50. Volume 81 N°1.**

- Gana A. et EL AMRANI 2006. les politiques de l'eau: grands principes et réalités locales. Edition Presses Universitaire, Laval, QUEBEC.

- EL AMRANI. 2006. La politica de regadios y la gestion intitucional del agua en Marreucos. Article publié dans la revue espagnole de la Fundacion de Estudios Rurales.

- EL AMRANI M. 2001. Evaluation de l'impact de la diffusion d'une innovation technique agricole sur les systèmes de production et sur la durabilité de l'agriculture. Le cas de la motopompe à eau dans la zone semi-aride de Saïs au Maroc. Thèse en sciences Agronomiques et ingénierie Biologique, option : Economie et Développement Rural. Faculté Universitaire des Sciences Agronomiques de Gembloux, Belgique

Roger MOUSSA
DR2 INRA
Date of birth : 16/08/1964
Place of Birth : Amchit (Lebanon)
PhD thesis and HDR
1988-1991 : PhD thesis in Hydrology, University of Montpellier II, France.
2003 : HDR, University of Montpellier II, Speciality Civil Engineering, "Modélisation hydrologique spatialisée des crues".

Research experience
Research topics : Distributed hydrological modelling; Flood routing; Hydraulics; Hydrological processes; Geomorphology.
Leader of the group "Surface hydrology" and co-leader of the team "Computing platform" at LISAH (INRA, Montpellier).
52 papers published in international journals, 7 book chapters, 35 publications in congress proceedings, 125 communications in congress and conferences. Supervision of 11 PhD, 3 postdoc and 22 MSc, and participation to 48 PhD and HDR jurys.
Courses for engineers and MSc (30 to 120 h/year) at the University of Montpellier II (since 1987) and SupAgro (since 1993) : Hydrological modelling, hydraulics, hydrology, mathematics.
Member of the "Conseil Scientifique" of the Departemnt EA of the INRA (2002-2011), of the "Commission Scientifique Spécialisée" of the INRA (2003-2010) and of the "Commission des Spécialistes n° 60" of the University Montpellier II (2001-2008).

Experience in National research projects
Coordination of projects of the CEMAGREF/INRA (200 k€),
Ministry of Environment (2 projects : 200 k€ and 150 k€), and leading work packages and participating to ANR (ANR Mesoeros and ANR Geduque 2006-2010), "Action Incitative Prioritaire" INRA (2 projects 1992-1998), PNRH (7 projects 1997-2006), etc.
Experience in International research projects: France-Canada (1988-1992), Procope France-Germany "Hydrological modelling" (2005-2007), and European project LIFE -Aware "A Water Assessment to Respect the Environment" (2006-2009), etc.

Recent publications relevant to the project
Crabit A, Colin F, Moussa R, 2011. A soft hydrological monitoring approach for comparing runoff on a network of small poorly-gauged catchments. Hydrological Processes, 25 (18), 2785–2800, DOI:10.1002/hyp.8041.
Gumiere S.J., Raclot D., Cheviron B., Davy G., Louchart X., Fabre J.C., Moussa R., Le Bissonnais Y. 2011. MHYDAS-Erosion a distributed single-storm water erosion model for agricultural catchment. Hydrological Processes, 25(11): 1717-1728. doi: 10.1002/hyp.7931.
Moussa R. 2010. When monstrosity can be beautiful while normality can be ugly: assessing the performance of event-based flood models. Hydrological Sciences Journal, 55(6), 1074 – 1084.
Moussa R, Chahinian N. 2009. Comparison of different multi-objective calibration criteria using a conceptual rainfall-runoff model of flood events. Hydrol. Earth Syst. Sc., 13, 519-535.
Moussa R, Bocquillon C. 2009. On the use of the diffusive wave for modelling extreme flood events with overbank flow in the floodplain. Journal of Hydrology, 374: 116-135.

SECTION 1: BIOGRAPHIES AND RESUMES: WORKPACKAGE 3 CO-MANAGER

Mohamed Moncef Masmoudi
Prof .INAT
Date of birth : 16/03/1959
Place of Birth Sfax - Tunisia
PhD thesis and HDR
2000 : Ph.D U Gent Belgium.
2001 : HDR INAT, Tunisia

Research experience
Research topics : Crop water use and modelling.

