DM2008 FULL PROPOSAL TEMPLATE

1. DM PROPOSAL NUMBER AND TITLE

(a) **Proposal Number: 5381**
(b) **Proposal Title: Converting Rice Fields into Green Fertilizer Factories**

2. PROJECT SUMMARY

(a) **Rationale:** Food prices are increasing worldwide. In Ecuador agriculture faces great challenges, one of them being the sustained use of artificial nitrogen fertilizers, which contaminate the soil, surface water and groundwater, negatively affecting native environments and long term productivity. The country needs to develop new, sustainable and environmentally friendly models, with crops that make business sense, are competitive, ensure quality and food security. Ecuador needs to accelerate technological development based on its native resources. Currently, purchases of imported chemical fertilizers for agriculture drain funds from the economy with social and environmental effects; these imports represent around US$ 70 million per year for rice crops and they represent about 30 % of current productions costs.

(b) **Objective:** To develop Azolla Anabaena (AA) cultivation to increase rice yields, reducing or eliminating the dependency on imported fertilizers.

Azolla is a tiny free floating aquatic fern, which grows in symbiosis with nitrogen-fixing cyanobacteria Anabaena azollae and has the potential to replace artificial nitrogen fertilizers. Therefore the project aims to eliminate the use of artificial nitrogen substances; to incorporate organic nitrogen to the crop; to maintain and improve the quality of rice fields, water and soil; and to strengthen social inclusion.

(c) **Innovation:** AA is a new and innovative crop that presents a novel opportunity to expand and diversify the supply of fertilizers and production of rice fields.

Moreover, applications of AA trigger the emergence of innovative forms of rural economy, actions of gender, social inclusion of farmers, organic farming, carbon dioxide sequestration and tropical knowledge.

3. PROBLEM DEFINITION / RATIONALE

The rice in Ecuador is an essential and primary food for most of the population. The country harvests more than 350 000 ha involving more than 140 000 families. Therefore it is important that rice is produced cost-efficiently and in an environmentally sustainable manner.

The production costs of rice depend on the type of seed, fertilizer and phytosanitary package used to control weed and insects, costs of labor, land preparation, rental equipment for seeding and harvest, and irrigation. The majority of fertilizers are chemical-based, involving heavy imports and cause environmental problems, because more than 40 % of the applied fertilizer is released into the environment, as plants cannot utilize 100 %.

The application of artificial nitrogenous fertilizer in rice cultivation represents a high drain of foreign exchange, while also contaminate the soil, surface water and groundwater, affecting the development of beneficial flora and fauna of the earth, and decreasing productive potential of the land in the long term.

This situation creates a great need and at the same time opens a huge opportunity for urgent development of an alternative fertilizer based on native resources, like AA, and its technical application.

The use of AA in rice fields will increase yield per hectare, while significantly reducing production costs. AA and other less chemical-based fertilizers are cheaper, since they contain less of the expensive urea and represent low field costs.

Comparing current technology with the use of AA, a rice field fertilized with AA is more productive, cleaner and more sustainable in the economic, social and environmental sense.

In Ecuador, in general, the benefits of AA have not been widely known. Rice farmers, mostly eliminated it, thinking that AA was a weed. One of the key objectives of this project is therefore to disseminate knowledge about the benefits of AA cultivation.

4. PROJECT OBJECTIVE

Azolla is a tiny aquatic floating fern that houses in the gaps in the base of its leaves a nitrogen-fixing cyanobacterium gender Anabaena azollae. Azolla fixes nitrogen from the air during its life and dies when this fixed nitrogen is used by plants.

Growing Azolla in the rice field can produce a fertilizer for rice and other crops.

The project's objectives are:

- To establish a gene bank of Azolla-Anabaena (AA) on ESPOL, and permanent azollaries and seedbeds of symbiont AA (Azolla + Anabaena) in selected cooperatives
- To transfer technology and to extend the application of AA as nitrogenic biofertilizer of rice crops in areas influenced by the project, and to generate own technological package systems concerning the rice-Azolla-Anabaena;
- To eliminate the use and application of artificial nitrogen to the crop and incorporate organic nitrogen, to maintain and improve the quality of the rice fields, water and soil.

The field research of the project could be applied to the entire rice farming industry of the country, which occupies 300 000 hectares, employing 22 % of the economically active

population and benefitting about 140 000 families. The alliance of AGRIPAC and ESPOL articulates scientific research and commercial development.

The geographical area the project seeks to directly address includes the municipalities of Yaguachi and Daule. The area indirectly impacted covers the whole rice-growing area of the Guayas Ecosystem.

