FOOD SECURITY

I. Agricultural Soil and Water Management
II. Livestock Production
III. Insect Pest Control
IV. Food Safety
V. Plant Breeding

I. Agricultural Soil and Water Management

1) Sustainable agricultural production in salt affected soils through innovative irrigation, soil and water management technology packages

Inappropriate soil and water management practices in agriculture are a major contributor to increased soil salinity, which affects 6.5 million hectares of land in Algeria, Bangladesh, Morocco, Pakistan and Iraq together. This project will test innovative irrigation, soil and water management technologies on farmers' fields which can be then upscaled for wider adoption. Isotopic, nuclear and related techniques will be used to measure soil water content, crop water use efficiency and salinity level in the soil. This information will then be related to crop yield and changes in soil salinity at these up-scaled sites to evaluate performance of technologies. Farmer field days will be organized to disseminate the technologies and guidelines will be developed for managing salt-affected soils for crop production.

Planned Activities

1. Training professional and technical staff on the use of isotopic nuclear techniques for assessing and monitoring soil and water salinity.
2. Implementing field studies on soil and crop management under saline conditions and collecting data on crop yield, nutrient uptake and soil salinity levels to evaluate the response to improved management techniques.
3. Providing equipment and consumables to Member States.
4. Organising regional workshops to strengthen the capacity of Member States to assess soil and water management changes on crop yield and soil salinity.
5. Organizing farmer field days for disseminating innovative soil and water management technologies.

Project Outcomes/Outputs

1. Professional and technical staff (two from each country) trained on the use of isotopic and nuclear related techniques to improve technical capability in soil, water and salinity management
2. Information collected on crop yield and soil salinity changes from field studies to evaluate the impact of management changes
3. Farmer field days organised to disseminate soil and water management technologies
4. Report on the performance of innovative soil and water manage practices on crop yield and soil salinity changes
5. Improved livelihoods of farmers in Member States by adopting innovative irrigation, soil and water management technology packages
6. Enhanced skills of professional and technical staff on the use of isotopic, nuclear and related techniques for managing salt affected soils and saline waters for crop and livestock production
7. Member States equipped with modern soil water and salinity monitoring devices.

Estimated budget per year: US $326 350 in the first year, US $144 450 in the second, and $299 600 in the third

Total estimated budget: US $770 400

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2) Carbon sequestration in agro-ecosystems to enhance food production and mitigate climate change

Rationale: Agricultural ecosystems are a major source of atmospheric carbon dioxide (CO_2) and other greenhouse gases (GHGs). Globally, agriculture is responsible for 20% of greenhouse gas emissions. Depletion of the soil carbon pool in agro-ecosystems has been exacerbated by soil mismanagement, which includes the widespread use of extensive farming practices leading to a negative nutrient balance and soil nutrient mining, removal of crop residues for other uses (e.g. feed, fuel, construction materials), and uncontrolled and excessive grazing. As much as 66 billion metric tons of carbon have been emitted from world soils to the atmosphere; and consequently soil quality and agronomic productivity are severely jeopardized. Restoring the soil carbon pool is essential to improve soil biodiversity, advance food security and ensure environmental sustainability. Despite the obvious significance of soil carbon, our present knowledge remains limited by uncertainties about the quantitative aspects of soil carbon storage and dynamics. Reducing the increased emissions of carbon dioxide (CO_2) from farmlands requires a better understanding of the mechanisms of soil carbon storage and dynamics in relation to land use and farm management practices.

Project Description: The objective of this project is to develop an integrated approach to assess the impacts of agricultural management practices and changes in land use for food production on soil carbon sequestration and its impacts on soil health and climate change mitigation. The focus will be laid on mulch-based cropping systems (e.g. conservation agriculture). Both isotopic (stable and radioactive) and non-isotopic techniques will be used as tracers to provide quantitative details about the mechanisms of soil carbon storage; and its and dynamics in relation to land use and environmental conditions.