Experience in national and international projects
2003-2006 "Water saving in Mediterrenean Agriculture" WASAMED, UE, INCO-
2004-2006 "Water Management in Agriculture" CGIAR-ICARDA-Comprehensive Assessement,
2005-2008 "Deficit Irrigation in Mediterranean Agriculture", DIMAS, UE FP6
2007-2008 Water Benchmarks of CWANA, "Community-based optimization of the management of scarce water resources in agriculture : Rainfed Benchmark", CGIAR-ICARDA-
2009-2011, Digisol-Hymed ANR-France

Recent publications relevant to the project
Masmoudi M.M., K. Nagaz and N. Ben Mechlia, 2010, Perception of drought by farmers and its impact on farming and irrigation practices. Option méditerranéennes, A 95, pp. 323-327.
Sghaier N., M.M. Masmoudi, N. Ben Mechlia, 2010, Etude comparative des méthodes d'estimation de la pluie efficace pour une culture de blé. Revue des Région Arides ns 24, vol. 3, pp.1139-1146, ISSN 0330-7956.
Ghrab M., M.M. Masmoudi, M. Ben Mimoun et N. Ben Mechlia, 2010, Etat hydrique d'une variété précoce de pêcher sous irrigation déficitaire : indicateurs de stress et effet du porte-greffe. Revue des Région Arides ns 24, vol. 2 pp.683-691, ISSN 0330-7956.
Mahjoub I., M.M. Masmoudi, J.P. Lhomme and N. Ben Mechlia, 2009. Sap flow measurement by thermal dissipation probe: exploring the transient regime. Annals of Forest Science 66:608.
Ben Mechlia N. and M. M.Masmoudi, 2008 "Water Use Efficiency in Tunisia", in Hamdan I, T. Oweis and G. Hamdallah (eds.) AARINENA water use efficiency network, proc. of the expert consultation meeting. ICARDA Aleppo Syria. pp. 163-171. ISBN 959127-210-4
Abid Karray J., J.P. Lhomme , M.M. Masmoudi, N. Ben Mechlia, 2008. Water balance of the olive tree–annual crop association: A modeling approach. in Agric. water management 95, pp. 575 –586.
Masmoudi M.M., C. Masmoudi-Charfi, I. Mahjoub and N. Ben Mechlia, 2007. Water requirements of individual olive trees in relation to canopy and root development. In Options Mediterranéennes, serie B, N. 56 vol. 1. pp.73-80.

Jean-Daniel Rinaudo
Senior Economist

41 years
BRGM (French Geological Survey), Water Environment and Ecotechnologies division
1039 rue de Pinville, 34000 Montpellier
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Education

1994	M Sc. Agricultural Economics, Montpellier Agricultural University (SupAgro)
2000	Ph.D. Environment and DevelopmentEconomics, Université d'Auvergne, Clermont-Ferrand

Current situation

Senior Economist at Brgm, regional office Montpellier.
Coordinator of research program on Water and Environmental economics at Brgm.
Scientific coordinator of the EU Water Cap & Trade project (Era Net IWRM).

Professional records

1994-1996	Junior Economist at the International Water Management Institute (IWMI), Lahore, Pakistan.
1997-2000	Ph.D research fellow at CEMAGREF (now IRSTEA), France.
2000-2001	Junior Economist, BRGM, Montpellier regional office.Involved in FP5 projects Gouverne and Aquadapt.Research focusing on water conflicts and public participation.
2001- 2004	Junior economist at BRGM, Strasbourg regional office. Coordination of a French-German economic working group in aInterReg project. Research focusing on the economics of groundwater agricultural pollution (cost-benefit analysis, farm economic modeling).
2004-2012	Senior economist at Brgm, Montpelier. In charge of the development and management of a research group (6 economists).In charge of the water and environmental economic program at Brgm. Involved in sereval FP6 projects (SWIFT-WFD, BRIDGE, AQUAMONEY), Era Net projects (AQUIMED, Water Cap & Trade) and ANR projects (ARENA Groundwater, VULCAIN, EAU&3^{E}).
2010	Member of the Scientific Committee of the Adour Garonne Water Agency.

Main recent publications

RINAUDO, J.-D., L. Maton, I. Terrason, S. Chazot, A. Richard-Ferroudji, and Y. Caballero. (accepté). Combining scenario workshops with modeling to assess future irrigation water demand.***Agricultural Water Management***.

