Final report

(Project Deliverable 1.1b)

for the CORE Organic II funded project

- INTERVEG -
Enhancing multifunctional benefits of cover crops – vegetables intercropping

Period covered: September 2011 – February 2015 (M42)

Project acronym:	**INTERVEG**			
Title:	**Enhancing multifunctional benefits of cover crops – vegetables intercropping**			
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Start of Project:	5th September 2011	End of project:	04th March 2015	

Project partners and contact persons:

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Projects website:

Project objectives

The project aims at verifying if the introduction and proper management of living mulch in vegetable production systems allows comparable yields and produce quality in comparison to the sole cropping systems, reducing the use of auxiliary, off-farm, inputs (i.e. plant protections products and fertilizers) and non-renewable energy consumption (i.e. fossil fuel for mechanical weeding). The cover crops – vegetables intercropped farming systems should then perform better in terms of environmental impact and profitability due to production costs reduction.

This hypothesis is tested in a range of European areas where open field organic vegetable production are a relevant activity. Field experiments have been carrying out in four CORE Countries (IT, DK, DE and SLO), in sites having different soil characteristics and climatic conditions.

Two yielding crops have been identified, one common for all and one for each of the study areas, according to the following criteria: (i) economic relevance, (ii) season of the cropping cycle and (iii) representativeness as "model" crop of a larger crops group with similar characteristic and to which, the project outcomes can be extended. A range of cover crop families and species are intercropped with the yielding species in function of the typology of "service" they provide and in relation to the agro-ecosystems characteristics in which they are introduced.

Cover crops sowing period, root pruning as well as spacing or yielding crop and cover crop density are the relevant experimental factors that are under investigation in order to optimize the performance of the living mulched agro-ecosystems in comparison to the sole crop systems. The living mulched and the sole crop systems is compared in terms of yield quality and stability, impact of weed and pests as well as nutrient availability and losses in relation to reduction in the use of off-farm inputs and energy, cost effectiveness and environmental impact. Involving 7 partners of 4 CORE countries, project activities are organized in 6 work packages.

Expected results and their impact

The main expected result is the development of cropping practices based on living mulch tailored for each of the crop/system studied in the different countries. These ready-to-use cropping model will be then disseminated. Organic vegetable producers will benefit from the project outcome as it will supply knowledge on systems to produce organic vegetables with lower use of external inputs (fertilizers, plant protection products, water, energy etc.). It will result in improved farm profitability and more resilient farming systems that grants long-term productivity and produce quality. The organic sector will also benefit from the higher credibility to consumers of the intercropping production methods based on lower external inputs and higher biodiversity.

Rural communities will benefit from the project outcome in terms of improved environmental profile of organic vegetable farms and this will reduce the negative environmental impacts on soil and water. Furthermore, the increase of plant diversity in the field will benefit the biodiversity of natural fauna and microorganisms in the agro-ecosystems.

Consumers will benefit from the project as they will have the chance to choose, among organic production, vegetable with lower environmental impact. Policy makers and standard setters can use the project outcomes for feeding the standards improvement process (as for organic vegetable production EU Regulation is still simplistic) and for the definition of rural development plans and premium schemes.

Overall, the project will increase the body of knowledge about the effect of introduction of the living mulch technique in organic vegetable productions on yield and produces quality, environmental impact and off-farm external energy and inputs use reduction for weeds, fertility and pests management. Accordingly, It is expected that the project outcomes will give a contribution in the debate about of the risk of the so called "conventionalization" of organic farming.

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Post project summary suitable for web publication

Cover crops in organically managed agro-ecosystems represent an important tool to manage all at once soil fertility, pests, disease and weeds. Cover crops are usually not so common in specialized vegetable systems but they can be introduced as living mulch, intercropped with cash crops. If this management option is chosen it is important to reduce the competition between the main and cover crop and to use a crop management strategy able to optimize the ecological services within the field and the farm as a whole.
The INTERVEG partners settled parallel experimental field trials in 4 EU countries (Italy, Denmark, Slovenia and Germany) to evaluate the effect of introducing living mulches in organic vegetable production systems. Cover crop sowing period, root pruning as well as spacing or yielding crop and cover crop density are the relevant factors that were under investigation in order to optimize the performance of the living mulched agro-ecosystems in comparison with the sole crop systems. The selected yielding crops had been identified as cauliflower for the 4 countries, artichoke for Italy and leek for the other three countries. A total of 12 field experiments have been carried out during the project spam: 8 in research farms of the research Institutions involved in the project and 8 in commercial organic farms (on-farm research). A detailed list of common measurement has been set up and, accordingly, results have been collected in each location. The data collected include yield and marketable yield, number of plants, N, P, K content, soil, water, competition indices for weeds, cover and cash crops. In addition data on pest and beneficial insects, energy consumption and costs have been also collected in the different European areas. Since also commercial organic farms are involved in the project as pilot farms, the effect of living mulch at larger scale, such as impact on pest and beneficial insects has been evaluated. On-farm research activities were also aimed to encourage farmers involvement and to support dissemination activities.

Pre-project summary

The project aims at verifying if the introduction and proper management of intercropping in vegetable production systems allows comparable yields and produce quality in comparison to the sole cropping systems, reducing the use of auxiliary, off-farm, inputs (i.e. plant protections products and fertilizers) and non-renewable energy consumption (i.e. fossil fuel for mechanical weeding). The cover crops – vegetables intercropped farming systems should then perform better in terms of environmental impact and profitability due to production costs reduction.
This hypothesis is tested in a range of European areas where open field organic vegetable production are a relevant activity. Field experiments will be carried out in four CORE Countries (IT, DK, DE and SLO), in sites having different soil characteristics and climatic conditions.
Two yielding crops have been identified, one common for all and one for each of the study areas, according to the following criteria: (i) economic relevance, (ii) season of the cropping

cycle and (iii) representativeness as “model” crop of a larger crops group with similar characteristic and to which, the project outcomes can be extended. A range of cover crop families and species are intercropped with the yielding species in function of the typology of “service” they provide and in relation to the agro-ecosystems characteristics in which they are introduced.
Cover crops sowing period, root pruning as well as spacing or yielding crop and cover crop density are the relevant experimental factors investigated in order to optimize the performance of the intercropped agro-ecosystems in comparison to the sole crop systems. The intercropped and the sole crop systems will be compared in terms of yield quality and stability, impact of weed and pests as well as nutrient availability and losses in relation to reduction use of off-farm inputs use and energy consumption, cost effectiveness and environmental impact. Involving 7 partners of 4 CORE Countries, project activities are organized in 6 work packages.

1. Main results, conclusions and fulfilment of objectives

1.1 Summary of main results and conclusions

According to the plan, each field experiment (either in research or in pilot farms) was carried out for two subsequent years. The main results and conclusions achieved are below reported.
Overall, the project allowed to asses in a range of different vegetable cropping systems, climatic and soil conditions and LM genotypes, the effect of the introduction and of different management strategies of LM on cash crop ***yield and products quality***. We concluded that living mulched systems designed in accordance to the substitutive approach are effectively implementable in vegetable production only if the value of the ecological services (positive externalities) delivered by LM to the system is of the same order of magnitude of the yield loss due to the cash crop density reduction. Moreover, In a wide range of conditions, we got confired that the plant density of the system and the length of the period in which the living mulches and the cash crops coexist in the same area are oppositely related for competition and yield. Therefore, if the ASC has to be established early relative to the cash crop cycle in order to deliver its agro-ecological services to the systems, it would be preferable to use the substitutive design instead of the additive one.
If the additive design is preferred, the living mulch should be planted several weeks after the cash crop. However, since we observed that the responses of the LM introduction were crop (system) and site specific, farmers should verify the effectiveness of the technique in their own conditions.
Our results indicated also that the cash crop genotype did not affect the performance of the living mulched vegetable systems and, consequently, farmers can select the genotypes to grow in accordance to their own preferences and/or on the basis of the market request.
The effect of the living mulch system versus the sole crop system on the risk of nitrate leaching was found to vary highly depending on the local conditions, the crop species and the management treatments tested. Overall the early sown living mulch reduced the risk of nitrate leaching compared to the late sown living mulch and the sole crop system. The additive design was effective in some cases to reduce the risk of nitrate leaching as opposed to the substitutive design, that was found to increase the leahing risk in some cases compared to sole crop systems.
An interesting result of our study is that LM in cauliflower did not negatively affected ***pest infestation***, showing the lack of detrimental effects. In one site (Denmark), LM showed to prevent aphid infestations. Some positive effects on ecosystem services and ***soil diversity*** were detected in living mulch system, although the response was affected by the end-point used. In particular, caterpillar parasitisation in Italy experiment was very high, sand a consistent regulatory capacity of the organic farm itself was detected. It is remarkable that parasitisation in one year (2012) was higher in LM in comparison with sole crop.
Carabid was the group that most benefited by the LM; the identification of Carabids to species or genus level contributed to a better interpretation of the results, providing an ecological analysis of the species sampled. This taxon showed higher diversity indexes or higher activity density of some dominant species, in the different countries. In general, taking into account that LM technique in this study was developed following a multitasking approach, and not only targeted to manage insect pest infestations and beneficial fauna, our results indicate a general

positive influence on plant/soil systems, as shown by a high level of soil biodiversity and a general lack of negative effects on the occurrence of canopy pests.
Managing ***weeds*** in organic farming is challenging and requires the use of many techniques and strategies to achieve ecological sustainability as well as economically acceptable weed control and crop yields. In our project, we demonstrated the potential for introducing living mulch to reduce weed emergence and development as well as their detrimental effect on cash crop performance, thus limiting the need for mechanical cultivation to control weeds in organic vegetable systems, under different climates.
In particular, the substitutive approach (LM strips replacing every third row of cash crop) was observed to determine a consistent reduction in critical period for weed control in vegetable cropping system in Nortern Europe, offering a trade-off to the crop yield reduction due to the lower crop density than in standard systems. Similarly, the delayed sowing of LM, when broad-sowed, highlighted to be effective in reaching the double objective of reducing the critical period for weed control and avoiding competitive effect of living mulch versus the cash crop, in Mediterranean conditions. In addition, both the F1 hybrids and open-pollinated local adapted cultivars highlighted tolerance to the living mulch introduction, even thought the F1 hybrids showed the highest suitability.
In general, ***human labour and fossil fuel energy*** use slightly increased in living mulched systems. In more depth, our findings suggested that the increase of human and fossil fuel origin energy consumption was not relevant and the observed differences between the living mulches and the sole crop systems would even be less important in relative terms if the energy embedded in the machinery as well as that contained in the off-farm inputs (i.e. fertilisers and plant production products) had been accounted for the calculation. Moreover, in two out of three cases, the measured differences were only due to the human labour, confirming that the implementation of agro-ecological practices may determine a shift in the proportion of fossil fuel and human energy consumption.
Overall, the ***farmers' acceptance*** towards the LM techniques can been considered as quite high. At the same time, concerns about the feasibility of the technique as well as the incommensurability between costs and resources used, on one hand, and product quality and environmental benefits, on the other, clearly emerged. The p***erception of farmers*** on the ecological services provided by living mulch in the vegetable cropping systems indicated that the control of weeds and the improvement of soil fertility were the most positively perceived services. Conversely, the promotion of insect pest-beneficial interaction was not clearly perceived as a relevant service by all interviewed famers. Also, the involved farmers had the perception that the LM technique is only able at a low or medium extent to reduce costs, energy consumption and the risk of nitrate losses from the vegetable cropping systems. Many farmers "biodiversity protection" and "soil erosion protection" aiming the potential positive services of LM, demonstrating a high familiarity of some of the farmers with the potential agro-ecological benefits of living mulch.
Indeed, the ***on-farm research*** carried out in the framework of this specific study, has played an important role for validating and developing the findings about LM. Moving to farmers' fields and interacting with them allowed the researchers to have a real appreciation of the farmers' conditions and problems. Consequently, it represented a great opportunity for the identification of problem areas and researchable issues that arise from farmers' prospective, promoting, thus, a continuous process of refining, improving, and re-testing the experimental technique.