Different social impacts and ways of (measuring) AA project include:
(a) Increased yields (t/ha/cycle);
(b) Reduction of agricultural inputs (kg/ha/cycle & L/ha/cycle);
(c) Cost Reduction in rice crop (US$/ha/cycle);
(d) Increase in income (US$/ha/cycle);
(e) Increasing of the beneficial soil organic matter (g/ha);
(f) Increase of soil microbial populations (cell counts/m^2);
(g) Reduction of contaminant water ammonium contents (mg N-NH_3/m^3);
(h) Gender issues (# women + # elderly + # children, planting, harvesting and managing AA in rice crops); and
(i) Appreciation of tropical knowledge of Ecuador (# Research publications).
(j) Social inclusion (# cooperatives & # rice farmers);

Social inclusion is reflected in many aspects including the training of poorly educated farmers who have cultivated rice in a traditional manner, the formation of groups interested in taking advantage of this new technology to improve rice production and environmental protection, the participation of smallholder rice of minor technical and economic capacity, and involving the whole family rice farm in the labour force in handling technical and marketing decisions.

5. KEY PROJECT DESIGN ELEMENTS

5a) Innovation

The leading innovation of this project is the replacement of artificial chemical components by organic nitrogen in rice crops; the implications on chemical and biological agriculture are going to be studied in order to extend this knowledge to other crops in Ecuador and other tropical regions of the planet. AA is a green manure that can be associated in a sustainable manner with rice cultivation and its biochemical reactions are directly linked to the needs of the plant and the environment. The project looks for high levels of savings in natural energy and matter, considering that the end product is green manure with substantial differences from other organic fertilizers, such as humus, compost or bokashi, due to nitrogen content, its structure and functions. Moreover, rice crops become fertilizer factories and generate additional income for farmers due to higher yields and sales from harvested surplus AA. At the end of the growing cycle of rice-Azolla this can be harvested and sold to farmers that grow other crops.

The focus is the emerging rural economy. In this respect, AGRIPAC will develop packaging and marketing with the inclusion of farmers. AA also opens interesting perspectives in other fields such as chemistry and biology of agriculture, carbon sequestration and climate change, global

cycles (carbon, nitrogen, phosphorus and hydrological), and emerging finance and economy, all within the context of tropical knowledge, whenever our country for its exclusive geographic position on the planet presents an opportunity to generate knowledge on issues of tropical agriculture, environment, health, economy, education and engineering.

While the benefits of introducing AA in rice cultivation have been known since 20 centuries ago in China, in Ecuador the enormous potential of a native species of Azolla in the production started to be valued for the environment and the economy of the rice farmers only recently.

This project activates this technology on a commercial scale for the first time. The production of biofertilizer Azolla Anabaena in flooded rice paddies, in order to be extracted, dried, packaged and sold as fertilizer for application in other crops is a novelty in Ecuadorian agriculture. Potential applicantions of a fertilizer 100 % natural, renewable and organic are becoming numerous, parallel to the growing number of producers in the country.

Another innovation is that the crop of AA could be linked to the gender issue. The maintenance of AA and its application to rice can be entrusted to women, children and elderly, namely people who stay at home, with economic advantage for them.

TABLE 1: Type of Innovation
Directions: Choose which type of innovation best describes your project. (See Annex B "Typology of Innovation" for reference).
☐ New technology X New product, benefit or results X New delivery method and/or service ☐ New financing method ☐ Application of demonstrated approaches to new types of beneficiaries

TABLE 2: Stage of Testing Out the Innovation
Directions: Choose the most accurate category that describes the *current* stage of the proposed project's innovation (prior to receiving DM funding).
☐ **Idea stage/early stage**: Innovation has not been tested. Idea is still a concept. No prototype exists yet. ☐ **Early testing stage**: Innovation has evolved beyond an untested concept / blueprint. For example, a prototype has been developed but not field-tested on a sufficient scale to indicate viability of idea. **X Proof of concept**: Innovation has been tested and validated to demonstrate that the business model or idea is feasible, but not at a sufficient scale to indicate viability of idea under a variety of conditions. ☐ **Ready for Scale-up / Replication**: Innovation has been successfully validated / field tested under several conditions. It is ready to be scaled-up or replicated in other geographic areas.

5b) Project's Geographic Area of Influence

The project takes place in the municipalities of Vinces (Artillería) and Santa Lucía (Mangle), which are located in the province of Guayas. Although both have very fertile soil, perfect for agricultural production, mainly rice, soil types differ in their structure in the two provinces. It is therefore an objective of the project to find out more about different classes of soil.

The two areas are the most representative of the rice sector in the country. The project's development on these sites will have direct influence in the provinces of Guayas and Los Rios. 98% of the rice production of Ecuador develops in these two regions.

This project will also contribute to acquiring more knowledge about the Guayas Ecosystem. This ecosystem is a good representation of a tropical area covered by the Gulf of Guayaquil and connecting watersheds including 105 municipalities in 13 provinces, in an area of about 6 million hectares (See figure Annex B. Guayas Ecosystem).