Graveline, N., S. Loubier, G. Gleyses, and J.-D.RINAUDO. (2012). Impact of farming on water resources: assessing uncertainty with Monte Carlo simulations in a global change context. ***Agricultural Systems***.

RINAUDO, J.-D., M. Montginoul, M. Varanda, and S. Bento. (2012). Envisioning innovative groundwater regulation policies through scenario workshops in France and Portugal. ***Irrigation and Drainage***.

RINAUDO JD, Neverre N and Montginoul M (2012).Simulating the impact of pricing policies on urban water demand: a Southern France case study.***Water Resources Management***.

Montginoul M and RINAUDO JD (2011).Controlling Households' Drilling Fever in France: an economic modelling approach.***EcologicalEconomics***. Vol 71 : 140-150.

Mohamed SABIR

ENFI, Soil-Water-Biodiversity
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Date of birth : 11/12/57
Place of Birth : Beni Mellal, Morocco

Education:

- 1982: Agronomic Engineer, Agronomic & Veterinary Hassan II Institute, Rabat
- 1986: DEA Water Sciences and management, University of Paris XI, France;
- 1994: Ph.D thesis in Soil and Water Conservation, Agronomic & Veterinary Hassan II Institute, Rabat.

Research experience

- Research topics : Impact of land uses on Soil features (hydrology, erosion, C sequestration), Payson's Land management practices and strategies ;
- Head of the research team : "Land uses and Soil erodibility" at IAV HII, MCA Consortium;
- 15 papers published in international journals, 1 book as editor, 7 book chapters;
- Supervision of 3 Ph.D and and 5 MSc;
- Member of the editorial board of Geo-Morphologie Journal and Sécheresse Journal.

Experience in project

- 1999-2001: "Impacts of land uses on runoff and erosion risks in Rif Mountains" (Moroccan and French cooperation: IRD, ENFI, IAV HII). Coordination.
- 2003-2005: "Influences of Ecosystems management on C sequestration and Soil Erosion in Rerhaya Watershed, High Atlas, Morocco. (Moroccan-French Cooperation). Coordination.
- 2009-11: "Moroccan Soil Vulnerability". (Moroccan-French Cooperation).
- 2009-11: "Evaluation of C sequestration for Mediterranean Soils: Cases of Morocco and Tunisia". (Moroccan-Tunisian-French Cooperation). Coordination.
- 2007-12: "Participatory Management of Amsiten Forest Area". (Moroccan-Belgium Cooperation). Coordination.
- 2010-12: "Impact of land uses on Soil and Water Conservation. Millennium Challenge Account Found. Coordination of Axe "Land uses and Soil Erodibility".

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Recent publications relevant to the project

Éric Roose, Mohamed Sabir, Mourad Arabi, Boutkhil Morsli et Mohamed Mazour. 2012. Soixante années de recherches en coopération sur l'érosion hydrique et la lutte antiérosive au Maghreb. Physio-Géo - Géographie Physique et Environnement, 2012, volume VI, pp : 43-69.

El Ouellani S., Chao J., El Mansouri B. & Sabir M. 2010. Utilisation du système d'information géographique pour l'évaluation des pertes en terre potentielles dans le bassin-versant de l'oued Tanoubert affluent rive droite du Bou Regreg. Géo Observateur N°17, CRTS, Rabat, Juillet 2010, pp : 61-69.

Roose E., Sabir M. & Laouina A. 2010. Les paratiques paysanes de gestion de l'eau et de la terre au Maroc : essai d'amélioration. Ed. IRD Montpellier, 345 p.

Sabir M. and Roose E. 2009. Forest vegetation cover functions in soil conservation and rehabilitation: Impacts on soil hydrology and erosion. EFIMED Scientific Seminar, Marrakech, 29-30 April 09, Forest: Water, Soil & Fodder.

Sabir M., Barthès B., et Roose E. 2004. Recherche d'indicateurs des risques de ruissellement et d'érosion sur les principaux sols des montagnes méditerranéennes du Rif occidental (Maroc). Sécheresse, 15 : 105-110.

Mustapha NAIMI
November 18th, 1958, Midelt, Morocco
PHD thesis in soil science
Department of Soil, Water and Climate
University of Minnesota, Saint Paul, USA
MS thesis in Soil Science
Hassan II Institute of Agronomy & Veterinary Medicine, Rabat, Morocco
Employment history
October 2007-.. Professor Hassan II Institute of Agronomy & Veterinary Medicine, Rabat, Morocco March 2004-October 2007. Agricultural Systems Modeler International fertilizer Development Center, Muscle Shoals, Alabama, USA.