1.2 Fulfillment of objectives

The activities carried out in the project have allowed to reach the following objectives:

- all the project hypotheses set up have been tested, the results of the planned experiments collected, evaluated and interpreted. Conclusions useful to improve scientific knowledge and technical background on agro ecological criteria to manage organic cropping system have been drawn;
- project achievements have been shared with organic farmers and with a wide range of actors involved in organic farming;
- novel procedures aimed to bring in a transnational dimension in research approaches and their potential outcomes were developed. These procedures were shared among the project partners;

- awareness among the project partners regarding the potential benefits of transnational studies carried out by researchers belonging to Countries having a wide range of social, economic and environmental conditions increased;
- expertise on integrated multi disciplinary study approach was strengthened;
- project milestones have been met (Table 1) and all the project deliverables have been produced in accordance with the original plan.

2. Milestones and deliverables status

Table 1. M&D of the InterVeg project

No[1]	Typology	Name	WP no.	Lead participant	Delivery month	Nature/means of verification	Dissemination level/Notes	Notes	Status
6.3 a	D	Press releases	6	AIAB	3	Docuemnt released	PU		√
2.3	D	Matrix for costs/benefits data collection	2	AIAB	7	Spreadsheet	INT		√
1.2 a	D	Annual administrative national reports	1	All	12	Report	CO		√
2.1 a	D	Year 1 field trials short reports	2	AU-H	18	Report (data collection sheet)	INT	postponed at M 20	√
1.1 a	D	Annual overall project report	1	CRA-RPS	19	Report	RE		√
6.3 b	D	Press releases	6	AIAB	19	Docuemnt released	PU		√
6.1 a	D	Project presentation at selected group and field-days reports	6	AIAB	24	Report	PU		√
1.2 b	D	Annual administrative national reports	1	All	24	Report	CO		√
2.1 b	D	Year 2 field trials short reports	2	AU-H	30	Report (data colection sheet)	INT		√
1.1 b	D	Annual overall project reports	1	CRA-RPS	31	Report	RE		√
6.3 c	D	Press releases	6	AIAB	31	n.a.	PU		√
2.2	D	Field trials final report	2	AU-H	41	Report	PU		√
2.4	D	Intercropping economic evaluation final report	2	AIAB	41	Report	PU		√
3.1	D	Nutrient availability and leaching risks final report	3	CRA-RPS	41	Report	PU		√
4.0	D	Insect dynamics and prevention/control of insect damages final report	4	DISTA-UniBO	41	Report	PU		√
5.1	D	Weed control final report	5	CRA-RPS	41	Report	PU		√
5.2	D	Energy consumption/saving final report	5	AIAB	41	Report	PU		√
6.1	D	Information sheet + video	6	AIAB	41	Demostrator	PU		√
6.1.b	D	Project presentation at selected group and field-days reports	6	AIAB	41	Report	PU		√
1.1.c	D	Annual overall project reports	1	CRA-RPS	42	Report	RE		√
1.2.c	D	Annual administrative national reports	1	All	42	Report	CO		√
1.1	M	Kick off meeting	1	CRA-RPS	3	Meeting minute and ppt presentation available			√
6.1	M	Guideline for stakeholders involvement	6	AIAB	3	Guideline sent to the partners			√
4.1	M	Workshop on methodologies for insects measurements and crop survey	4	DiSTA-UniBO	3	Workshop ppt presentations available			√
5.1	M	Workshop on methodologies for weeds measurements	5	CRA-RPS	3	Workshop ppt presentations available			√
5.4	M	Monitoring grid for energy consumption	5	AIAB	3	Grid sent to the partners			√
6.2	M	National presentations at selected group (DE SLO?)	6	AIAB	6	National presentation programme available			√
2.3	M	Matrix for costs/benefits data collection prepared	2	AIAB	7	Matrix sent to the partners			√
1.2 a (ii)	M	Web conference (overwiew on the field activities)	1	CRA-RPS	12	Meeting ppt presentations available			√
2.1.a	M	Field trials in experimental sites	2	AU-H	15	Field trial concluded			√
1.2 a	M	Annual scientific meetings	1	CRA-RPS	18	Meeting ppt presentations available			√
2.4	M	Acceptability questionnaire prepared	2	AIAB	18	Questionnaire sent to the partners		Postponed at M 20	√
3.1 a	M	Nutrient availability and leaching risks short report from involved partners	3	CRA-RPS	18	Short reports from partners (data collections sheet)		Postponed at M 20	√
5.2.a	M	Weed control (measuremets) short reports from involved partners	5	CRA-RPS	18	Short reports from partners (data collections sheet)		Postponed at M 20	√
3.2	M	Nutrient availability and leaching risks provisional report	3	CRA-RPS	24	Report finalised			√
5.3	M	Weed control provisional report	5	CRA-RPS	24	Report finalised			√
6.3 a	M	National Field-days	6	AIAB	24	Field days programme available			√
1.2 b (ii)	M	Web conference (overwiew on the field activities)	1	CRA-RPS	24	Meeting ppt presentations available			√
2.1 b	M	Field trials in experimental sites	2	AU-H	27	Field trial concluded			√
2.2.a	M	Field trials in pilot farms	2	AU-H	27	Field trial concluded			√
1.2 b	M	Annual scientific meetings	1	CRA-RPS	30	Meeting ppt presentations available			√
3.2.b	M	Nutrient availability and leaching risks short report from involved partners	3	CRA-RPS	30	Short reports from partners (data collections sheet)			√
4.2.a	M	Insect dynamics and prevention/control of insect damages short report from partners	4	DiSTA-UniBO	30	Short reports from partners (data collections sheet)			√
5.2.b	M	Weed control (measuremets) short reports from involved partners	5	CRA-RPS	30	Short reports from partners (data collections sheet)			√
4.3	M	Insect dynamics and prevention/control of insect damages provisional report	4	DiSTA-UNIBO	34	Report finalised			√
6.3 b	M	National Field-days	6	AIAB	36	Field days programme available			√
6.4	M	Information sheet draft and video storyboard	6	AIAB	36	Draft document and video storyboard available			√
1.2 c (ii)	M	Web conference (overwiew on the field activities)	1	CRA-RPS	36	Meeting ppt presentations available			√
4.2.b	M	Insect dynamics and prevention/control of insect damages short report from partners	4	DiSTA-UniBO	41	Short reports from partners (data collections sheet)			√
1.2.c	M	Annual scientific meetings	1	CRA-RPS	42	Meeting ppt presentations available			√
2.2.b	M	Field trials in pilot farms	2	AU-H	42	Field trial concluded			√

Additional comments (in case of major changes or deviation from the original list)

The list of Milestones and Deliverables above reported is the updated one, approved by the Core Organic II Secretariat and to all the National Funding Agencies of the partners involved in the project, which was set up to take into account the no cost six months project extension.

3. Work package description and results:

WP 1	Coordination
Responsible partner: S. Canali (CRA-RPS)	
Original description of work: The WP aims to assure overall coordination (scientific, administrative, quality control and IP management) The WP is divided into following tasks: Task 1.1 – scientific coordination. Leader: Stefano Canali. Involved partners: all The activity is to constantly monitor project scientific activity, prevent deviations from original planning and in case of need define appropriate changes to work-plan. The decision body is the	

project steering committee (PSC) whose members are all WP and Task leaders. PSC will meet at least once every 6 months or during project meeting or via conference call and more often on case of need.
Task 1.2 – administrative coordination. Leader: Stefano Canali. Involved partners: all
The activity for the coordinator is to manage Italian partners administrative duties but as well to make sure that all other national partners are fulfilling their administrative duties towards their national authority.
Task 1.3 – quality control and IP management. Leader: Stefano Canali. Involved partners: all
The activity is to monitor the quality of all project deliverables (intermediate and final, publications , events, press releases etc.) prior to their dissemination. The quality control is done by the project coordinator together with PSC. IP (intellectual property) management will be assured by PSC information and evaluation of all scientific publications issued from or related to the project activity.

Report on results obtained and changes to the original plan/WP aims:

A- results obtained:

In order to ensure the appropriate integration and synergy among the different research groups and Countries, specific procedures to promote and carry out common discussion, manage the decision making process and share the project outcomes were developed. According to the activity plan, the following 5 workshops have been carried out:

1. the kick off workshop, held in Monsampolo del Tronto (IT) on September 2011, organised by CRA-ORA;
2. the WP4/WP5 joint workshop, held in Maribor (SLO) on February 2012, organised by the Maribor University;
3. the annual project workshop, held in Witzenhausen (DE) on February 2013, Organised by the UKAS University;
4. the annual project workshop, held in Aarslev (DK) on June 2014, organised by the Food Department of Aarhus University;
5. the project final workshop, held in Rome in February 2015, co-organised by AIAB and CRA-RPS.