The Guayas Ecosystem exhibits peculiarities that are unique in the world, such as its strategic position with regard to longitudinal and latitudinal magnetic axes of the planet, all levels of altitude ranging from the peak of the Chimborazo mountain to the imposing depths of the Pacific Ocean, impressive biodiversity, a valuable estuary of the Guayas River and the production of bananas, cocoa, passion fruit, vegetal ivory (tagua) and shrimp for the global market.

The interest at any level in the Guayas Ecosystem emerges from the diversity and opportunity of knowledge areas and applications. The themes of environment, agriculture, health, economy, education, engineering, can be developed here in the tropical perspective and extrapolated to the whole tropical zones of the world.

6. IMPLEMENTATION PLAN

The activities to be implemented in the project include: (1) To develop a genetic bank of Azolla-Anabaena (AA) in ESPOL to maintain a source of seed to researchers and stakeholders; (2) To establish and maintain seedbeds of alive AA (Azollary) in two growers cooperatives in order to provide steadily material to the project; (3) To promote and grow together AA and rice in a single crop (Azoryzary); (4) To extend the application of AA to commercial rice crops; (5) To repeat the experiment in ten cycles over two years in order to validate the technical implementation of AA and organic crops of rice in different geographic areas, (6) To expand the use of the Azolla fern culture as green manure among beneficiaries through field days; (7) To create a technological and commercial proposal for sales as green manure throughout AGRIPAC's national chain distribution; (8) To gain knowledge about growing AA in the Guayas Ecosystem, a tropical area, aiming to help solve global issues; and (9) To spread knowledge found locally, regionally and internationally (See chronogram at end the chapter).

The development of the project will build on the following methodologies:

(a) Learning by doing: The producer is directly involved in field activities to enhance the assimilation of knowledge acquired in the training sessions.
(b) Gender sensitive approach: The project will review ways to incorporate women, children and elderly in all planned activities, particularly in the stages of developing the azollary and nursery.
(c) Participatory approach: We seek the incorporation of the leaders of micro businesses in the process in order to better evaluate the progress and difficulties.
(d) Development of documenting culture for certification processes: All activities, procedures and events will be recorded and records kept.
(e) Replication: All methodological approaches outlined above enable the empowerment of micro-entrepreneurs with the use of technology. The role of AGRIPAC is key in this, as thanks to the level of involvement with the various associations and cooperatives, it can help generate the enthusiasm necessary for learning.
(f) Integrated systems approach: Pursuing the establishment of comprehensive states, not simply isolated productive elements.
(g) Quantitative approach in technical, economic and environmental aspects.

Activity \ Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
To develop a gene bank of AA in ESPOL											x	x	x	x										
To establish and keep alive the Azollary in 2 cooperatives	x	x	x	x	x	x	x																	
To promote the growth of AA and rice in a single crop (Azoryza)				x	x			x	x			x	x			x	x			x	x			
To expand the application of AA to commercial crops of rice						x	x	x		x	x	x		x	x	x		x	x	x		x	x	x
To expand the use of culture fern Azolla as green manure among beneficiaries through field days			x			x			x			x			x			x			x			x
To create a package of technological and commercial sale of green manure in the whole chain of distribution of national AGRIPAC							x	x			x	x			x	x			x	x			x	x
To develop tropical knowledge in regard to AA in the Guayas Ecosystem				x	x				x	x				x	x				x	x			x	x
To spread knowledge found locally, regionally and internationally										x	x	x	x								x	x	x	x

Other key elements taken into account by the project:

(a) Corporate Vision: Exploiting the potential of the system- to transform AA rice farmers in true entrepreneurs of new profitable, eco-friendly and cooperative agro-businesses.
(b) Competitiveness: Promote a change of attitude towards the marketing of products. There are alternatives to produce more efficiently (AA can reduce the production costs of rice) and to new markets: organic production and production of organic inputs.

(c) Focus on regional solutions: Considering the socio-economic diversity, cultural and biodiversity, not solutions such as "comprehensive technological package."
(d) Focus on promoting a healthy lifestyle based on healthy food in a healthy environment.
(e) Development of experiences: In technical and socio-cultural issues. The technical experiences relate to procedures for cultivation, fertilization, maintenance and post-harvest crop of AA. The main socio-cultural issues relate to marketing, rice cultivation and agreements of cooperatives, associations and cantonal agricultural centers.

7. COMMUNICATION WITH PROJECT STAKEHOLDERS

The main stakeholders in the project include farmers, agricultural enterprises, government, academia and NGOs (Non-governmental organizations).

Farmers are directly involved in the project. Communication with them will be through training sessions throughout the project on experimentation sites and through demonstrative field days to show results. An important part of this communication will be the calculations of the economic advantages and calculations for the application of AA to other crops.