Research experience
- Research fields : Digital soil mapping, soil erosion and conservation, land evaluation, crop modeling.
- Head of soil unit within the Department of Natural Resources & Environment
- Coordinator of PRAD project on soil vulnerability to soil erosion (2009-2011)
- Coordinator of soil erosion component of MCC project (2010-2013) ~ 10 M USD
- Coordinator of soil mapping project (2010-2014) ~ 16 M MAD
- Coordinator of Doctoral Formation Unit on Soil and Water Conservation
- Member of the scientific and the organizing committee of the International Conference on "Érosion hydrique et Vulnérabilité des Sols au Maghreb: Etats des Lieux et Perspectives" (October 12-13, 2011, Rabat, Morocco).
- Supervision of 40 MS theses on Natural Resources
- Supervision of 10 PhD theses on Natural Resources
- Publication of more 40 scientific papers
- Publication of 50 expertise reports for national and international organization
Organizations worked with
- Chemonics International - USAID. Pérennité des Ressources en Eaux du Maroc
- International Fertilizer Development Center (IFDC): Implementation and Development of an Information Decision Support System for Cereal Production in Near East and North Africa (NENA) Region
- Millennium Challenge Account – Morocco: Fruit Tree Plantations and Environmental and Social Management Action Plans,
- DAI - USAID: Reuse of wastewater in agriculture in Meknès, Morocco.
- CRC SOGEMA, Canada : Development of environnemental and social management plans, MCC project.
- Ministry of Agriculture & Fisheries: National Strategy for Fertilizer Uses.

Recent publications
- NAIMI, M. EZZINE, H. BAGHDAD, B. ET P. ZANTE. 2011. Evaluation de l'érosion des sols dans le bassin versant à l'amont du barrage Hassan II, Haute Moulouya, Maroc. Colloque international « Érosion hydrique et Vulnérabilité des Sols au Maghreb: Etats des Lieux et Perspectives » 12-13 Octobre, 2011, Rabat, Morocco).
- BATIONO, A. A. HARTEMINK, O. LUNGU, M. NAIMI, P. OKOTH, E. SMALING, AND L. THIOMBIANO. 2006. African Soils: Their Productivity and Profitability of Fertilizer Use. June 9-13, 2006, Abuja, Nigeria. Background Paper Prepared for the African Fertiliz

Fabrice VINATIER

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30 years old

PhD in Spatial Ecology and Modelling

FORMATION

2003- 2010	**AgroParisTech. PhD thesis and Master Degree.** Specialization in agronomic sciences and spatial ecology

CURRENT SITUATION

2012- ...	**Researcher : UMR LISAH, INRA Montpellier.** Modelling spatial organisation of agricultural landscapes for eco-environnemental optimization.

OTHER PROFESSIONAL EXPERIENCES

2011 (un an)	**Post-doctoral contract : UMR Agronomy, INRA AgroParisTech**. Modelling complex system at landscape scale.
2007-2010	**PhD : UPR 26, CIRAD Martinique.** Spatial dynamics of banana black weevil in relation with cropping system and landscape.

AWARDS AND DISTINCTIONS

2012	**Early career researcher grant (19th ialeUK conference)**
2011	**Post-Doctoral grant (DIM Astrea)**
2011	**Post-Doctoral grant (DIM Astrea)**

SCIENTIFIC PUBLICATIONS

Vinatier, F., Lescourret, F., Duyck, P.-F., & Tixier, P**.** 2012. From IBM to IPM: Using individual-based models to design the spatial arrangement of traps and crops in integrated pest management strategies. *Agriculture, Ecosystems & Environment*, **146**, 52-59. **(Impact Factor 2011: 3.0)**

Vinatier, F., Lescourret, F., Duyck, P.-F., Martin, O., Senoussi, R., & Tixier, P. 2011a. Should I Stay or Should I Go? A Habitat-Dependent Dispersal Kernel Improves Prediction of Movement. *PLoS ONE*, **6**, e21115. **(Impact Factor 2011: 4.1)**

Vinatier, F., Tixier, P., Duyck, P.-F., & Lescourret, F. 2011b. Factors and mechanisms explaining spatial heterogeneity: a review of methods for insect populations. *Methods in Ecology and Evolution*, **2**, 11-22. **(Impact Factor 2011: 5.1)**