In a first stage, a large part of the work done was finalized to set up common tools to consistently and homogeneously carry out the subsequent project activities. From the beginning, a shared dropbox® folder was opened and file storing criteria defined. Detailed research hypothesis were defined, identifying those valid at “transnational” level - to be simultaneously tested in each of the four Countries involved and across the range of the pedo-climatic environments considered within the project – and the “local” hypothesis, to be evaluated at national level, in specific environments. An excel *hypothesis matrix* was done.
On the basis of the research hypotheses, layouts for the planned field activities, either for the experimental and pilot farms, were defined. The *list of the common measurements* to be carried out in all the crops/sites/countries combination was agreed in order to provide consistent results to be used in the frame of the WP2.2 (yield and yield quality), WP 3.1 (nutrients uptake), WP 3.2. (N leaching risk) and WP 5.1 (competition assessment). Moreover, in accordance to sheared criteria, a data collection excel sheet was set up in order to store all the results obtained in the different field experiments as soon as they became available and let them available to the WP/task leaders from subsequent elaboration.
Simultaneously, the matrix for the collection of the information concerning *costs* (WP 2.3), *energy use* (WP 5.1) and *pests and beneficial insects monitoring* (WP4) were proposed by the respective WP/task leaders, discussed among the partners and agreed. These matrixes have been used for the data collection during the field trials.
All the results obtained in the two years 16 experiments (4 Countries * 4 experiment/Country) were collected in a file suite called “chocolate box”, specifically designed for the Interveg Project (Fig. 1). The results contained in the “chocolate boxes” have been quality checked according to a double check procedure opportunely set up in advance of the statistical elaboration and evaluation. Only the results which passed the quality check have been utilized for scientific publications. More in general, all the dissemination materials produced (see the specific session for details) were quality checked prior its diffusion.

B- comments on deviations from the original plan:
Once defined the exact starting date of the project (September 2010) it was possible to defined in detail the timeline of field activities in the experimental and pilot farms (Fig. 2) and plan all the other relevant activities accordingly. In order to allow, as foreseen in the original approved proposal, the cultivation of two cropping cycles for each crops in all the countries either in the experimental and pilot farms, a no cost six months project extension was requested. The list of deliverables and milestones was updated in accordance the new project duration and program. The requested was approved by the Core Organic II Secretariat and to all the National Funding Agencies of the partners involved in the project.
No deviations from the updated working plan (the one communicated to the CO secretariat with the request of extensions) were needed.

Fig. 1. Structure and features of the "chocolate box"

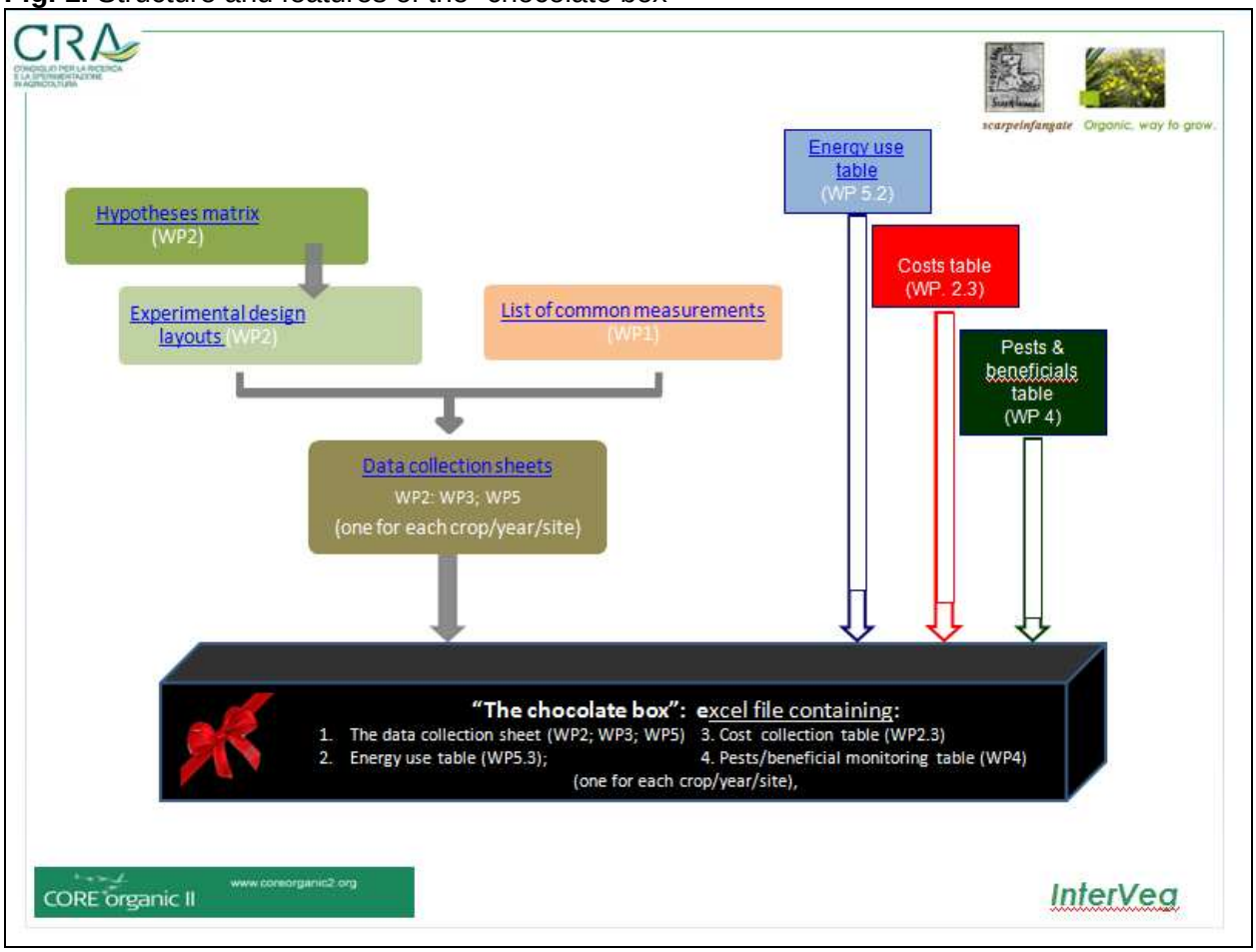
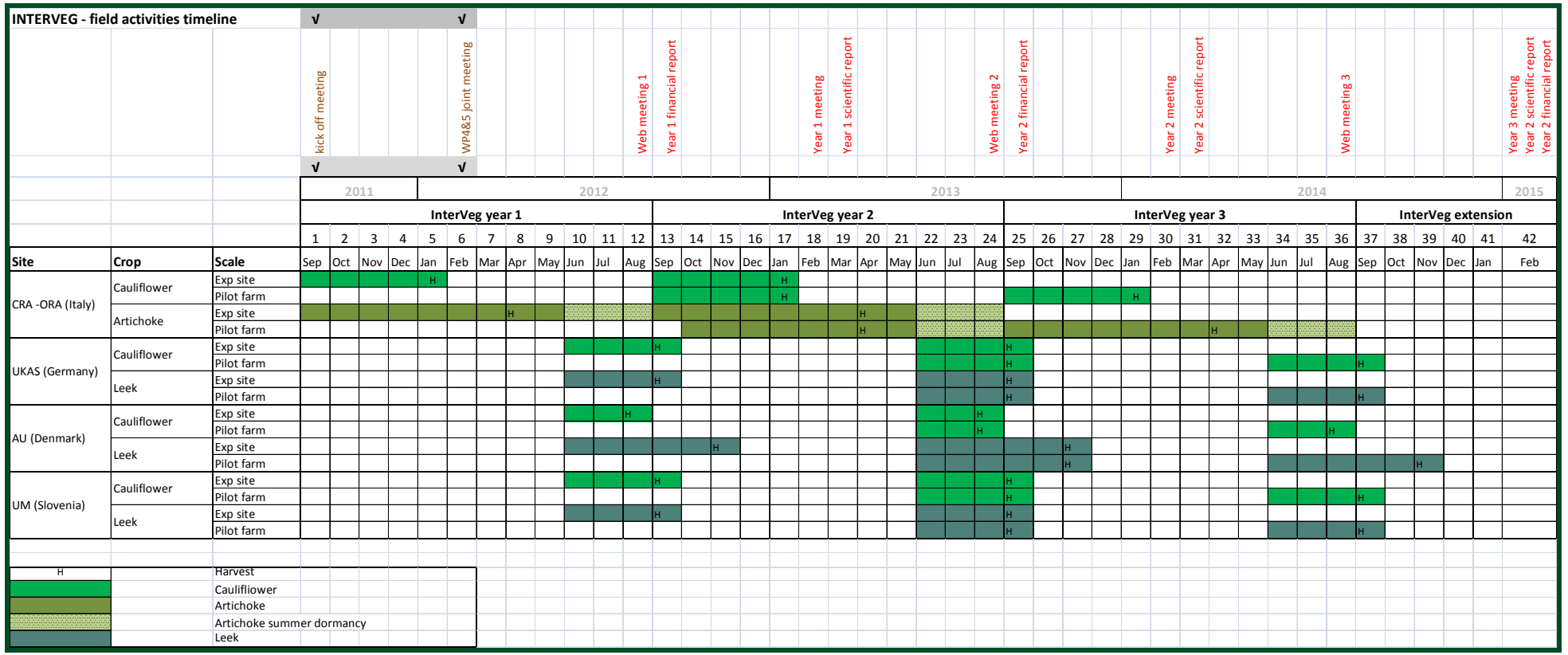


Figure 2. Timeline of the INTERVEG filed activities in the four involved CORE Countries



WP 2	Experimental sites establishment, management and harvest quality evaluation

Responsible partner: H.L. Kristensen (AU-H)

Original description of work:

Objectives: The WP is aimed to coordinate the establishment and the management of the field trials in the experimental sites and in the pilot farms, to evaluate the effect of intercropping on yield and produce quality and to assess benefits and costs in the intercropped systems compared with the sole crop ones.

The WP is divided into following tasks:

Task 2.1 - Field experiments implementation and management. Leader: H.L. Kristensen, AU-H. Involved partners: CRA-ORA, UKAS, AU-H and UM.

The main aim of this task is to coordinate the implementation and the management activities of the field trials. At the end of the first year of field trial in the experimental sites, each partner involved in the task will provide a short report with the main outcomes. AU-H will collect the partners' short reports and will elaborate an analysis aimed to identify critical points to be corrected in the next steps of the project and to plan the pilot farms trials.

In more depth:

- CRA-ORA will perform the artichoke/self-reseeding legumes and cauliflower/legumes intercrop systems in the IT experimental site (CRA-ORA Experimental Farm) in year I and II and in the pilot farm in year II and III;
- UKAS will perform the cauliflower/legumes cover crop and the leek/legumes cover crop intercrop systems at the Hessian Estate Frankenhausen, Experimental farm of the University of Kassel, in year I and II and in the pilot farms in year II and III;
- AU-H will perform the cauliflower/cover crop and the leek/legumes intercrop systems at the research centre Aarslev (AU) in year I and II and in the pilot farms in year II and III;
- UM will perform the cauliflower/legumes cover crop and the leek/legumes cover crop intercrop systems in his experimental site in year I and II and in the pilot farms in year II and III.