The agricultural enterprises will benefit from the project, which will provide a useful technology package. These benefits will be communicated to farmers through training courses, field days and communications.

The government benefits from the implementation of the project, as it is an assistance programme for farmers.

This project is a source of knowledge and practices for the university as well. Initially two graduation theses were scheduled, but this project opens the door to others.

The NGOs will find motivation for their work in this project, since the various issues identified can be supported with high and immediate profit.

The dissemination plan of the project will be carried out by the leading group of stakeholders with whom we will be conduct regular meetings and practical trainings to publicize the virtues and benefits of Azolla fern as fertilizer, and to motivate and engage farmers in the adoption and spreading of the usage of this technology.

The dissemination plan will be implemented in a participatory manner and continuing practice by developing a growing cycle of Azolla as much as rice with Azolla. In each of the sites we will establish pools that demonstrate Azolla cultivation and associated Azolla-rice cultivation. The first phase will be devoted to disseminating knowledge about Azolla, while we distribute the initial Azolla cultures for rice cultivation. In the next phase, we will work in spreading the technology package that relates to the introduction of the Azolla rice and share the results of completed training about Azolla. Finally, the last phase is designed to process information and to the dissemination of the research results.

TABLE 3 (optional): Communication Strategy Worksheet			
Directions: For each audience, fill out the form below			
Audience	**Behavioral change and/or transfer of knowledge desired by the end of DM-funded project implementation.**	**Degree to which the project team has been already interacting with this stakeholder group regarding this project.**	**Is this group already supportive or opposed to the project idea? Indicate if you do not know.**
Rice Farmers	They will ad an extra crop to the rice crop with new activities for the Azolla; extra harvest and sales of AA.	Currently rice growers have a relationship buying seed, fertilizers and agriculture supplies from AGRIPAC.	This group is already supportive to the project idea
Other growers: banana growers, corn growers, cacao growers, sugar cane growers, etc.	The use of a new fertilizer replacing artificial nitrogen.	Currently other growers have a relationship buying seed, fertilizers and agriculture supplies from AGRIPAC.	This group is supportive to the project idea
Agrochemicals Suppliers	New ways of agricultural practices using the new technology.	AGRIPAC is part of the team searching for data to support the development of new agriculture practices.	This group is supportive to the project idea
Academia	Open new fields of study and investigation related to chemistry, biology, soils, water, environment and agriculture.	The principal team is part of ESPOL with faculties that interact.	This group is already supportive to the project idea
Government	The government will have to define policies that benefit environmentally friendly growers of crops	The project through their proposals and results will necessarily interact with the ministry of agriculture and the central government facing the problems of improving rice production and securing the fertilizer supplies at long-term	This group is supportive to the project idea

As we are developing crops of Azolla and rice-Azolla, the dissemination plan is implemented addressing the specific themes designed for each crop.

Likewise, interviews with various media will be conducted in order to obtain greater coverage on the issues raised by the project, thus farmers and entrepreneurs from various sectors of the "rice country" could obtain information about AA.

8. RISK ASSESSMENT

Potential risks	Potential impact of these risk	Mitigation strategies
Lack of cooperation from farmers to facilitate the experiment.	The project is aborted.	Motivation and participation of farmers and entrepreneurs in order to accept the project and support it. With their cultivation plots their participation and their work.
Lack of credibility towards farmers and entrepreneurs.	The project is aborted.	Dissemination, motivation and participation of farmers, to learn the benefits of the project and approval.
Lack of coordination and collaboration of technical personnel involved in the project.	Delay and failure to meet targets.	Motivation and control of programming through training courses and participation in the project.
Abnormal weather conditions such as the El Niño. phenomenon.	The project is stopped.	Establishing potential alternative sites in order to test the implementation of the project over there.
Lack of aid from the World Bank and AGRIPAC with resignation of base personnel, etc.	The project is aborted.	Discuss and establish precisely the rights and obligations.
Negative government policies in marketing which discourage rice cultivation.	The project is aborted.	Informing and involving the government in advance and seek their support all along.
Political problems affecting the country's rice sector (strikes, road closures, etc.).	The project is delayed.	Planning based on contingencies to avoid problems.

9. SUSTAINABILITY AND GROWTH POTENTIAL

SUSTAINABILITY FOR ECONOMICAL PROFITS. The national annually market for urea used in rice production is US$ 70 million and in all the agricultural system is US$ 313 million. AA alternatively replacing this fertilizer will produce economic benefits for the country as well as the individual growers. The profitability of an Azolla project produces a positive Net Present Value and an Internal Rate of Return higher than banks' interest rates along the time. Therefore the business interests will keep the project going and help sustain it after the DM support is finished. The project promotes changes in the attitudes and abilities of growers to promote agribusiness.