Vinatier, F., Chailleux, A., Duyck, P. F., Salmon, F., Lescourret, F., & Tixier, P**.** 2010. Radiotelemetry unravels movements of a walking insect species in heterogeneous environments. *Animal Behaviour*, **80**, 221-229. **(Impact Factor 2011: 3.5)**

Vinatier, F., Tixier, P., Le Page, C., Duyck, P.-F., & Lescourret, F. 2009. COSMOS, a spatially explicit model to simulate the epidemiology of Cosmopolites sordidus in banana fields. *Ecological Modelling*, **220**, 2244-2254. **(Impact Factor 2011: 2.3)**

Anne BIARNES

CR1 IRD
53 years old

IRD, UMR LISAH
2 Place Pierre Viala, 34060, Montpellier
Tel : 04 99 61 24 56; biarnes@supagro.inra.fr

Thesis

1984 MSc in Plant production (INA-PG, France)
1982 MSc in Economic and social sciences (National Institute of Agronomy Paris-Grignon - INA-PG, France)

Current position

- Research scientist at IRD in Montpellier, UMR Lisah
- Research topics : farm management and modeling of decision making processes for crop management, analysis and simulation of spatial and temporal distribution of agricultural practices

Other professional experiences and activities

- Co-supervision of 2 PhD and 15 MSc
- Participation to scientific projects in Ivory Coast (1984-1985), Mexico (1986-1995), Tunisia (2000-2005) and France (1992-2012)
- Courses for MSc on farmers' practices and decision making processes

Five publications relevant to the project

- Biarnès A., Coulouma G., Compagnone C. (2012) Unexpected predominance of wine grower location over soil trafficability for vine management in southern France, *Agronomy for Sustainable Development* 32, 661-671.
- Ripoche A., Rellier J.-P., Martin-Clouaire R., Paré N., Biarnès A., Gary C. (2011) Modelling adaptive management of intercropped vineyards to satisfy agronomic and environmental performances under mediterranean climate, *Environmental Modelling & Software* 26, 1467-1480
- Leenhardt D., Angevin F., Biarnès A., Colbach N., Mignolet V. (2010). Describing and locating cropping systems at a regional scale. A review. *Agronomy for sustainable development* 30, 131-138.
- Biarnès A., Bailly J. S., Boissieux Y. (2009). Identifying indicators of the spatial variation of agricultural practices by a tree partitioning method: the case of weed control practices in a vine growing catchment. *Agricultural System* 99, 105-116.
- Biarnès A., and Colin F. (2006). Methodology for assessing the hydrological impact of weed control practices with a view to management of Mediterranean vinegrowing catchments. *International Journal of Sustainable Development* 9, 161-179.

SECTION 2: POSTDOCTORAL PROFILES: POSTDOCTORAL POSITION ON DIGITAL SOIL MAPPING

Description of the work of the 18 months post-doctoral position to be funded in the project for the tasks of WP1.

The candidate will be located in IAV Rabat (Morocco) with large visiting periods in LISAH (Montpellier). The supervisors are: Mohamed Chikhaoui (IAV Rabat), Cécile Gomez (LISAH) and Philippe Lagacherie (LISAH).

The successful candidate will develop new procedures of high resolution mapping of the surface and deep soil properties that are required by the parameterizations of SWAT and by the Integrated Hydrological Processes Model developed in the ALMIRA project. The methodology will include two steps: i) extending the successful mapping of some topsoil properties obtained by using airborne hyperspectral images to larger areas by using remote sensing data at coarser spatial and spectral resolutions that are available at lower costs from spaceborne sensors (Ex: ASTER and LANDSAT sensors) and ii) merging the outputs of the previous step with legacy soil measured profiles to infer deep soil properties by means of spatial statistic procedures. Methodologies will be developed in La Peyne and Lebna catchments where soil datasets have been already collected. Validation of the entire approach will essentially take place in the Tleta catchment (Northern Morocco) in which a validation dataset will be collected.

SECTION 2: POSTDOCTORAL PROFILES: POSTDOCTORAL POSITION ON DRIVERS AND LOCATION FACTORS FOR LAND USE AND CROPPING SYSTEMS

Description of the work of the 18 months post-doctoral position to be funded in the project for the tasks of WP2.