Planned Activities:

1. Conduct baseline survey of soil carbon status in four long-term experiments conducted by National Agricultural Research Systems (NARS) in Africa (Kenya), Asia (Indonesia and Vietnam) and Latin America (Brazil)
2. Establish integrated research protocols and modelling tools on soil carbon sequestration (fluxes – storage – dynamics) through adaptive research at FAO/IAEA Agriculture & Biotechnology Laboratories (ABL) that can be used in low-technology environments
3. Validate research protocols on soil carbon sequestration and develop guidelines for management of mulch-based cropping systems at the field and landscape levels in Brazil, Indonesia, Kenya and Vietnam

Project Outcomes/Outputs:

1. Techniques and guidelines developed for the assessment of soil carbon sequestration and dynamics in agro-ecosystems using isotope and related techniques
2. Baseline information on the extent of soil carbon sequestration as influenced by soil and crop management in the tropics and subtropics
3. Recommendations formulated for policy makers in climate change mitigation

Estimated budget per year: US $139 100 in the first year, US $64 200 in the second, US $37 450 in the third

Total estimated budget: $ 240 750

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3) Innovative soil management technologies in mulch-based cropping systems in support of the green revolution and food security in Sub-Saharan Africa

Rationale: Poverty in sub-Saharan Africa is largely a rural phenomenon, as 85% of the poor reside in rural areas. Agriculture is the main economic sector upon which the rural population depends for

their livelihoods. Therefore, agriculture is increasingly being recognized as the economic engine for sub-Saharan Africa development. Although significant advances have been made over the past decade in soil fertility management, staple crop yields have remained less than one tonne per hectare in most of tropical Africa since the sixties. Restoring soil organic matter and soil fertility are essential to catalyze sustainable development by both enhancing crop productivity and mitigating climate change through the capture of atmospheric carbon dioxide.

Project description: This project aims to improve and strengthen the capacity in four selected countries to adapt mulch-based cropping systems; and to quantify the beneficial impacts of these systems on soil fertility and SOC storage. The mulch-based cropping systems, in particular conservation agriculture, are innovative practices that combine reduced tillage, retention of crop residues and the use of legume crops. These systems have demonstrated, though a network of coordinated research projects, to be able to improve crop yield and improve water use efficiency.

The project objectives are: (i) to enhance soil fertility diagnostic capabilities, (ii) to test and improve integrated rapid and cost-effective approaches to adapt mulch-based cropping systems to the agro-ecological and socio-economic context of the countries involved and (iii) to assess the impact of these systems on soil carbon sequestration and soil health. Both isotopic (stable) and non-isotopic (infrared spectroscopy) techniques will be used as innovative tools in research on carbon sequestration issues and rapid and cost-effective monitoring of soil fertility status. The impacts of agricultural management practices and land use changes on soil carbon sequestration, soil health and climate change mitigation will be assessed through an integrated approach.

Planned Activities:

1. Capacity building for rapid diagnosis of soil fertility status and SOC sequestration
2. Producing techniques and guidelines for the rapid and cost-effective assessment of SOC sequestration and dynamics in agro-ecosystems, in particular mulch-based cropping systems, using isotope and related techniques
3. Testing integrated rapid and cost-effective approaches to assess the impacts of agricultural management practices on soil carbon sequestration
4. Validating research protocols on SOC sequestration validated for Madagascar, Malawi, Mozambique and Zimbabwe
5. Developing strategies for adoption of mulch-based cropping systems

Project Outcomes/Outputs:

1. Improved livelihoods of poor-resource farmers (targeted average increase in annual household income by 300 US$) through soil resilience to climate change impact on crop productivity and soil-water conservation
2. Enhanced skills of professional and technical staff on assessing SOC sequestration in agriculture
3. Integrated research protocols and modelling tools adopted on SOC sequestration through adaptive research
4. Enhanced Member State capacity for rapid diagnosis of soil fertility status and SOC sequestration in particular
5. Strengthened link between adaptive research and policy development sectors

Estimated budget per year: US $588 500 in the first year, US $481 500 in the second, 337 050 in the third

Total estimated budget: US$1 407 050

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4) Scientific and risk-based responses and countermeasures to nuclear emergencies for agricultural remediation in the Asia and Pacific Region

Rationale: After a nuclear emergency, it is important to develop remediation strategies for food safety and to restore farming and other agricultural activities as soon as possible after the event, addressing uncertainty and strengthening remediation actions. Vital for this exercise includes not only correct immediate response, but also accurate and appropriate data collection and application of scientific based countermeasures for food and agriculture. In many countries, there is planning, but most are not adequately prepared. Support is needed from international organizations for decision making based on science and risk management.