AA growing in combination with rice provides the economic viability of the program and subsequent production. The use of AA in a rice field will improve yields reducing production costs per unit. The rice will be sold in the market recovering costs and making a profit. The extra cost of managing AA in the fields is absorbed by the extra income generated, by increased efficiency and the extra sales of excess AA made to growers of other types of crops like corn or bananas.

Category \ Crop production	Normal	Using AA
Land preparation (US$/ha)	297.8	297.8
Seed (US$/ha)	84.3	84.3
Agricultural Supplies (US$/ha)	152.3	152.3
Labour (US$/ha)	180	280
Fertilizer (US$/ha)	303.72	77.22
Harvest (US$/ha)	266	266
Total (US$/ha)	1284.12	1157.62
Rice Yield (qq/ha)	100	158
Paddy Rice Cost (US$/qq)	12.84	7.33
Paddy Rice Price (US$/qq)	15	15
Profit (US$/qq)	2.16	7.67
Profit (%)	14	51

As it is shown in the table of different categories of costs and revenues, the estimated profit in the normal crop rice is 14 %, while in the crop using Azolla is 51 %.

SUSTAINABILITY OF THE MARKETS. Demand for organic fertilizers is expected to grow seeing the advantages of the use of green manure. AA in rice farms is sustainable, pushing the market to the formation of "factories" of AA in pools of rice. The massive use of this technology will impact on other crops like banana, sugar cane, corn, pineapple and vegetables, by the availability of this organic and cost effective fertilizer. This is expected to raise the supply of AA produced and available, making the cycle sustainable. The media (radio, newspapers and television) coupled with word of mouth advertising will help AA usage become a common practice among growers.

ENVIRONMENTAL SUSTAINABILITY, ENVIRONMENTAL IMPROVEMENT. The project helps maintain soil fertility by producing organic material rich in nitrogen. AA prevents the growth of aquatic weeds, as it covers the mirror of water from the paddy fields, avoiding the use of herbicides. This represents a positive impact on costs and preservation of water quality and the environment.

In the post- project steps the following mechanisms for sustainability will be expected/provided:

(a) ESPOL and AGRIPAC will promote changes before, during and after the AA project, which should change attitudes and abilities of micro enterprises for rice farming business based on market opportunities.
(b) ESPOL through ICQA will continue to contribute to the development of AA as a resource in Ecuador, as a source of knowledge, experience, technical documentation, information material and genetic material from AA.
(c) AGRIPAC will be on track to achieve permanent sources of funding to boost the mechanisms described in paragraph (a).

10. FINANCIAL VIABILITY

The main budget expenditures include the construction of azollaries, materials and equipment needed for crops, materials and equipment needed to work at the laboratory to support the field work, and things necessary to operate an office. An example of the justification of budget expenditure is included in the box at the end of section.

It requires moreover personnel of various types, starting with an international consultant, the team of fieldwork, laboratory and office staff.

To transfer knowledge about the benefits of AA we will conduct demonstration field days with farmers. To raise awareness of the progress of the project to different constituencies we will use press, radio and TV

Also we will subscribe to databases and information to do the job based on scientific knowledge.

During the execution of the project we will assess the production of AA on a commercial scale, its harvesting and packaging technology, and finally the marketing for AA applications outside the rice paddies.

The data collected in the initial project phases will be confirmed/validated over the life of the project. We will therefore have the ability to commercialize AA, as well as knowledge of the reaction of the market.

During the execution of the project there will be more expenses than in regular farming, but scientific investigation is an investment, so it will spend more money than it will generate. But as a result of the project we will be able to better estimate actual costs and the costs of different forms of operation linked to AA, such as harvesting, drying, packaging and transporting.

A. Works			
Construction of Azollaries: It is for all the necessary goods to build the azollaries.			
B. Goods (Materials and Equipment)			
Equipment	Use	Who will be use	Where it will be used
Laptop Computer	Managing information. Writing documents.	Staff office	Office
Printer	Printing documents	Staff office	Office
Camera	Recording project evolution, meetings and photographing crops	Technician	Countryside
Photocopier	Duplicating documents.	Staff office	Office
Laboratory equipment: Potentiometer Ground-water spot Others	Analysis of samples of different types of paddy	Laboratory Technician	Laboratory
Pump to water extraction	Distribution of water to irrigate crops	Rice Farmers	Countryside
Freezer	To conserve organic and inorganic material, vegetal tissues and chemicals	Laboratory Technician	Laboratory
Subscriptions to ISI. Web of Sciences: It is for library work.			
Office supplies: It is for daily work.			
Lab materials: Used for technique laboratory analysis.			
C. Services:			
(1) Personnel Costs			
Director: Team leader for planning, organization, leading and controlling the activities.			
Associate Biology Researcher: responsible for carrying out work which requires knowledge of biology			
Lab analysts: Analysis of water, soil and leaf material.			
Organic certification: Studies certification of rice cultivated with Azolla.			
Group leader: Transfer field experiences to farmers.			
Day labourers (4): Maintaining permanent azollaries and rice crops.			
Students-thesis (2): Generating knowledge and design of experiments.			
(2) Consultants			
International Consulting: Dr. Teófilo SAnfeliu, Jaume I University (sanfeliu@camn.uji.es; http://www.uji.es/ES/departaments/camn/membres/e@/22547/)			
International Flights: Travel.			
(3) Training and Workshop Facilities			
National Training: Training of technicians and leaders of groups.			
Workshops: Extended trainings to cooperatives.			
Demonstrative Field Days: Demonstration of Azolla and rice crops technology.			
(4) Travel			