Task 2.2 – Yields and produces quality assessment. Leader: H.L. Kristensen, AU-H.
Involved partners: CRAORA, UKAS, AU-H and UM.

The main aim of the task is to evaluate the effect of intercropping on plant growth, yield and produce quality in comparison with the sole crop system. In the experimental sites, for each crop, the partners involved in the task will carry out measurements on yield and produce quality according to the methodology above described and will furnish the outcomes to AU-H. After the second year of field trials in the experimental sites, AU-H will collect data about the effect of intercropping on yield and produce quality and will produce a final report.

Task 2.3 – Benefits and cost assessment. Leader: L. Ortolani, AIAB. Involved partners: CRA-ORA, UKAS, AU-H and UM.

The main objective of this task is to asses costs and benefits of intercropped systems compared with the corresponding sole crop ones as well as the intercropping acceptance in the farming practice. AIAB will prepare a matrix to collect economic data of the two systems, including and specifying different categories of costs (energy consumption, water consumption, machinery use, human labour, etc). CRA-ORA, UKAS, AU-H and UM in their respective countries will be responsible to collect data from the experimental field and from the pilot farms. The matrix will be elaborated and distributed at project start-up, to allow data to be collected. Data collection will be performed in the pilot farm as it will allow to estimate economic impact at farm level and at crop rotation level and not only at field and crop level. Similarly, acceptability assessment (through a questionnaire prepared by AIAB) will be run at pilot farm level. AIAB will elaborate collected data by all involved partners and run a cost benefit analysis at crop level and estimate the farm level.

Report on results obtained and changes to the original plan/WP aims:

A- results obtained:

Task 2.1

The first phase of the InterVeg project was dedicated to plan in detail the field experiments, types and methodologies of measurements to be carried out. During and following the kick off meeting in Monsampolo and the WP4-5 meeting in Maribor details of management options and

cultivar choices were discussed and decisions were taken regarding sole crop and crop-living mulch systems in the field experiments and pilot farms. This included definition of common and site specific hypotheses to be tested (construction of a hypothesis matrix); as well as overlap between sites of cultivars tested when possible due to climatic conditions. In addition we went through a process of common planning of appropriate sampling schemes for the field trials year I and II resulting in a List of Common Measurements to be executed at all four experimental sites (Slovenian, German, Italian, Danish). This planning was done in close collaboration with WP3, 4 and 5. Experimental layout of the field trials was designed by each responsible partner in close collaboration with the WP5 leader to ensure fulfilment of the needs for weed-crop-living mulch competition studies. Field trials and the planned samplings were conducted at all experimental sites and years as foreseen. In Figure 1 the overall picture of the field experiments (either research and pilot farms) carried out in the frame of the InterVeg project is presented.

Task 2.2 Methodology for evaluation of yield and produce quality in the sole crop versus crop-living mulch systems in the field experiments were discussed and decided as part of the process in task 2.1 of making the List of Common Measurements. The results about yield and produce quality obtained in the first year were preliminary reported in Canali, S., Campanelli, G., Bavec, F., von Fragstein, P., Leteo, F., Jocop, M., Kristensen, H.L., 2014. Do living mulch based vegetable cropping systems yield similarly to the sole ones? Building Organic Bridges 1, 167–170.

The overall conclusive project results on yield and quality will be published in a scientific paper by Canali et al., which has been just submitted to the Journal "Renewable Agriculture and Food Systems" and it is under evaluation (see Table 2, *Hera*) .

Task 2.3

At the beginning of the project AIAB prepared the matrix to collect economic data of the experimented system with the contribution of all partners. All the partners collected data on the base of such matrix either in the first and in the second year experiments in accordance to what originally planned. The results obtained in this activity in the first year were reported in Ortolani, L., Kristensen, H.L., Campanelli, G., Bavec, M., Bavec, F., von Fragstein, P., Bergmam, A., Leteo, F., Canali, S., 2014. Cost and energy evaluation of organic cauliflower in sole crop and living mulch systems. Building Organic Bridges 1, 179–182.

B- comments on deviations from the original plan:

The yield and quality assessment of the weeded sole crop and crop-living mulch treatments in the experimental trial in Slovenia failed due to too small experimental plot size. The high weeds in the un weeded plots (needed for weed competition analysis in WP5) shadowed over the weeded plots and disabled proper crop and living mulch development and harvest. The plot size will be increased for experimental field trials in Slovenia in year II. No other deviations from the original plan were needed.

WP 3	Reduction of off-farm inputs for fertility management

Responsible partner: F. Tittarelli (CRA-RPS)

Original description of work:

The main objectives of this WP are to evaluate the potential for the reduction of off-farm fertilisers as consequence of intercropping introduction and to evaluate the potential risk of nitrate leaching in the intercropping system respect to the "sole crop" system.

The WP is divided into following tasks:

Task 3.1 – N, P K availability assessment. Leader: F. Tittarelli, CRA-RPS. Involved partners: CRA-RPS, UKAS, AU-H and UM.

The main aim of this task is to coordinate and to perform soil and plant analysis carried out to measure the effect of intercropping on macro - nutrient availability and uptake. At the end of the first year of field trial in the experimental sites, each partner involved in the task will provide a short report with results and main outcomes. CRA-RPS will collect the partners' short reports and will elaborate a provisional analysis based on the first year results on the effect of intercropping on soil nutrient availability and uptake. After the second year of field trials in the experimental sites, each partner involved in the task will provide a final report with the results obtained in the second cropping cycle and the main outcomes obtained in both the two years

experiments. CRA-RPS will collect the partners' reports and will elaborate the final analysis on the effect of intercropping on soil nutrient availability and uptake and the potential to reduce the use of off-farm inputs. In details, CRA-RPS will perform:

- basic soil analysis;
- soil sampling and analysis (mineral N and available P) in the artichoke/self-reseeding legumes and cauliflower/legumes cover crop intercrop systems in the IT experimental site in year I and II;
- N, P uptake in cauliflower, artichoke and cover crops in the IT experimental site in year I and II.

UKAS, AU-H and UM will perform:

- basic soil analysis;
- soil sampling and analysis (mineral N, available P & K) in the cauliflower/legumes cover crop and in the leek/cover crop intercrop systems in their experimental sites in year I and II;
- N, P. K uptake in cauliflower, leek and cover crops in the experimental site in year I and II.

Task 3.2 – N leaching potential risk evaluation. Leader: F, Tittarelli (CRA-RPS). Involved partners: CRA-RPS, CRA-ORA, UKAS, AU-H and UM.

The main aim of the task is to evaluate the effect of the introduction of intercropping on potential risk of N leaching. CRA-ORA, UKAS, AU-H and UM will carry out analysis of mineral N at different depth in their experimental sites. At the end of the first and the second year of field trial in the experimental sites, each of them provide a short report with results and main outcomes. These results will be used to calculate N leaching. CRA-RPS will collect the partners short report and will elaborate a provisional analysis, based on the first year results, and a final report, based on results of year I and II, on the effect of intercropping on potential risk of N leaching.

Report on results obtained and changes to the original plan/WP aims:

A- results obtained:

In order to evaluate the performances of the different management systems of the living mulch (no living mulch, early sowing, late sowing), and of the cultivar for cauliflower in all the experimental sites and for artichoke (Italy) and leek (all the other experimental sites with slight differences in the experimental designs), a common criteria for sampling (number of samples, timing and soil depth) was defined. The main decisions regarding the sampling protocol were taken during the first and second Project workshop in Monsampolo, Italy (Kick-off meeting, September 2011) and Maribor, Slovenia (February 2012).

In particular for Task 3.1 CRA-RPS has decided to sample soil at the following phenological phases for cauliflower: planting, fast growing, head formation and harvest.

For artichoke soil was sampled at: planting, first fresh flower, start of harvest and end of harvest.

In all sampling times, available nitrogen (as sum of NO3-- N and NH4+ - N) was determined, while Olsen P was determined only at planting and harvest.

Total N and P were determined in all the above soil biomass components of the system at harvest (yield, crop residues, cover crops and weeds) in order to quantify the amount of N and P uptaken by the above soil plant biomass and to calculate the uptake efficiency. For UKAS, AU-H and UM, soil available N, Olsen P and exchangeable K were determined and total N, P and K in cauliflower, leek and cover crop were measured for the evaluation of uptake efficiency.

For Task 3.2, in Italy the potential risk of nitrate leaching was evaluated by the use of microlysimeters at different depth (total 18 lysimeters per each crop), while UKAS, AU-H and UM sampled soil at different depths. Moreover, while microlysimeters were activated at any rainfall higher than 10-15 mm, in the other experimental sites, it was decided to collect soil samples at the beginning and at the end of the leaching season at different depth.

During the meeting held in Witzenhausen (Germany) last 12th and 13th of February, available elaborated results obtained in the different experimental sites were presented and openly debated.

The meeting gave to all participants the chance to put in evidence main significant results obtained in the first year of the project and, at the same time, main problems faced carrying out the field experiment. In particular, reported below are the more significant issues coming out from the discussion:

- In Italy, the drier and warmer autumn respect to the mean of the last thirty years determined a sensitive reduction of the risk of nitrate leaching in all the treatments, but in

particular in the treatments with living mulch (either for the early and late moment of sowing).

- In Italy and Slovenia, the availability of soil mineral nitrogen was affected by the system of management, while no cultivar effect was detected. As far as available P is concerned, no significant differences were observed in both countries neither as a function of system management nor as a function of the cultivated cultivar.
- N and P uptake in all above biomass components of the systems (yield, crop residues, living mulch and weeds) were calculated. N and P partitioning to different components of the systems showed that the percentage of uptake differentiated according to the system of management for the crop residues, while was quite homogeneous for the yield. In the Slovenian experimental site, the development of weeds in some treatments had an effect also in the amount of nitrogen and phosphorus uptake.
- In general the effect of the living mulch systems versus the sole crop system on the risk of nitrate leaching was found to vary depending on the local conditions and the management treatments tested. The early sown living mulch reduced the risk of nitrate leaching compared to the late sown living mulch and the sole crop system. However, this effect on nitrate leahing was in some cases accompanied by a reduction of crop yield, due to the higher competitive ability of the living mulch.

The preliminary results obtained within the activity of this WP were reported in:

- Kristensen, H.L., Campanelli, G., Bavec, F., von Fragstein und Niemsdorff, P., Canali, S., Tittarelli, F., 2014. Effect of an in-season living mulch on leaching of inorganic nitrogen in cauliflower (Brassica oleracea L. var. botrytis) cropping in Slovenia, Germany and Denmark. Building Organic Bridges 1, 199–202.
- Tittarelli, F., Kristensen, H.L., Campanelli, G., Bavec, F., von Fragstein, P., Testani, E., Robacer, M., Canali, S., 2014. Effect of living mulch management on nitrogen dynamics in the soil–plant system of cauliflower. Building Organic Bridges 3, 737–740.