Project Description: The objective of this project will be to merge the mechanism of a coordinated research project (CRP) with a practical implementation strategy, in order to respond to Member State needs for scientific, risk-based decisions and support and advice for risk management as relates to responding to nuclear emergencies in relation to food and agriculture. This project will include not only the provision of learning materials and advice to policy makers, but also the development of practical technologies for use in remediation strategies, and especially to fill gaps where information and technologies currently do not exist. To achieve this goal, it is necessary to include aspects of soil and water management, crop production and protection, animal production and health, and food

safety. The aim of this project is to provide advice and support to Member States in responding to a nuclear emergency and in developing follow-up remediation strategies in food and agriculture.

Planned Activities

The planned activities fall into the following four areas outlined below, ranging from immediate actions to longer term strategies:

1. Promote knowledge and information sharing on radioactive contamination of food and agriculture, including the mechanisms and persistence of such contamination, radionuclide transfer rates and international standards.
2. Design and develop immediate action plan for a nuclear emergency, including

a) Minimizing radioactive contamination of agricultural product in affected areas;

b) Protecting commodities from radioactive contamination in affected areas or potential contamination areas;

c) Safeguarding agricultural production in greenhouses in affected areas;

d) Decontaminating techniques for agricultural commodities;

e) Disposal techniques for contaminated agricultural products.

3. Develop detecting and monitoring systems for contamination in food and agriculture, including
    a) Development of sampling procedures of agricultural products, soil and irrigation water;
    b) Establishment of a contamination monitoring information system, including simple-to-use global positioning systems (GPS) for the identification of all sampling point locations and an inexpensive geographic information system (GIS such as Google Earth Pro) for mapping and monitoring changes in radioactive contamination in time and space (data processing);
    c) Development of sample procedures preparation and measurement techniques for assessing radioactive contamination of agricultural products, farm soils and irrigation;
    d) Implementation of contamination monitoring programmes for food and agricultural products so as to generate rapid risk assessments in support of emergency management decisions.
4. Establish strategy and protocols for agricultural remediation under different contamination scenarios, including
    a) Development and application of phyto-extraction measures and provision of assistance in the selection and distribution of locally adapted plant species/varieties for radionuclide accumulation;
    b) Development and application of physical and chemical techniques to minimized the impact of radioactive contamination in the soils;
    c) Development of protective measures on the contaminated land which is unsuitable for crop production;
    d) Study on transfer factors of radionuclides from soils to plants under different soil characteristics;
    e) Implementation of good agricultural practices to minimize the impact of radioactive contamination on crop and livestock production;

f) Development of stable- and radioactive-isotope traceability measurements to help ensure food safety, food authenticity and to support trade in foodstuffs after nuclear emergency.

Project Outputs

1. Publication of information sheet on radioactive contamination of food and the environment.
2. Publication of various guidance on immediate actions, agricultural countermeasures, as well as agricultural remediation.
3. Contamination monitoring information system through the application of GPS and GIS.
4. A generic response kit/protocol for immediate action plan following a radiological emergency resulting in the release of radioactivity that could affect food producing areas.
5. A generic sampling protocol for various agricultural product, soils and irrigation water.
6. A genetic sample preparation and analytical protocols for various agricultural products and soils.
7. Guidelines for farmers and policy makers in growing appropriate crops or other potential land uses.
8. Simulation exercises covering different aspects of agriculture.
9. Dissemination of this information on preparation and planning for nuclear emergencies through various media, including distance learning and web based modules to train and inform affected communities on agricultural countermeasures against radioactive contamination in the event of nuclear exposure. Documents/photos/videos/guidelines and recommendations will be available in both hard (paper copy) and soft (web) format. The intention is to develop visual and user-friendly documentation with step-wise approach for each recommended action plan.

Project Outcomes

1. A network of countries with a common platform and established capacity to sample, analyse and map results of monitoring for radioactivity in food, soil and agricultural commodities, therefore ensuring food safety and quality.
2. Immediate and short term action plans to reduce the negative impact of radioactive contamination on agriculture.