Per diem national: Site visits to coopertatives and demonstration plots
National Flights: Internal Travel
Per diem national: Subsistence
D. General Administration/Overhead
Administrative Assistant: Management official.
Financial Management: Financial control of the project.
Telephone: Communication.
Mail and Internet: Communication.
E. Other (please specify)
Papers: Dissemination of Technology.
Bulletin / brochure: Training in coopertativas
Manual: Dissemination of Technology
Dissemination (Media): Dissemination of technology
Reporting: Reports
Site Visits Transportation: Work, progress and control of crops. Training to cooperatives.

11. ORGANIZATIONAL CAPACITY

ESPOL (www.espol.edu.ec)

ESPOL is an institution of higher education, legal person of public law. In ESPOL the links with the community are articulated through the quality of teaching and scientific research-driven technology under the principle of useful science.

ESPOL has different centers that provide collaboration and support for research serving the community, such as CIR (Centro de Investigaciones Rurales), CIBE (Centro de Investigaciones Biotecnológicas del Ecuador), CICYT (Centro de Investigaciones Científicas y Tecnológicas) and CTT (Centro de Transferencia de Tecnología).

CICYT is responsible for promoting and evaluating research in ESPOL. It has coordinated a large number of research projects in fields of biotechnology, environment, marine science, electricity, mechanics, physics, agriculture, economy, tourism and earth sciences. CICYT also develops training, dissemination, sponsorship of small projects and thesis, promoting research events and internships. It is in charge of the following publications: Technology Review, Journal of Research and Development, and ESPOL Science Memories. In addition, CICYT gives ESPOL´s investigators logistical support, technical advice and produces scientific publications (www.cicyt.espol.edu.ec).

CTT (Technology Transfer Centre), established in 1998, is the responsible unit for executing the Advisory and Monitoring Project Financial Management. Simultaneously, it acts as a Promotion Centre for Projects, which seeks to establish a bond with the productive sector of the country, and therefore looks for the potential for disseminating research, technology and services of ESPOL (www.ctt.espol.edu.ec).

AGRIPAC *(*www.agripac.com.ec)

AGRIPAC, a 35-year old private company, currently offers lines of credit per agriculture cycle to small, medium and large growers of rice, corn vegetables, bananas, broccoli, flowers, fruits, sugar cane, potato etc. AGRIPAC has a close and long lasting relationship with these growers, because AGRIPAC has always been there for them in good and bad times, providing training, credit lines and new product development that improve their yields.

AGRIPAC has 115 shops around Ecuador so you may say that AGRIPAC is close to where the growers are located, making it easy for them to accesses its services and products. Each shop is managed by a certified agricultural engineer and a shop assistant, who gives recommendations to the growers and helps in problem solving. They are organized in teams all around Ecuador. These teams are groups of shops and of sales representatives that are also certified professionals and that pay regular visits to the field, providing the necessary training and helping the growers with problems. Finally, these teams organize on-site programs and demonstrations, where the grower can see first hand the results of correct agricultural practices.

AGRIPAC also has facilities to receive grains as a service for the growers they can sell or pay their credits there in rice or corn. These plans are tree Victoria Rice, Agrigrain Corn and Balanfarina Corn and feed production.

Personnel

MARIANO MONTAÑO, Chemical Engineer, Master of Business Administration, Ph. D. (Candidate)

- Guayas Ecosystem. Tropical knowledge.
- Lipidology: food and feed; omega 3 fatty acids.
- Development of forest: Forests Trust Rights.
- Environmental studies.
- Preparation and management of projects:

"Implementation of the symbiosis between Diazotroph Azolla and Anabaena as green manure in rice cultivation in the Ecuadorian Littoral"

"An inventory of emissions of dioxins and furans (D & F) in Ecuador (Director), GET/2732-02-4456 project, Global Environmental Facility (GEF)/Ministry of Environment of Ecuador-National Integrated Programm for the sound management of chemicals chemical. 2003"

"Establishment of the residues of fungicides (triazoles and estrobirulinas) in banana leaves and fruit depending on the cycles of plant health applications". Participation in Fair ESPOL Science Prototype- ESPOL Science 2002 - implementation of the Azolla-Anabaena as green manure for rice cultivation. Prototype- ESPOL Science 2005 - System-Rice Azolla in the production of organic rice.