The candidate will be located in IRMC (Tunisia) under the supervision of Alia Gana (IRMC).

The objective of the post-doctoral position is the analyse more specifically the socioeconomic factors that influence the spatial organization of land uses and cropping systems in two agricultural regions located in Tunisia and Morocco. The selected candidate will be in charge of: i) the collection of data through questionnaire surveys and interviews conducted with farmers, representatives of farmer associations, and representative of local and regional agricultural service in Lebna and Tleta catchments, ii) the analysis of the available regional databases on farms, agricultural practices and spatial distribution of agricultural production and iii) to work on the results for publishing.

SECTION 2: POSTDOCTORAL PROFILES: POSTDOCTORAL POSITION ON THE MODELLING OF LANDSCAPE FUNCTIONING

Description of the work of the 18 months post-doctoral position to be funded in the project for the tasks of WP3.

The candidate will be hosted at LISAH with travels in Tunisia and Morocco and the supervision will be shared between F. Colin, R. Moussa, D. Raclot. The selected candidate will carry out the modelling of landscape functioning (WP3) on the three sites and to derive recommendations in terms of optimization of landscape services (WP4). The tasks are:

- To establish state of art on calibration and validation analysis of spatial models considering multi-criteria, multi-objective, multi-site and multi-processes approaches.
- To carry out simulations for present landscape mosaics (WP1 outputs) and future evolution (WP2 outputs) of using SWAT and IHPM models on the three studied sites and compare the three situations.
- To synthesize the related eco-systemic services for each landscape mosaics through indicators and finally derive recommendations on the best landscape mosaic
- To publish the proposed methods and results in 2 scientific articles.

SECTION 2: POSTDOCTORAL PROFILES: POSTDOCTORAL POSITION ON THE MODELLING OF VEGETATION AND LANDSCAPE FUNCTIONING

Description of the work of the 18 months post-doctoral position to be funded in the project for the tasks of WP3.

The candidate will be hosted at INAT and the supervision will be shared between INAT and LISAH.

The selected candidate will support the implementation of the Integrated Hydrological Processes Model (IHPM) that couples runoff, erosion and vegetation functioning, adapted for short time steps. The successful candidate will be in charge of the following points

i) Collect the field data for calibration of the vegetation functioning model (e.g. vegetation growth, LAI, biomass production, energy flux measurements, available water capacity, and soil properties).

ii) Conduct sensitivity analysis; and calibration / validation exercises at different sites for vegetation evolution in order to quantify its influence on the uncertainty in the environmental landscape services assessment.

iii) The successful candidate will also work on the results to publish at one peer-review paper during the project.

SECTION 3: ENGINEER PROFILES: ENGINEER POSITION ON SOFTWARE FOR ENVIRONMENTAL MODELLING AND SIMULATION

Description of the work of the 18 months engineer position to be funded in the project for the tasks TK 3.1, WP3.

The software engineer for environmental modelling and simulation will be hosted at LISAH. The research theme concerns the:

i) development of parts of the Integrated Hydrological Processes Model (IHPM) as simulation functions in the OpenFLUID software platform, conforming to the scientific design of the IHPM

ii) development of new complementary functionalities in the OpenFLUID software platform, in support to the OpenFLUID project team, in order to match the IHPM requirements

The selected candidate will be in charge of :

- the C++ programming
- the development on Unix (Linux) systems, using GCC build tools
- the modelling and simulation of dynamic systems

SECTION 3: ENGINEER PROFILES: ENGINEER POSITION ON IMPLEMENTING EXITING MODELS FOR LANDSCAPE FUNCTIONING

Description of the work of the 12 months engineer position to be funded in the project for the tasks TK 3.2; 3.3; 3.4, WP3.

The candidate will be hosted at INRGREF with a shared supervision between INRGREF and LISAH. The research theme concerns the application of SWAT model in the Lebna catchment. The aim is to predict the impact of land management practices evolution on environmental landscape services (downstream water delivery, soil preservation). As soon as the candidate have been selected, he will be in charge of : i) the compilation of the required dataset for the SWAT model parameterization and that have been already collected (topography, land use, soil properties, hydro-meteorological data, agricultural practices, discharge at the catchment outlet), ii) the collection of the field measurements and necessary input data that are not available for the SWAT model validation, and iii) the implementation of the model on the Lebna catchment in order to investigate the catchment response to the landscape mosaics scenario.