Estimated budget per year: US $214 00 in the first year, US $321 000 per year for the following three years

Total estimated budget: $1 177 000

II. Livestock Production

5) Improving animal disease diagnostic capacities of veterinary laboratories at the regional level in Africa and Asia by transfer of nuclear and nuclear related techniques

Rationale: Poverty, hunger and food security are three major challenges facing the world and the problem is most acute in developing countries. For the 900 million people in the developing world who live in rural areas on less than $1 a day, agriculture is vital for their livelihood and survival. The

World Bank estimates that for the world's poorest people, GDP growth originating in agriculture is four times more effective in reducing poverty than growth in any other sector.

In developing countries, most of the farmers are also subsistence livestock keepers, and they use their animals not only for meat and milk but also for draught power and social and cultural reasons. Hence livestock in developing countries are essential for food security and poverty alleviation. Unfortunately, livestock productivity is threatened by a number of infectious, transboundary animal diseases (TADs) that cause high morbidity and mortality in domesticated animals. These TADs are capable of spreading rapidly over long distances, not only from one country to a neighbouring one, but also from continent to continent. Examples of such diseases affecting livestock in Asia and Africa are: Foot and Mouth disease (FMD), African swine fever (ASF), contagious bovine pleuropneumonia (CBPP) and peste des petits ruminants (PPR).

Other diseases, such as Rift Valley Fever (RFV) and highly pathogenic avian influenza (HPAI) that also occur in Africa, have the potential to cause deadly diseases in humans. In a document published by the Food and Agriculture Organization (FAO) and the World Organisation for Animal Health (OIE), it is reported that 75% of emergent animal diseases occurring in the past decade have zoonotic implications. These TADs constitute a constant threat not only to animal production and food security but also to human health and to the world economy at large. Therefore the early and rapid diagnosis and control of these diseases are of utmost importance for both public and veterinary health. The two major influenza epidemics, caused by H5N1 and H1N1 viruses, both linked to animal origins, have affected the world since 2003 and serve as a reminder that more can, and must be done, in terms of improved disease surveillance, identification, and preparedness in order to ensure that Member States have the capacity to initiate and maintain programmes for disease control and prevention. These two epidemics have clearly shown that the developing world is not properly equipped to deal in an effective way with such emerging and re-emerging diseases. There is therefore an urgent need to strengthen surveillance and enhance laboratory capacities in selected regions in order to achieve more timely disease detection that will lead to more effective control.

Project Description: Based on the experience of the Animal Production and Health Subprogramme in the transfer and sustainable use of nuclear and nuclear related techniques to developing countries for animal disease diagnosis, this proposal is designed to build and improve diagnostic capacities of veterinary laboratories at the regional level in Africa and Asia. Training and technical support will be provided to local staff and yearly refreshment training courses/workshops will be conducted as part of a continuous education programme in order to keep pace with the rapid evolution of molecular techniques. Equipment, harmonized standardized operating procedures, protocols and reagents would be provided. The performance of the targeted laboratories in their routine diagnostic work will be assessed by organizing ring tests. Results of such tests will allow the detection and correction

potential weaknesses in laboratory competence. The first phase of this project will establish a network of laboratories in Africa and the second phase will focus on Asia.

Planned Activities: A pilot laboratory has been launched in Ethiopia with PUI financial support for 2010-2011, and this proposal aims to roll out additional laboratories in Asia and Africa, which will act as regional hubs for TADs testing and diagnosis. This project will concentrate on the following areas:

1. The support of laboratory infrastructure and to build laboratory capabilities: provision of appropriate laboratory equipment and supplies, upgrading laboratories facilities for better compliance with international standards, and provide guidance and advice towards quality assurance management, provision of proficiency-testing programmes.
2. The strengthening of human technical capabilities: transfer of technologies, training.
3. Promoting and strengthening laboratory networks with the PUI supported laboratories being major players, organization of workshops.
4. Participation in the development/validation of new techniques, in particular techniques for multiple diseases diagnosis using the same sample.