Moreover, the conclusive project results regarding the nitrate leaching risk evaluation in leaving mulched systems and the dynamic of P will be published in two scientific papers, namely by Xie *et al*. and by Trinchera *et al*. which have been just submitted to the Journal "Renewable Agriculture and Food Systems" and are currently under evaluation (see Table 2, *Apollo and Hermes*).

B- comments on deviations from the original plan:

During the meeting held in Witzenhausen, it was possible to share main problems faced carrying out the field experiment. In particular, weed management in different treatments was object of discussion especially for the definition of competition indeces (WP5). Agreed changes in experimental field management for the Slovenian site are supposed to influence nutrients availability and uptake in the second year of the project. No other deviations from the original plan were needed.

WP 4	*Functional biodiversity and beneficial insect population management*

Responsible partner: *G. Burgio (DiSTA-UNIBO)*

Original description of work:

The aim of the WP is to evaluate the effect of intercropping on pest/beneficial dynamics and the potential of intercropping on enhancing biological control against insect pests. Within the first semester of the project, DiSTA-UNIBO will organise and coordinate a workshop with the partners involved in the task aimed at sharing expertise and set up common protocols for insect sampling. At the end of the first year of field trial in the experimental sites, each partner involved in the task will provide a short report with results and main outcomes. DISTA-UNIBO will collect the partners short report and will elaborate a provisional analysis, based on the first year results, on the effect of intercropping on ecological services and diseases/pest control and prevention. After the second year of field trial in the experimental sites, each partner involved in the task will provide a final report with the results obtained in the cropping cycle and the main outcomes obtained in both the two years experiments. DISTA-UNIBO will collect the partner reports and will elaborate the final analysis on the effect of intercropping on potential control of pests and

diseases.
In detail, CRA-ORA will perform:
- the pest damage measurements on the main crop in the artichoke/self-reseeding legumes and cauliflower/legumes intercrop systems in the IT pilot farms in year II and III;
DISTA-UNIBO will perform:
- insect pests sampling/identification, insect beneficial sampling/identification and evaluation of the percent of parasitism against pests in the artichoke/self-reseeding legumes and cauliflower/legumes intercrop systems in the IT pilot farms in year II and III;
UKAS, AU-H and UM will perform:
- the pest damage measurements on the main crop in the cabbage - leek/cover crop legumes intercrop systems in their pilot farms in year II and III;
- insect pests sampling/identification, insect beneficial sampling/identification, and evaluation of the percent of parasitism against pests in the cabbage - leek/legumes intercrop systems in their pilot farms in year II and III.

Report on results obtained and changes to the original plan/WP aims:

Considering that the aim of the WP was to evaluate the effect of intercropping on pest/beneficial dynamics, we decided to carry out an insect survey in the experimental sites during the first year, in order to collect preliminary data on pest infestations and beneficial occurrence. In the first workshop held in Maribor (February 8-10th 2012) together with the other partners, it was decided to focus on a trophic system involving a key pest with its natural enemies, with the object of transferring this knowledge in the pilot farm at the second year of experimentation. On the basis of this goal, a visual evaluation, as basic sampling method, was conducted to detect the key pest of the two crops in each partner country. In particular one sampling per month was carried out, checking 5 organs (leaf or flower) per plant, for 30 plants. A total amount of 150 sampling points randomly selected, was checked every month for at least 3 month. In the case of Denmark, selective techniques as sticky yellow traps and *diptera* eggs traps, were added to the visual evaluation, to determine the presence of trips and flies.
At harvest, the damage evaluation was carried out. The pest damage measurement was recorded, considering the relative score of damage: 0 = absence; 1 = light; 2 = intermediate; 3 = heavy.

A- results obtained:

Both in Italy and Denmark, the living mulch did not affect the infestation of cabbage caterpillar *Pieris* spp, showing no detrimental effect of this technique on this key-pest. In Italy, a very high level of larval parasitization was detected in both treatments; in one year, the percentage of parasitization was higher in LM (88%) *vs* sole crop (63%). In Denmark, in both seasons, aphid population were higher in sole crop system than LM.
LM positively affected the activity density of Carabid beetles, both increasing diversity and evenness of species (i.e. Italy and Slovenia) and activity density of some groups (Slovenia and Denmark). Overall, it is remarkable that in Italy and Slovenia, Carabid evenness was higher in LM in comparison with sole crop system; considering that evenness quantifies how equal a community is numerically, this finding could suggest that intercropping system with living mulch provided a more stable colonization of Carabid populations, leading to a higher uniformity of the species abundances. In some cases, the higher activity density of *Harpalus* spp.(see Slovenia and Denmark), a genus which includes generalist and seed-feeder species, could be explained by a more availability of seeds in living mulch plots. It is remarkable that also predator species (i.e. *Platynus* spp in Slovenia) showed an increased activity density in the living mulch treatment.
In Germany, Rove beetles activity density was higher in the sole crop system although the other soil arthropod taxa showed similar dynamic between the treatments.
An interesting result of this study is that living mulch in cauliflower did not negatively affect pest infestation, showing the lack of detrimental effects. Some positive effects on ecosystem services and soil diversity were detected in living mulch system, although the response was affected by the end-point used. In Italy, on artichoke, a rich complex of aphid predators was found, including ladybirds (Col. Coccinellidae) and hoverflies (Dip. Syrphidae).
In the case of Denmark, the key pest of leek should be selected considering the damage, because of the presence of three potential pests.

A similar scenario occurred in Slovenia, where the presence of two potential key pests was found for cauliflower, while no pest was recorded for leek. Also in this case, the key pests should be selected considering the damage occurrence.
A similar scenario occurred in Slovenia, where the presence of two potential key pests was found for cauliflower. Leek fly (Phytomyza gymnostoma), which causes harm also in commercial production, was found in the leek experiment.

The preliminary results obtained (first year of field experiments) have been published in:

- Burgio, G., Kristensen, H.L., Campanelli, G., Bavec, F., Bavec, M., von Fragstein und Niemsdorff, P., Depalo, L., Lanzoni, A., Canali, S., 2014. Effect of living mulch on pest/beneficial interaction. Building Organic Bridges 3, 741–744.;
- Canali, S., 2013. Interveg-enhancing multifunctional benefits of cover crops vegetables intercropping. Bulletin of Insectlogy Alma Mater Studiorum, Univ. Bologna Dept. Agroenvironmental Sciences & Technology, Viale G. Fanin, 42, Bologna, 40127, Italy.
- Robačer, M., Bavec, M., Grobelnik Mlakar, S., Vajs, S., Lešnik, M., Jakop, M., Canali, S., Bavec, F., 2014. Management practices effects on pests in organic cauliflower production. V: 6th Balkan Symposium on vegetables and potatoes, Zagreb, 29. September - 2. October 2014. Book of abstracts. Zagreb: University of Zagreb, Faculty of agriculture, p. 60.

Moreover, the conclusive project results regarding the activities of this WP will be published in a scientific paper by Dapalo *et al*., which has been just submitted to the Journal "Renewable Agriculture and Food Systems" and it is under evaluation (see Table 2, *Artemis*) .

B- comments on deviations from the original plan:
No deviations from the original plan were needed.

WP 5	Weed management and energy saving

Responsible partner: C. Ciaccia (CRA-RPS)

Original description of work:
The WP aims at managing the research activities to evaluate the potential of intercropping as agro-ecological,
indirect tool to weed control and to quantify its impact on the reduction of energy use for mechanical weed
control and in general crop management.
Task 5.1 – Yielding crops/cover crops/weeds interaction and competition assessment. Leader: C. Ciaccia,
CRA-RPS. Involved partners: CRA-RPS, UKAS, AU-H and UM.
The main aim of this task is to coordinate and to perform the evaluation of the effect of intercropping on weed population density and biomass production and the potential competitive effect between the components of intercropping. Within the first trimester of the project, CRA-RPS will organise and coordinate a workshop with the partners involved in the task aimed at sharing expertise and set up common protocols for weeds measurements. At the end of the first year of field trial in the experimental sites, each partner involved in the task will provide a short report with results and main outcomes. CRA-RPS will collect the partners' short reports and will calculate the competitive indices and elaborate a provisional analysis, based on the first year results, on the effect of intercropping on weed control. After the second year of field trial in the experimental sites, each partner involved in the task will provide a final report with the results obtained in the second cropping cycle and the main outcomes obtained in both the two years experiments. CRA-RPS will collect the partners' reports and will calculate the competitive indices and elaborate the final analysis on the effect of intercropping on competitive effects among the components of the systems (i.e. yielding crop/cover crop/weed) and the role of intercropping on weed control. In detail, CRA-RPS will perform:
- the determination of the total above soil biomass (yielding crops, cover crops and weeds) in the artichoke/self-reseeding legumes and cauliflower/legumes intercrop systems in the experimental site in year I and II;
- the identification of weed population composition (main species) in the artichoke/self-reseeding legumes and cauliflower/legumes intercrop systems in the experimental site in year I

and II;
- the calculation of competitive indexes (RBT, Cb, ATC) for all (different countries) sites/systems.
UKAS, AU-H and UM will perform:
- the determination of the total above soil biomass (yielding crops, cover crops and weeds) in the cauliflower and leek/ cover crop legume intercrop systems in their experimental sites in year I and II;
- the identification of weed population composition (main species) in the cauliflower and leek/cover crop legume intercrop systems in their experimental site in year I and II.
Task 5.2 – Energy saving quantification. Leader: L. Ortolani, AIAB. Involved partners: CRA-ORA, UKAS, AU-H and UM.
With the use of available data (from existing databases) the energy consumption of intercropped system will be estimated in all 4 experimental sites and compared to the sole crop systems. It is common understanding that intercropping decrease energy use due to no weeding operations and improved organic soil fertility that facilitates soil preparation but no data are available for real comparison. AIAB will prepare a grid for data collection in all 4 experimental sites and partners managing the 4 sited will supply the data that will be elaborated by AIAB.

Report on results obtained and changes to the original plan/WP aims:

Task 5.1
On February 2012 a workshop was organized in Maribor with the aim to let all the scientists involved in the task to discuss about critical point in experimental sites layouts assessment, objectives and activities. The main aim to obtain a common layout approach was reached. As second step the common competition assessment approach was shared to all the involved partner, aiming to evaluate cover crop competition role in weed management across the different sites. The competitive relationships among the three component - yielding crop, cover crop and weeds - were analysed by using biomass comparisons, competitive indices and weed community structure evaluation. The competitive indices were calculated by considering either two component at a time (cover crop vs weeds, crop vs weeds and crop vs cover crop) and the relative effect of one component in comparison to the others (crop vs weeds+cover crop and weeds vs crop+cover crop). On February 2013 and June 2016, the main outcomes of competition assessment for the first and the second experimental year were shared and discussed among all the partners at the Interveg workshop of Witzenhausen and Aarslev, respectively.