SECTION 3: ENGINEER PROFILES: ENGINEER POSITION ON IMPLEMENTING EXITING MODELS FOR LANDSCAPE FUNCTIONING

Description of the work of the 12 months engineer position to be funded in the project for the tasks TK 1.2; 3.3; 3.4, WP3.

The candidate will be hosted at IAV; he will be supervised by a multidisciplinary research team including modelling, soil erosion, agronomy, SIG and remote sensing. It is expected that the candidate must have knowledge in catchment hydrology (transfers of water and sediments), in modelling and be in command of the computer tools and SIG. A taste pronounced for the field experimentation, work in laboratory and the rigour in the synthesis of databases are essential for this work. Good knowledge in statistics is required as well as any former experiment of research project in landscape characterization and competences in geomatics will be an additional advantage.

SECTION 4: SUPPORT LETTER FROM FUNDING STRUCTURES – AGROPOLIS FOUNDATION

agropolis fondation

4 Septembre 2012,

Frédéric Jacob
Laboratoire d'étude des intéractions sol-agrosystème-hydrosystème (LISAH)
Montpellier SupAgro
34000 Montpellier

Subject: Letter of support for the project « Adapting Landscape Mosaics of medIterranean Rainfed Agrosystems (ALMIRA) for a sustainable management of crop production, water and soil resources»

Dear Dr. Jacob,

This is to express the interest of Labex Agro Agropolis Foundation to support the proposed project entitled *Adapting Landscape Mosaics of medIterranean Rainfed Agrosystems (ALMIRA) for a sustainable management of crop production, water and soil resources.*

We are pleased to note that the two pilot projects supported by Agropolis Foundation, namely *Model level integration for understanding and managing human influenced ecosystems at the landscape scale* (2008) and *Understanding land surface-atmosphere exchanges within a Tunisian hilly watershed devoted to agricultural activities: on the influence of upward and downward flows on energy and mass transfers* (2009), have contributed to the development of this proposal.

ALMIRA aims to explore the modulation of landscape mosaics to compromise on agri-environmental and socio-economic services related to crop production and to preservation of soil and water resources. In the context of mitigating pressure induced by global changes and in view of the recommendations of various studies (e.g., Millenium Ecosystem Assessment in 2005, International Assessment of Agricultural Knowledge, Science and Technology for Development in 2008, etc.) which addressed local and regional scales, ALMIRA will explore the intermediate scale of landscape mosaics to help in identifying new actions and in revisiting the range of recommendations put forward in the previously cited assessments.

ALMIRA project is also expected to come up with new methodology for landscape study. It is thus fully consistent with the scientific priorities of Labex Agro, particularly in the field of ecological intensification and resource conservation.

Yours sincerely

Anne-Lucie Wack,
Director Agropolis Fondation and
Labex Agro Coordinator

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Membres fondateurs / Charter members

cirad INRA IRD Institut de recherche pour le développement Montpellier SupAgro

Montpellier, le 4 septembre 2012

Mr Frédéric Jacob
Porteur du projet ALMIRA à l'Appel à propositions TRANSMED
IRD Tunis
5 impasse Chehrazade - Menzah 4 BP 434
1004 Tunis - TUNISIE
Tel: +216-71-237-888

Cher collègue,

Nous avons pris connaissance de votre projet de réponse à l'appel à proposition TRANSMED intitulé ALMIRA - Adapting Landscape Mosaics of MedIteranean Rainfed Agrosystems for a sustainable management of crop production, water and soil resources.

Votre projet rentre parfaitement dans les objectifs prioritaires et la stratégie scientifique du programme inter-organismes SICMED. En effet, il développe une approche pluridisciplinaire pour l'étude de l'adaptation des écosystèmes méditerranéens cultivés face aux changements globaux en cours et associe de manière équilibrée des équipes de recherche du nord et du sud de la Méditerranée. Nous avons également le plaisir de constater que votre projet aide à la concentration des efforts scientifiques sur plusieurs des sites majeurs d'étude identifiés par SICMED.

S'il est retenu, votre projet participera activement à l'avancement des travaux de recherche de SICMED. Convaincus de l'intérêt de votre proposition, nous vous souhaitons une pleine réussite dans l'AaP TRANSMED et espérons qu'elle nous permettra de mener ensemble plus vite et plus loin les actions SICMED.

Bien cordialement

L'équipe de Coordination SICMED

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