Project Outputs/Outcomes:

1. Improved laboratory infrastructure with use of molecular-based disease diagnostic techniques
2. A common quality strengthening stepwise approach developed, standardization of procedures and practices, and an external quality assessment programme
3. Laboratory staff trained; laboratory structure and staff to put the supported laboratories in a position to train scientists from other countries in the region and to serve as support or reference centre for the region
4. Improved and enhanced skills of veterinary diagnostic staff
5. Animal disease diagnostic capabilities improved
6. Transboundary animal disease control and epidemiological capabilities improved

Total estimated budget: $4 012 500 for Africa, $5 200 000 for Asia

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III. Insect Pest Control

6) Contributing to sustainable agricultural development in the Balkans through the environmentally-friendly pest suppression to facilitate fruit exports

Rationale: In parts of the Balkans, the Mediterranean fruit fly (*Ceratitis capitata*) causes major damage to fruit and vegetable production. This pest reduces fruit and results in significant insecticide use, which leaves residues on the commodities and negatively impacts farmers and the environment. Furthermore, in spite of intensive insecticide applications, some export shipments are regularly rejected by importers due to the detection of living worms in fruit or because they exceed maximum insecticide residue limits.

The Neretva Valley straddles Croatia and Bosnia and Herzegovina, and is the largest citrus producing area in Croatia. Over 80% of Croatian national citrus production is concentrated in Neretva Valley (50% of production is export), while peach production of similar value is concentrated next to the border on the Bosnia and Herzegovina side. Interest from both countries has been expressed to collaboratively introduce the environmentally-friendly Sterile Insect Technique (SIT), as an alternative to insecticide-based medfly control.

An initial project was launched in Croatia (including economic and technical feasibility studies, and training of staff to implement the technique) under an IAEA technical cooperation project entitled "Feasibility Study for the Suppression of the Mediterranean Fly by Integrating the Sterile Insect Technique (SIT) on an Area-Wide Basis in the Neretva Valley". After the initial project, Bosnia and Herzegovina joined the project for a transboundary bi-national effort. A Fly Emergence and Release Facility with the capacity to handle 20 million flies a week was recently established and a 1,000 ha pilot project was implemented during 2010 with the release of about 1 million sterile flies per week, supplied by the Biofly mass rearing facility in Israel. Based on the positive results, moving towards implementing a transboundary project would be of economic benefit to all local stakeholders including growers, exporters, and also local and external fruit and vegetable consumers, by giving them greater access to fresh fruit with fewer insecticide residues.

Project Description: The objective of this project would be to further develop and expand the integrated approach to the use of the SIT and other suppression techniques to relevant production areas, and eventually throughout the Neretva Valley in Croatia and Bosnia and Herzegovina. This will include the field validation of recently developed methods of improving sterile male sexual performance, as well as the testing of compatible suppression technologies such as bait stations that are still under development.

To achieve this goal, collaboration between growers, plant protection officers and scientists from the two countries and the sterile pupae supplier in Israel is needed. Additionally, staff in both countries needs to be trained through workshops and expert missions; and outreach must be conducted to raise awareness in the communities and among fruit producers. Ultimately, the aim of this project is to

achieve tangible socio-economic benefits by reducing the use of insecticides in rural areas and facilitating increased exports of high quality fruits to international markets.

Planned Activities:

5. Train project staff and farmers, and create awareness with other stake-holders
6. Expand gradually the pilot areas under surveillance in Croatia and then Bosnia-Herzegovina
7. Exchange of information and cooperation between plant protection services of the two countries
8. Complete equipping fly emergence and release facility
9. Implement the existing protocols for handling sterile flies at facility
10. Validate new methods to treat sterile males to increase field performance
11. Procure sterile flies from mass-rearing facility in Israel
12. Implement new suppression techniques for pest hot spots and release sterile males on an area-wide basis over expanding pilot areas

Project Outcomes/Outputs:

1. Transboundary collaboration between Croatia and Bosnia and Herzegovina strengthened in the area of plant protection
2. Staff trained in surveillance, area-wide population suppression and SIT activities
3. Farmers association engaged to have their full participation and outreach activities undertaken
4. Technology transfer and field validation results on new methods and techniques developed by the FAO/IAEA and its partners
5. Surveillance network and the use of GPS/GIS for pest population data management
6. Activities for the environment-friendly suppression of Mediterranean fruit fly operational in selected areas
7. Procurement / shipment of sterile flies from Israel to Croatia Fly Emergence and Release Facility
8. Area-wide implementation of the SIT in relevant areas of Neretva Valley in both countries.