A- results obtained:
Task 5.1. Results showed an effect of cover crop sowing date on competitive relationship. More in detail:
i) Cover crop vs weeds: the competitive ability of cover crop was higher when late sowed
ii) Crop vs cover crop: cover crop did not influence crop biomass in late sowing but its biomass was reduced. Cover crop in early sowing compete with crop for limiting resources, showing an high competitive ability vs crop.
iii) Crop vs weeds: the competitive abililty was slightly different in cultivar comparison. Hybrid genotypes showed higher competive ability than open pollinated-local ones.
iv) Crop – cover crop – weeds competitive relationship: cover crop did not promote weed biomass in late sowing respect to no-cover crop systems contributing to a positive competitive ability of crop
In the artichoke experiment the use of root pruning limited the weed and cover crop biomass production showing a positive relationship with crop competitive ability in comparison to condition of absence of either cover crop and root pruning.
Main species identification was performed by each involved partner in all the experimental sites.
Task 5.2. The grid for data collection in experimental site has been prepared by AIAB with the contribution and comments of all the partners. The data collection for the first and strge second

year in experimental site were done by all the partners.
The preliminary results obtained (first year of field experiments) have been published in:

- Ciaccia, C., Kristensen, H.L., Campanelli, G., Bavec, F., von Fragstein, P., Robacer, M., Testani, E., Canali, S., 2014. Living mulch and vegetable production: effect on crop/weed competition. Building Organic Bridges 3, 717–720.

Moreover, the conclusive project results regarding the activities of this task will be published in a scientific paper by Ciaccia *et al*., which has been just submitted to the Journal "Renewable Agriculture and Food Systems" and it is under evaluation (see Table 2, *Ares*) .

Task 5.2.
A grid for energy data collection was prepared and sent to the partners to get information. As planned, partners managing the 4 sites supplied the data that were elaborated by AIAB.
The preliminary results obtained (first year of field experiments) have been published in:

- Ortolani, L., Kristensen, H.L., Campanelli, G., Bavec, M., Bavec, F., von Fragstein, P., Bergmam, A., Leteo, F., Canali, S., 2014. Cost and energy evaluation of organic cauliflower in sole crop and living mulch systems. Building Organic Bridges 1, 179–182.

Moreover, the conclusive project results regarding the activities of this task will be published in a scientific paper by Canali *et al*., which has been just submitted to the Journal "Renewable Agriculture and Food Systems" and it is under evaluation (see Table 2, *Hera*) .

B- comments on deviations from the original plan:
Due to the high weed pressure recorded in Slovenian leek and cauliflower trials, crop and cover crop plants died in presence of weeds. As a consequence their biomass (crop yield, crop residues and cover crop) were not available and, thus, part of the competitive indices was not computed. No other deviations from the original plan were needed.

WP 6	Stakeholders involvement and dissemination

Responsible partner: L. Ortolani (AIAB)

Original description of work:
The overall objective of this work package is to assure the involvement of organic vegetable producers and other stakeholders within the project activity and allow their practical implementation of project outputs. The objective will be reached through specific steps:
- identification and involvement of local vegetable producers (and other interested stakeholders such as extension people and local agriculture authorities) since the start-up phase;
- production/organization of dissemination materials and events for specific targets (farmers, extension, scientific society, civil society, policy decision makers, consumers etc.) .

Task 6.1 – stakeholders involvement. Leader: AIAB. Involved partners: all AIAB will prepare the guidelines for stakeholders involvement and monitor their implementation through the
project phases while each national implementing partner (AIAB for Italy, UKAS for Germany, AU-H for Denmark and UM for Slovenia) will implement them in their project activity.
Specifically for stakeholder involvement following activity are foreseen:
- 1 meeting for project presentation in each implementing country (I) before starting up of field activity with a selected group of 6-10 organic vegetables experts (producers and extension agents) in order to discuss project background, methodology and expected output.
- At least 2 field visits during the project time-spam at experimental field and/or at pilot farms implementing project schemes in each implementing country (IT, DE, DK and SLO).

Task 6.2 - Wrap-up of project outcomes and dissemination. Leader: AIAB. Involved partners: all
Each stakeholder group needs specific language and formats to make full use of project outcomes and as a consequence dissemination of project outcomes will be organized with appropriate tools for each category.
6.2.1 Dissemination towards producers and extension services. Project presentation, progresses and final outcome will be communicated with press-releases to organic and

conventional agriculture media and each partner communication tools (newsletter, web-page, magazines etc.). AIAB will prepare and English version (with input from all partners) to be translated into national languages by other partners (AIAB for Italy, UKAS for Germany, AU-H for Denmark and UM for Slovenia).
At first and second project year end a progress report will be prepared by AIAB (with input from all partners) for dissemination towards practitioners in appropriate format and language.
At project termination an information sheet (8-16 pages) will be prepared by AIAB (with input from all partners) 9 and translated in all involved National languages by National partners. It will be printed in 5 languages and distributed nationally. A digital version will be available at each partners web-page. The project information sheet in its web version will be complemented by a short video (in pod-cast) where the national research activity and outcome is described. The contents of the information sheet and videos will include: a) background information of intercropping techniques; b) specific experiences on vegetables and links to specific vegetable production problems that can be solved through intercropping; c) proposed techniques; d) project findings and outcomes; e) specific experience from pilot farms involved in the project.
6.2.2 Dissemination towards scientific community
Each research partner will monitor publication opportunities and presentation (at conferences) opportunities. In total 2 scientific publications are foreseen and at least 6 presentations at conferences/workshops. Specific occasions for publication and presentation within the organic scene will be used but as well the conventional horticulture scientific arena will be included.
6.2.3 Dissemination towards policy makers, consumers and civil society
As public/citizens support to farming and payment of agro-environmental services are important facts to be highlighted and intercropping techniques have a clear role in them, it is foreseen to present project outcomes also to all actors not directly involved in farming but influencing it by several means (buying preferences, public support etc.). Specific press releases on environmental benefits of experimented intercropping techniques will be produced in 3 project phases (starting-up, second year and final) by AIAB and translated into national languages by national partners. A final report on community benefits of intercropping will be produced and presented to EU Rural Network, EU, National and Regional authority (main document in English with summaries in national languages).

Report on results obtained and changes to the original plan/WP aims:

A- results obtained:

A continuous integration between stakeholders involvement and dissemination of the project results has been carried on in this WP with the aim of addressing different target groups since the beginning of the project.

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With reference to the task 6.1, guidelines for stakeholder involvement have been presented during the kick off meeting, and the process has started since the beginning of the project, considering the need to work in pilot farms in the second and third year. Data collection procedures and research design took into consideration the opportunity cost of collecting data in pilot farms and experiments in research stations have been adapted to pilot farm contexts. The two years experiments carried on in the organic farms represented an opportunity for continuous knowledge exchange between farmers and researchers. At the same time, the presence of the trials on farm allowed to address also other target groups on the project activities.

The project has been presented, during the first year, in at least one public meeting for each country with the aim of raise the attention of different target groups. In Italy, the presentation took place in Sassari, on the 20 of March 2012 with the participation of scientists, farmers and technicians with expertise in both organic and conventional agriculture. In Slovenia, the project has been presented during the Biosymposium helded from the 15-19 November 2011 in Maribor. In Denmark, the Interveg experiment has been presented during a stakeholder meeting involving organic vegetable growers at AU-Årslev. In Germany, the project has been presented during teaching activities in the University of Kassel. The coordinator presented the project in 2

international meetings; the core organic seminar in Paris on the 29/11/2011 and the TILLMAN Project interim meeting in Jan 2013.

During the project lifespan the field visits represents the opportunity to shows experiments both on farm and on experimental stations to different target groups. Field visits were carried out in each implementing country involving people with different backgrounds. They represented interesting learning experiences for all the participants. The knowledge exchange on the field result to be an effective tool to use a shared language among different target groups. More in detail, in Italy field visit have been held (two in December 2012 and one in December 2013) and groups of local farmers and technicians have visited the experimental site and the pilot farm. The technique experimented in the field, living mulch, has been shown to the participants. In Slovenia, 4 field days have been carried out and, moreover, on 27th of August 2013 (in Slovenia) and from 29 October - 2 November 2014 (in Croatia), the project was presented during international fairs and workshops.
In Slovenia beside to groups of farmers and stake holders living mulch was presented also to the students from the faculty of Maribor who also participated in research work and based on the field trial results finished their diploma work (Kekekc T. (2014). *Vpliv različnih načinov zastiranja na pridelek cvetače. Diploma thesis*. Maribor, http://dkum.uni-mb.si/IzpisGradiva.php?id=46433 and Hozjan Katja (2012). *Preliminarni rezultati pojava škodljivcev na cvetači v odvisnosti od načina pridelave. Diploma thesis*. Maribor, http://dkum.uni-mb.si/Dokument.php?id=51912.). Field trials were shown also to visiting agriculture students from BOKU Wienna, Austria and Osijek, Croatia.
In Germany, 3 field days were organized and also an international project presentation was carried out in Hungary, in the framework of the ICOAS 2013 workshop. A second one followed during the Conference of the German Horticural Society in Dresden.
In Denmark, 4 field days involved students, researchers and farmers and made INTERVEG results spread among all the local stakeholders. Six more events, lectures and workshops have been held in Denmark in order to share knowledge and best practices related to INTERVEG trials.

With reference to the task 6.2, specific dissemination activities have been developed for different target groups. Table 3 present in details dissemination activities developed during the whole project.
A first press-release in English language has been prepared by AIAB with input from other partners in November 2011. The press release has been used to promote the project on local press and on partners newsletters and websites. In Italy the news was present on 4 external news websites and on the AIAB web site in November 2011. The Danish agricultural newsletter and the Norwegian agricultural newsletter cited the project on January 2012, together with the partner website. In Germany the project was presented in several webpages: the University of Kassel one, the organic eprint database and the BLE homepage. Constantly, during the project period, each partner produced articles and short press releases on national languages to promote the dissemination of project activities towards practitioners in appropriate format and language.

Concerning the dissemination through producers and extension services a video, lasting about 16 minutes and entitled “Living Mulch in vegetables” has been produced and presented during the final project workshop, held in Italy on February 2015. The video has been broadcasting and publicizing at national and international level by each partner. The video, edited by a professional film-maker, explains what Living Mulch is, which the challenge is and what the potential disadvantages and advantages are; it shows**,** through interviews to the involved scientists, the project results in connection with the ecological services provided by the LM technique, telling also the point of view of the farmers. The video could be used in training courses and universities to better understand the techniques experimented in the project. In addition to the video, an information sheet, in electronic format, has been elaborated to show the main final project results. Each partner distributed the information sheet at national level. Both information sheets and video represent an useful information package for all the target groups (producers and technicians, policy makers, scientists).