IVAN NOBOA, MBA

- Marketing crops in summer and winter through the operational management of the plant.
- Import and marketing of raw material corn, wheat and soybean meal.
- Organization of the sales force consisting of 228 vendors, technicians organized into 22 teams with goals and shared system of commissions.
- Implementation of a database of 8,287 producers for the development of profitable agricultural programmes. The information in the database allows the sales team be more efficient.
- Developing a structural organization that allows a culture of teamwork and customer service.

MARIUXI ESPINOZA, Biologist

- Experience in the preparation of growth environment for the development of Azolla as a source of nitrogen.
- Participation for 3 years as a biology researcher in the project "implementation of the symbiosis between Diazotroph Azolla-Anabaena as green manure for rice cultivation in the Ecuadorian Littoral" PROMSA-ESPOL/ICQA.
- Collaboration in preparing the project profile Broadcasting "Azolla Anabaena", and as technical coordinator in the dissemination/communication of the project in question.
- Participation in the fair with ESPOL Science. Prototype-ESPOL Science 2002 - implementation of the Azolla-Anabaena as green manure for rice cultivation. Prototype-ESPOL Science 2005 - System-Rice Azolla in the production of organic rice.

Table 4: Summary of Capacity of Implementing Organization
Directions: Please choose any of the following that apply to your organization
☐ New organization that will implement the project ☐ Project team has no project implementation experience in the geographic area(s) impacted by the project X The applicant has a long standing positive relationship with the local communities that will be impacted by the project ☐ Project team's organizational focus is outside the field of sustainable agriculture. ☐ Project team leader or other core project staff need to be hired to implement this project

Table 5: Summary of Capacity of Partner Organization (if applicable)
Directions: Please choose any of the following that apply to your project partner organization.
☐ New partnership to implement the project ☐ Project team that has no project implementation experience in the geographic area(s) impacted by the project X The project partner has a long standing positive relationship with the local communities that will be impacted by the project ☐ Project partner's organizational focus / mission is outside the field of sustainable agriculture.

Table 6: Implementing and Partner Organization Information			
Directions: Fill in the following information about the applicant and partner organization.			
	Number of Full-time employees:	**Date of legal registration with government authority (registered business, NGO) or if government agency, date of creation of organization:**	**Has your organization ever implemented a project with budget size of at least the size of this proposed project (DM funds plus other planned funding sources)? (Yes/No)**
Implementing Organization	906	October 1958	Yes
Partner Organization (if not an individual)	150	April 1972	

12. TEAM LEADER

Mariano Montaño

Project Experience	Duration (start-end)	Staff	Budget (US$)
Establishment of fungicide residues (triazoles and estrobirulinas) in banana leaves and fruit depending on the cycles of plant health applications.	24 months (10-06 /11-08)	11	49 785.00
Inventories of emissions of dioxins and furans (D & F) in ECUADOR (Director), GEF/2732-02-4456 projects, Global Environmental Facility (GEF) / Ministry of Environment of Ecuador-National Integrated Programme for the Sound Management of Chemicals. 2003.	6 months (2-8/04)	6	40 000.00
Inventories of Persistent organic pollutants (POPs) pesticides in ECUADOR (Director), GEF/2732-02-4456 projects, Global Environmental Facility (GEF) / Ministry	8 months (3-11/04)	6	60 000.00

of Environment- National Integrated Programme for the sound management of POPs in ECUADOR. 2003.			
Implementation of the symbiosis between Diazotroph Azolla and Anabaena as green manure for cultivation of rice on the Ecuadorian coast, proms, 2001-2004.	42 months (1/01-10/04)	8	110 000.00
Study Water Quality Coastal Ecuadorian Management Program Coastal Resources-AID, 1993.	60 months (11/1987 - 12/1993)	8	300 000.00
Biochemical and Nutrition Research in Reproduction and growth of shrimp, ESPOL / EEC (European Economic Community), 1991.	36 months 1988 - 1991	10	150 000.00
Preliminary Study of fatty acids Partners Food Shrimp, ESPOL / EEC, 1991	12 months 1990-1991	10	150 000.00

TEACHING:

ESPOL: General Chemistry and Organic chemistry for Aquaculture; Chemistry for Economics; Chemistry for Archaeology; Chemistry for Food Technology; General Inorganic Chemistry II; General Inorganic Chemistry I; and Ecology.
ESPOL-UG: Resource Management.
UNIVERSITY OF GUAYAQUIL (UG): Chemical Reactions and Engineering Thermodynamics.
CATHOLIC UNIVERSITY OF GUAYAQUIL: Mathematics.
NATIONAL POLYTECHNIC COLLEGE (EPN, www.epn.edu.ec): General Chemistry.