Estimated budget per year: US $368 658 in the first year, US $635 706 in the second, US $807 727 in the third and fourth

Total estimated budget: $2 619 818

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7) Development and validation of mobile mosquito production units for improved mass rearing to apply the sterile insect technique in the Indian Ocean Region

In the light of the current surge of emerging, and re-emerging vector-borne diseases, the introduction of exotic insect pests into new areas due to globalisation and climate changes, strict government

legislation, and the increasing appearance of insecticide resistance, there is a need for novel, environmentally friendly solutions to support and enhance the existing control and prevention efforts for mosquito born diseases.

The sterile insect technique (SIT) is an autocidal, biological control tactic that agrees with present day concerns regarding human health and the environment. It is target specific, and can be applied over difficult topography. It acts inversely density dependant meaning that the technique becomes more effective as the population diminishes. Furthermore, SIT integrates well with other control methods and reduces insecticide dependence.

The integrated use of the SIT against mosquitoes will most likely have its highest potential in urban areas where the use of insecticide spraying is prohibited. The strategy of choice would be population suppression where the aim is to use the sterile insects to keep the target population below a certain threshold level that would break the disease transmission cycle.

Member States are showing increased interest in developing and integrating the SIT in their arsenal of control tactics for mosquitoes, as is exemplified by several requests for national and regional TC projects for the 2012-2013 cycle: Mauritius, South Africa, Sri Lanka, Sudan and various islands of the Indian Ocean Region. Support is needed to demonstrate the true efficiency and effectiveness of the release of sterile male mosquitoes as part of an area-wide integrated pest management programme. A basic concrete mass rearing facility is expensive (with costs rising to several million USD) and in many countries, building such a facility, transferring know-how, and becoming fully operational would be highly time-consuming due to a variety of political and technical hurdles.

As part of the assessment whether it is feasible to integrate the SIT with other control tactics to suppress populations of disease transmitting mosquitoes, a pilot project that provides “proof of principle” would be essential. The development of mobile mosquito mass-production units based on containers customized for the rearing, the sorting and the sterilization of the target mosquitoes, would greatly facilitate this process. Such mobile units would save time and costs in initial project “start-ups”, and they could be re-used for different mosquito species, and readily be moved from one place to another.

Various Governments of the Indian Ocean Region have expressed interest in the use of SIT for integrated mosquito control and have requested assistance from the Agency in this respect. The region contains numerous small accessible islands containing isolated mosquito populations and therefore provides an ideal setting for smaller-scale pilot trials. These pilot trials would not only be an essential contribution to the development of the SIT package for mosquitoes, but would also reduce the disease burden for the human population on these islands.

Planned Activities:

1. Modify existing mosquito mass rearing equipment and adapt to suit the mobile units concept.
2. Develop concept of mass-rearing container and construct prototype.
3. Assess feasibility of rearing mosquitoes in mobile unit.
4. Validate concept of rearing in mobile units in the Indian Ocean region and/or Southern Africa.
5. Develop and implement pilot trial in selected target areas.
6. Assess impact of pilot trial on target mosquito densities and disease prevalence.
7. Assess feasibility of integrating the SIT for mosquito control.

Project Outcomes/Outputs:

1. Mass-rearing equipment for mobile units available.
2. Concept and prototype mobile unit available.
3. Required number of mosquitoes reared in mobile units in target areas.
4. Target mosquito populations reduced.
5. Mosquito SIT based on mobile units tested.
6. Disease prevalence reduced

Estimated budget per year: US $374 500 per year for four years

Total estimated budget: US $1 498 000

IV. Food Safety

8) Sustainability of capacity building activities to improve food safety and quality through nuclear technology and networking

Rationale: Access to food control laboratories and related services represents the minimum requirement to generate monitoring data for the food risk management activities within a nation. Currently, outsourcing analytical services and the use of private analytical services are the only option available in some countries, but this is not feasible as a regular practice. Each national government needs to establish and sustain accredited laboratories for the control of food consumed nationally and exported, by effective monitoring of small and large scale producers.