The dissemination towards the scientific community concentrated in two cycles of scientific paper. The first group of paper, reported in tables 1, have been developed to be presented in the ISOFAR Conference in Istanbul in October 2014 both as posters or oral presentations. The second group of papers, reported in tables 2, are directed to peer review journals. Each WP produced a specific publication, in collaboration with others. This process of coordinated scientific paper development strongly encourage the collaboration between project partners not just on managing project activities but especially on developing new knowledge based on their reflection on experiments carried on in the project.

Posters showing the main project results have been presented in Australia and Brasil, during the 29th International Horticultural Congress and the 16th world Fertilizers Congress of CIEC. More details on scientific events in which the project has been presented are listed in the table below.

Concerning the dissemination towards policy makers, consumers and civil society, articles on grey literature, field days with related local press release and the video represented the main activities. A final report on community benefits of intercropping has been produced to be used for lobby activities. In Italy, the project and the main results were presented in a specific meeting targeted local authorities, civil society and stakeholders.

B- comments on deviations from the original plan:
The main activities have been realized respecting the target groups described in the work plan. However during the project some dissemination tools resulted to be more effective than others and so the balance between them as been changed. A coordinated press release has been done at the beginning of the project, however for individual field days each partner developed his own local channels of dissemination that resulted to be more effective in encouraging the participation of local stakeholders. The video has been anticipated with respect to the work plan because of the need to film the experimental sites and it became the core dissemination tool of the project. The video results to be useful for different type of target groups: from extension services and students to policy makers and consumers. It could be used, also after the project duration by policy makers and civil society to support environmental and economic benefit of living mulch. Dissemination to the scientific community has been largely covered by an high number of join publication with different partners as authors and by presentation of the whole project and specific issues studied within the project in International Conferences. Students represented an interesting additional target group largely involved in dissemination activities.
The project allowed to have interactive lessons for University students in all the countries involved in the project. Teaching activities focusing on the project results have been carried on in the University of Aahrus, the University of Kassel, the University of Maribor and the Politecnico delle Marche. Specific dissemination activities allow to involve students also from other EU countries such as Austria and Belgium.

4. Publications and dissemination activities

4.1 Dissemination activities and list extracted from Organic Eprints

The tables 2 and 3 list the main dissemination activities of InterVeg, respectively referred to the period 2011/2012 and 2013/2014. Tables 4 and 5 report the scientific papers published (table 4) and submitted (table 5). Please, note that publications mentioned in table 5, since not yet published, are not present in the Organic E-prints repository to date.

4.2 Further possible actions for dissemination

The dissemination plan of the INTERVEG project had a clear objective to reach a broader audience by defining different targets. Specific tools have been identified for the general public: the project leaflet, already available in English on project approach; the press releases translated in all languages and directed to the local press, the video with a duration of 16 minutes, the information sheet that explain to farmers and advisors the practical application of the technique, the acceptability questionnaire, that will help the policy maker to understand the

real applicability of the technique. In addition, the project has been largely promoted also through students, integrating the project contents in Universities teaching activities.

TABLE 2 - InterVeg – 2011/2012 dissemination activities

When/What/Where
16-17 November 2011 CORE organic II/RDD meeting, Scandic Hotel, Byghol, Denmark.
15-19 November 2011 Byosimposium, in Maribor, Slovenia.
29 November 2011 CORE organic Seminar in Paris, France.
3 November 2011 Press release in italian launched by AIAB
7 November 2011 News in www.greenews.info and in www.liquida,it
4 November 2011 News in www.closetonews.it and www.Italintermedia.com
11. Jan. 2012. Blomkål og porrer får selskab i marken. Agricultural Newsletter for Aarhus University. Janne Hansen.
11. Jan. 2012. Blomkål og porrer får selskab i marken. Homepage for the Danish Center for Food and Agriculture AU. Janne Hansen. http://agrsci.au.dk/nyheder/artikel/blomkaal-og-porrer-faar-selskab-i-marken/
13. Jan. 2012. Danske forskere tester samplanting av grønnsaker. Norwegian newsletter for agriculture. Marianne Røhme.
http://www.norsklandbruk.no/naeringsutvikling/2012/01/13/danske-forskere-tester-samplanting-av-groennsaker.aspx
16. Jan. 2012. Cauliflower and leeks to have company in the field. Homepage for the Danish Center for Food and Agriculture AU. Janne Hansen.
20 March 2012 Stakeholder meetings in Sassari, Italy
20. Sept. 2012. Stakeholder meeting: Organic vegetable growers meeting at AU-Årslev with presentation of the Interveg field experiment. Arranged in collaboration with the Fruit & Vegetable advisory service.
27-28. Sept. 2012. Two days of teaching and experimental exercise in the Interveg field experiment with 23 students at the AU-Agro Environmental Management master education course Nutrient Cycling and Environmental Management.
11.-12. Oct. 2012. One day of teaching and experimental exercise in the Interveg field experiment with 8 students at the AU-Agrobiology master education course Crop Nutrition and Physiology.
7 December 2012 Field Visit in Monsampolo del Tronto, Italy
7 December 2012 Field Visit in the pilot farm in Pescara, Italy
23 January 2013 TILLMAN Project interim meeting, Birmingham, UK

TABLE 3 - InterVeg – 2013/2014 dissemination activities

When (dd/mm/yy)	Where (City/name of the farm)	What	Country	Target groups
10th of April 2013	ROME - Workshop with Regione Lazio local authority	Project introduction and selection of first year results	Italy	Policy makers, Civil Society
3rd of June 2013	Organic pilot farm Berden	Introduction of the project	Slovenia	Farmers, Civil Society, Scientists, Extension Services
3rd of October 2013	UM FKBV - field trials	"Open day in experiments" with national TV recording	Slovenia	Farmers, Civil Society, Scientists, Extension Services
13th of June 2013	UM FKBV - field trials	Introduction of the project - Students from BOKU Vienna	Slovenia	Farmers, Civil Society, Scientists, Extension Services
11th of July 2013	UM FKBV - field trials	Introduction of the project - Experts from Faculty of agriculture - Osijek	Slovenia	Farmers, Civil Society, Scientists, Extension Services
27th of August 2013	Gornja Radgona, Slovenia	Presentation on international fair of agriculture and food – AGRA	Slovenia	Civil Society, Consumers, Agricultural Sector, Policy makers

29 October - 2 Noveber 2014	Zagreb (Croatia)	6th Balkan Symposium on Vegetables and Potatoes"	Slovenia	Scientific community
29th of June 2013	Hessian State Etate Frankenhausen	Open day Event	Germany	Farmers, Civil Society, Scientists, Extension Services
9th of July 2013	Hessian State Etate Frankenhausen	Visit of Prof. Dr. H. Paillan, University of TALCA/Chile	Germany	Students, Scientists, extension services, farmers
5th of July 2013	Hessian State Etate Frankenhausen	Student tour of the course Special Crops	Germany	Students, Scientists, extension services, farmers
9th-13th of October 2013	Eger, Hungary	Presentation at the 4th International Conference on Organic Agriculture Sciences (ICOAS), “Multi-functionality of living mulch in organic vegetable production systems”	Hungary	Scientific community
3rd of May 2013	Aarslev Denmark/Research centre Aarhus University-Aarslev	Presentation and experimental exercises in the Interveg field experiments as part of the Ph.D. course Applied Crop Physiology at Aarhus University	Denmark	Students, Scientists, extension services
12th of September 2013	Aarslev Denmark/Research centre Aarhus University-Aarslev	Presentation and experimental exercises in the Interveg field experiments as part of the Master course Nutrient Cycling and Environmental Management (Agro-Environmental Management line) at Aarhus University to 22 students	Denmark	Students, Scientists, extension services
10th of October 2013	Aarslev Denmark/Research centre Aarhus University-Aarslev	Presentation and experimental exercises in the Interveg field experiments as part of the Master course Crop Nutrition and Physiology (Agrobiology line) at Aarhus University to 7 students	Denmark	Students, Scientists, extension services
24th of October 2013	Aarslev Denmark/Research centre Aarhus University-Aarslev	Presentation of the Interveg field experiments to stakeholders from the Chinese-Danish company NATURE DK and the Danish Advisory Service Horti-advise (3 persons)	Denmark	Extension Services, Market actors, Policy Makers, Civil Society
27th of November 2013	Vingsted Centre, Vejle Denmark	Workshop poster presentation of the Interveg project at the National Organic Congres (ØkologiKongressen), Denmark. Nov. 27-28.	Denmark	Farmers, Civil Society, Scientists, Extension Services
6th of September 2013	Tangkrogen, Aarhus Denmark	Poster presentation at the FOOD FESTIVAL of the Interveg project, Sept. 6-8.	Denmark	Consumers
17th of September 2013	Ghent Belgium/Ghent University	Conference oral presentation including a presentation of the Interveg project at the NutriHort conference: Nutrient management innovative techniques and nutrient legislation in intensive horticulture for an improved water quality. Sept. 16-18. Book of Abstracts p. 21. Abstract no. 16.	Belgium	To >100 scientists and other stakeholders.
25th of November 2013	Aarhus University, Aarhus Denmark	Teaching including a presentation of the Interveg project as part of the Master course Organic Fruit Berries and Vegetables in a Temperate Climate	Denmark	Students, Scientists, extension services

		(Agrobiology line) at Aarhus University to 6 students		
5th-8th of March 2014	Dresden	Fragstein und Niemsdorff, P. von, Presentation at the Congress of the German Horticultural Society, "Multifunktionalität von Untersaaten im Ökologischen Gemüseanbau"	Germany	Scientific community
5th-7th of September 2014	Århus	Xie, Y, Kristensen, H. L. Poster presentation at the FOOD festival 2014 Århus 5.-7. Sept. 2014 "Complementary root systems in organic intercropping of vegetables."	Denmark	Students, Scientists, extension services
21st-22nd of June 2014	Copenhagen	Xie, Y. Kristensen, H. L. Poster presentation at ESOF European Science Open Forum 2014 Copenhagen, 21.-22. June 2014. "Complementary root systems in organic intercropping of vegetables."	Denmark	Students, Scientists, extension services
13th-15th of October 2014	Istanbul	Kristensen, H. L., G. Campanelli, F. Bavec, P. von Fragstein und Niemsdorff, Y. Xie, S. Canali F. Tittarelli (2014)Effect of an in-season living mulch on leaching of inorganic nitrogen in cauliflower (Brassica oleracea L. var. botrytis) cropping in Slovenia, Germany and Denmark. Oral presentation and proceedings of the 4th ISOFAR Scientific Conference 'Building Organic Bridges' at the Organic World Congress 2014	Turkey	Scientific community
22nd-24th of October 2014	Copenhagen	IARU Sustainability Science Congress 22 -24 October 2014 in Copenhagen, Denmark	Denmark	Scientific community
17th-22nd of August 2014	Brisbanne (Austratia)	The 29th International Horticultural Congress	Australia	Scientific community
20th-24th of October 2014	Rio De Janeiro (Brasil)	16th world Ferilisers Congress of CIEC	Brasil	Scientific community