ACADEMIC TITLE:

Master of Business Administration, ESPOL, Guayaquil, 1987; chemical engineering, National Polytechnic College (EPN), Quito, 1977.

ADDITIONAL UNIVERSITY TRAINING:

Ph. D. (Candidate), University Jaume I (UJI) Castellon-University and Miguel Hernández (UMH) Elche, Spain, areas of Experimental Science and Technology, Management Resources and Environment-ecosystems Guayas, 2002 until today.

APPENDIX A: CONTACT INFORMATION UPDATE

1. Project Team Leader Information	
First Name:	Mariano
Last Name:	Montaño
Position at Organization:	Professor-Researcher
Unit Within Organization:	ICQA
Organization:	ESCUELA SUPERIOR POLITECNICA
Organization Type (Please select): X Academia ☐ Development Agency (Bilateral or Multilateral) ☐ Foundation ☐ Government ☐ Non-Governmental Organization (NGO) ☐ Private Business	
Primary Email Address:	ecosistemaguayas@gmail.com
Secondary Email Address:	mmontano@espol.edu.ec
Organization Website:	www.espol.edu.ec
Telephone:	59342269566
Fax:	59342269566
Address:	Km. 30.5 Vía Perimetral, POBOX 09-01-5863
City:	Guayaquil
State/Province:	Guayas
Postal Code:	09-01-5863
Country:	Ecuador
Organization Date Established: The Escuela Superior Politécnica del Litoral (ESPOL) was created in 1958.	
Describe Your Organization	ESPOL is an institution of higher education, legal entity of public law, nonprofit, autonomous in the academic, scientific, technical, administrative, financial and economic, with a capacity for self-regulated, seeks the truth and looks for the human development.

2a. Partner Information	
First Name:	Iván
Last Name:	Noboa
Partner Position at Organization:	Project Manager and Grain trade expert
Partner Organization:	AGRIPAC S.A.
Classify Partner Organization (Please Select): ☐ Academia ☐ Development Agency (Bilateral or Multilateral) ☐ Foundation ☐ Government ☐ Non Governmental Organization (NGO) x☐ Private Business ☐ Individual	
Partner Primary Email Address:	enoboa@agripac.com.ec
Partner Second Email Address:	info@agripac.com.ec
Partner Organization Website:	www.agripac.com.ec
Partner Telephone:	59342560400
Partner Fax:	59342313327
Partner Address:	Córdova 623 y P. Solano
Partner City:	Guayaquil
Partner State/Province:	Guayas
Partner Postal Code:	
Partner Country:	Ecuador
Partner Organization Date Established:	1972
Describe Partner Organization (word limit 30):	AGRIPAC is a group of companies forming the largest Agro Industrial Group in Ecuador. Established 35 years ago, it has achieved a clear leadership position and currently enjoys sustained and continued growth
Duration of Partnership: X Pre-existing; for how many months? 24 ☐ New	
Describe Partner's Responsibilities (word limit 50): AGRIPAC has experience in managing and investigating rice crops. Last year a new line of organic products was introduced with great acceptance from the market. The need to develop new technologies is of great importance to keep leadership in the industry. Prices of Nitrogen fertilizers push to look for new technological solutions.	

2b. Second Partner Information (if any)	
First Name:	
Last Name:	
Partner Position at Organization:	
Partner Organization:	
Classify Partner Organization (Please Select): ☐ Academia ☐ Development Agency (Bilateral or Multilateral) ☐ Foundation ☐ Government ☐ Non Governmental Organization (NGO) ☐ Private Business ☐ Individual	
Partner Primary Email Address:	
Partner Second Email Address:	
Partner Organization Website:	
Partner Telephone:	
Partner Fax:	
Partner Address:	
Partner City:	
Partner State/Province:	
Partner Postal Code:	
Date Established:	
Describe Partner Organization (word limit 30):	
Duration of Partnership: ☐ Pre-existing; for how many months? ☐ New	
Describe Partner's Responsibilities (word limit 50):	

3. Project Profile	
Project Title for booth at Marketplace (maximum: 15 words)	How to convert a rice field in green fertilizer factory
Region of Implementation (Please Select One): ☐ Africa ☐ East Asia and the Pacific ☐ Europe and Central Asia X Latin America and the Caribbean ☐ Middle East and North Africa ☐ South Asia ☐ Multi-region	
Country of Implementation:	**Ecuador**
Sub-theme (Please Select One): X Linking small-scale farmers to input-output markets ☐ Improving land access and tenure for the poor ☐ Promoting the environmental services of agriculture in addressing climate change and biodiversity	
Project Duration Using DM funds (up to 24 months):	24

APPENDIX B: Project Geographic Area of Influence (JPG/TIF/GIF map)

Guayas Ecosystem