Project Description: Activities will be implemented in developing countries to build infrastructure for the intervention of donor organizations (regionally and internationally) to implement food control systems and ultimately to contribute to enhanced food safety and quality. The project would follow a modular approach applying successful approaches adopted in other countries and coordinating donor resources to accelerate the commissioning of laboratories and state of art analytical equipment. In addition, building capacity will require a multidisciplinary approach. All project participants will work cooperatively on the core programme using nuclear and complementary technologies. As members of a wider group, the project participants will apply proven technical solutions and efficient information and communication technologies to allow countries without any existing capacity to quickly begin their training using regional capacity and transfer from well-established to less well established laboratories.

Planned Activities:

1. Undertake food safety gap analyses in selected countries
2. Initiate pilot studies in selected countries to develop capacity building packages to support food safety systems

3. Commission state of the art laboratories and develop transferable protocols for analytical methodology (potential participating countries include Argentina, Colombia, Costa Rica, Kenya, Peru, Uruguay) in coordination with national authorities and donor organizations
4. Initiate a platform recognised by donor organizations for coordinated intervention to build regional capacity and ensure the sustainability of capacity building activities and integrated monitoring
5. Implement train-the-trainers courses and sustainable technology transfer to developing country scientists, and workshops for regulators and policy-makers on food quality and safety (potential countries involved - Argentina, Belize, Brazil, Chile, China, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Haiti, Kenya, Malaysia, Nicaragua, Panama, Peru, Thailand, Uruguay, Venezuela).

Project Outcomes/Outputs:

1. State of the art food control laboratories, including methodologies to address identified gaps in food control systems commissioned and fully operational.
2. Networks of laboratories and affiliated/donor/technical cooperation agencies established and recognized internationally
3. Analytical strategies and integrated monitoring initiated in several countries to ensure adequate risk management decisions
4. A recognized platform, including a financial mechanism to ensure sustainability of capacity building activities in place in several countries.

Estimated budget per year: US $299 600 in the first year, US $214 000 per year for the second and third

Total estimated budget: US $727 600

V. Plant Breeding

9) Improving farmers' livelihoods on saline ridden soils

Rationale: Soil salinity due to climate change is expected to intensify by 10% by 2030. Rice, the staple for more than half the world's population, is a salt-sensitive crop. In this period, the world's population will increase by a further billion people and rice productivity will need to rise by 40% from the current average of 4.5 tons/ha to 7.5 tons/ha in order to satisfy the growing demand without adversely affecting the resource base. Rehabilitating saline lands by cleaning them up is uneconomical and impractical on a large scale. Technology packages integrating the introduction of salt tolerant mutant varieties with best-fit soil and water management practices provides a sustainable eco-friendly approach to diversify rice cultivars, increase farm incomes and promote global food security.

Project Description: This project aims to improve the livelihoods of farmers through enhanced rice productivity in saline soils using a participatory approach. To reach this goal, national breeding programs in the National Agricultural Research Systems (NARS) will be enabled to deliver effective contributions to enhance

crop adaptation to the effects of climate change and variability through capacity development and technology transfer.

Planned Activities:

1. 1st year pilot: Enabling NARS to use and adapt technology packages through capacity development. Transferring technology packages for salinity tolerant rice soils directly to six farmlands (two per country) for seed multiplication. Assessing mutant variety performance and strategies for further adaptation.
2. 2nd year: Recruiting six new farmlands through Field Demonstrations and Farmer's Days. Complementing acreage expansion with soil and water monitoring before sowing and after harvest. Measuring farm production (assessing harvested yield and quantifying plant nutrient status).
3. 3rd year: Continuing technology adaptation and transfer activities. Wide dissemination of adopted technology packages/tools in the region through extension and media activities. Conducting a survey on the socio-economic impact.

Project Outputs/Outcomes:

1. At least one salt tolerant mutant variety and its related package of best fit water and soil management practices introduced per country and data from at least 12 farmlands in three regions determined
2. Capacity enhanced in NARS in target countries laboratories proficient in using technology packages for technology transfer and adaptation of mutant crop varieties to local conditions
3. Productivity of rice in saline soils in the target countries sustainably strengthened through best fit soil and water management strategies applied to adapted mutant cultivars leading to increased income
4. Effectiveness of NARS to deliver well adapted mutant varieties significantly increased.

Estimated budget per year: US $267 500 per year for three years

Total estimated budget: US $802 500