TABLE 4. InterVeg – first year scientific publication plan

Paper nickname	Topic/Title	First author	Middle authors	Last author	Destination	Organic E-Prints id no
Doc	**DO LIVING MULCH BASED VEGETABLE CROPPING SYSTEMS YIELD SIMILARLY TO THE SOLE ONES? THE INTERVEG (CORE ORGANIC II) RESEARCH PROJECT IS SEEKING THE ANSWER**	S. Canali	G. Campanelli F. Bavec P. von Fragstein F. Leteo Y. Xie M. Jacop	H.L. Kristensen	ISOFAR 2014 http://www.owc2014.org/	23521
Sneezy	**EFFECT OF LIVING MULCH MANAGEMENT ON NITROGEN DYNAMICS IN THE SOIL – PLANT SYSTEM OF CAULIFLOWER**	F. Tittarelli	H.L. Kristensen G. Campanelli F. Bavec P. von Fragstein E. Testani M. Robacer	S. Canali	ISOFAR 2014 http://www.owc2014.org/	23905
Dopey	**LIVING MULCH AND VEGETABLE PRODUCTION: EFFECT ON CROP/WEED COMPETITION**	C. Ciaccia	H.L. Kristensen G. Campanelli F. Bavec P. von Fragstein M. Robacer E. Testani	S. Canali	ISOFAR 2014 http://www.owc2014.org/	23772
Happy	**EFFECT OF LIVING MULCH ON PEST/BENEFICIAL INTERACTION**	G. Burgio	H.L. Kristensen G. Campanelli F. Bavec P. von Fragstein L. Depalo A. Lanzoni	S. Canali	ISOFAR 2014 http://www.owc2014.org/	23908
Bashful	**EFFECT OF AN IN-SEASON LIVING MULCH ON LEACHING OF INORGANIC NITROGEN IN CAULIFLOWER (BRASSICA OLERACEA L. VAR. BOTRYTIS) CROPPING SYSTEMS IN SLOVENIA, GERMANY AND DENMARK**	H.L. Kristensen	G. Campanelli F. Bavec P. von Fragstein S. Canali Y. Xie	F. Tittarelli	ISOFAR 2014 http://www.owc2014.org/	23981
Sleepy	**COST AND ENERGY EVALUATION OF ORGANIC CAULIFLOWER IN SOLE CROP AND LIVING MULCH SYSTEMS IN THREE EUROPEAN COUNTRIES**	L. Ortolani	H.L. Kristensen G. Campanelli F. Bavec P. von Fragstein A. Bergmam F. Leteo	S. Canali	ISOFAR 2014 http://www.owc2014.org/	23713
Grumpy	**SYSTEM ASSESSMENT OF ORGANIC LIVING MULCH − CAULIFLOWER (BRASSICA OLERACEA L. VAR. BOTRYTIS) CROPPING SYSTEMS**	S. Canali	G. Campanelli F. Bavec P. von Fragstein G. Burgio C. Ciaccia F. Tittarelli L. Ortolani	H.L. Kristensen	IHC 2014 http://www.ihc2014.org/	To be uploaded

TABLE 5. InterVeg – final peer reviewed scientific publication plan

Paper nickname		Tentative title	Authors	Destination	Submission deadline
	*HERA* *The Goddess of fertility and abundance*	Effect of LM on yield, products quality and energy use in vegetables	Canali, S., Ortolani L., Campanelli, G., Bavec, M., von Fragstein, P, Kristensen H.L.	RAFS Themed Issue	July 15th , 2015
	*ARES* *The God of war*	Living mulch for ecological weed management in organic vegetable cropping systems	Ciaccia, C., Kristensen, H.L., Campanelli, G., Xie, Y., Testani, E., Leteo F., Canali, S.	RAFS Themed Issue	July 15th , 2015
	*ARTEMIS* *The Goddess of the hunt and wilderness*	Living mulch and arthropod fauna: analysis of ecological sustainability of cauliflower in four different European scenarios	Depalo, E., Burgio, G., von Fragstein, P., Kristensen, H.L, Bavec, M., Robacer, M., Campanelli, G., Canali, S.	RAFS Themed Issue	July 15th , 2015
	*APOLLO* *The God of music arts and knowledge*	Nitrogen management in organic cauliflower (Brassica oleracea) and leek (Allium porrum) intercropping systems across European conditions	Xie, Y., Tittarelli, F., von Fragstein, P., Bavec, M., Canali, S., Kristensen, H.L.	RAFS Themed Issue	July 15th , 2015
	*ATHENA* *The Goddess of intelligence*	Living mulch strategies to sustain yield and manage weeds in organic cauliflower (Brassica oleracea L.) production in Mediterranean conditions	Montemurro, F., Ciaccia, C., Diacono, M., Campanelli, G., Tittarelli, F., Leteo, F., Canali, S.,	RAFS Themed Issue	July 15th , 2015
	*HERMES* *The messenger of the gods*	Effects induced by living mulch on biotic and abiotic rhizosphere interactions in artichoke	Trinchera, A., Testani, E., Ciaccia, C., Campanelli, G., Leteo F., Canali, S.	RAFS Themed Issue	July 15th , 2015
	*APHRODITE* *The Goodness of love and beauty*	Cover crops in open field organic vegetable production (Review paper)	Robačer M., Canali S., Lakkenborg Kristensen H., Bavec F., Grobelnik Mlakar S., Jakop M., Bavec M.	Scientia Horticulturae	Submitted June 28th, 2015

4.3. Specific questions regarding dissemination and publications

- Is the project website up-to-date?

The text available at the “Projects website”, which has been updated from the previous version, has to be used for the Interveg website page in the Core Organic II web portal. Also photos coming from the field experiments are available and can be uploaded.

- List the categories of end-users/main users of the research results and how they have been addressed/will be addressed by dissemination activities

Farmers: Field day in Italy, Organic vegetable growers meeting/fied day in Denmark and Pilot farm activities in Slovenia, Germany, Italy and Denmark.
Policy Makers: CORE organic seminar in Paris and CORE organic/RDD meeting in Denmark/Video on line
Students: Teaching activities in the 4 universities involved in the project.
Scientists: Conferences and databases such organic e-print.
General Public: web pages of the partners, press release and news in some website, field days and video.

- Impact of the project in relation to main beneficiaries of the project results
  (Note: for the different categories of end-users/main users of the research results, explain how well the project has been able to reach these target groups, and any known impact)

The main beneficiaries of the project were organic vegetable growers that have an available technique for different crops (cauliflower, leek, artichoke).
The farmers were involved since the beginning of the project following the stakeholder involvement guidelines presented by AIAB in the Kick off meeting.
The experimental activities represented an opportunity for continuous knowledge exchange among farmers and researchers. During the field visits, the knowledge developed by farmers and researchers was shared with all the target groups and stakeholders.
The involvement of farmers during all the project process facilitated the diffusion of project result and the possibility for the main beneficiaries to deep their knowledge on the specific technique.

5. Added value of the transnational cooperation in relation to the subject

The researchers involved in the Interveg belong to Countries having a wide range of social, economic and environmental conditions and, consequently, they have approached the living mulch study bringing into the project different perspectives. Their expertise already available, mainly developed at national level by the different scientists in the frame of local research projects resulted largely complementary and once shared, allowed the exploitation of relevant synergies.
The common discussion and the experiences shared is promoting the buildup of a common expertise about living mulch as potential tool to manage organic cropping systems will contribute to spread within the European organic stakeholder communities a consistent knowledge on ecological service providing crops.

ANNEX 1: CHANGES IN WORK PLAN AND PROBLEMS ENCOUNTERED

Changes in consortium and work plan

No changes in Consortium have been done.

Problems encountered, delays and corrective actions planned or taken, if any:

A no extra costs, six month project extension was requested to the COII secretariat and to the National Funding Agencies of all the partners involved in the project. In accordance to the request, a new list of milestone and deliverables was proposed. The extension and the new list were regularly approved. Other corrective actions were not necessary.

ANNEX 2: COST OVERVIEW AND DEVIATIONS FROM BUDGET

Project budget and costs in €:

Partner no.	1 CRA-RPS	2 CRA-ORA	3 AIAB	4 DISTA – UNIBO	5 UKAS	6 AU-H	7 UM
TOTAL BUDGET	43000	55000	35000	28000	113698	173000	35000
SPENT after M 42 (end of the project)	43000	55000	35000	28000	113698	186.960	35000
DEVIATION	-	-	-	-	-	+13.960	-

Person months (PM) spent on the project:

Partner no.	1 CRA-RPS	2 CRA-ORA	3 AIAB	4 DISTA - UNIBO	5 UKAS	6 AU-H	7 UM
TOTAL PM budgeted	9.0	27.2	12.0	13.5	22.0	18.0	5.0
PM spent M 42 (end of the project)	9.0	27.2	12.0	13.5	22.0	18,37	5.0
DEVIATION	-	-	-	-	-	+ 0.37	-

Reasons for major deviations in spending compared to original budget:

Major deviations in spending have not occurred.

ANNEX 3: RECOMMENDATIONS TO THE CORE ORGANIC CONSORTIUM IN RELATION TO LAUNCHING AND MONITORING OF FUTURE TRANSNATIONALLY FUNDED RESEARCH PROJECTS

- Core Secretariat is asked to provide a dedicated and effective web conferencing tool. Indeed, the most of the open source application available on the web are not powerful enough to allow quality conferences among the partners and this has often been an obstacle for the project managing and information sharing;
- The research topics definition should be keep transparent as much possible, including scientists communities among the stakeholders involved and attributing to them peer role with respect to the other stakeholders groups;
- The budget formation system based on the “virtual common pot” should be preferred over other solutions since it enables involved scientists to deal with the national funding procedure which are familiar to them;
- Transnational research calls should be based on the “two step” process is more efficient in term of resources use. Direct involvements of specific research groups/bodies should be avoided;
- The scientific evaluation of the project proposal should be carried out by a transnational committee composed of peers in both the steps of the call;
- Assistance to the project consortiums by a call secretariat should be guaranteed for all the project(s) duration.