

## Programme E. FOOD AND AGRICULTURE

**Rationale:** The three global goals of the United Nations for sustainable food security are: (i) ensuring access of all people to sufficient, nutritionally adequate and safe food; (ii) the continued and sustainable contribution of agriculture to economic and social progress; and (iii) the conservation and sustainable utilization of natural resources, including land, water and the genetic resource base for food and agriculture. Three thematic areas identified for priority action and considered relevant to the mandate of both the IAEA and FAO are: (i) productivity enhancement; (ii) conservation and sustainable use of natural resources; and (iii) plant, animal and consumer protection.

Various constraints to agricultural development related to the above thematic areas can be addressed effectively through nuclear techniques, which nowadays include techniques that fall within the UN definition of “biotechnology”. Some of these techniques provide more precise and specific tools for characterizing and monitoring critical constraints and risks to farming systems in developing countries, including those arising from the genetic make-up of the micro-organisms, plants, animals and insects that comprise these systems. Yet others offer direct and highly effective means of reducing the risks to food chains by altering genes and functions in ways that provide agronomic or other benefits. Nuclear techniques are therefore essential or provide significant added value, both for understanding the processes that underpin the production and transformation of biophysical resources into food and agricultural products and, directly or indirectly, for manipulating these processes to increase crop and livestock productivity while conserving and sustainably using natural resources and improving food quality and safety.

The Revised Arrangements that were agreed by the Directors General of the IAEA and FAO for this programme identified the above as the three core areas of common interest with respect to nuclear applications in food and agriculture. These Arrangements also recognized the need in the years ahead to strengthen the programme’s interdisciplinary capacity for producing outputs and outcomes while preserving the advantages of the disciplinary structure essential to ensure continued excellence in the programme’s main spheres of competence.

Against this background, and to provide a consistent presentation for Member States of its two sponsoring organizations, the programme is now structured into three subprogrammes dealing, respectively, with crops, livestock and food safety, each offering a mix of strategic and applied research, technical co-operation and information products consistent with the Agency’s Statute and FAO’s Constitution and in support of their respective medium term strategies. The projects and the specific activities proposed are

the outcome of substantial upstream planning, involving a variety of processes (e.g. Country Programme Frameworks, Thematic Planning, consultant’s meetings, external evaluations, and technology watch by the Secretariat) and the key stakeholders within national agricultural ministries and the research, plant and animal protection and food control institutes that support them. Priorities are therefore based on identified needs, comparative advantages and opportunities for incorporating nuclear techniques to improve the technology mixes available for understanding, reducing or removing constraints or risks to agricultural production and food processing and control systems in developing countries.

**Objective:** To enhance capabilities within Member States for alleviating constraints to sustainable food security by the application of nuclear techniques.

Outcomes
<ul style="list-style-type: none"> <li>— Increased use of Agency recommended techniques, procedures, guidelines and information products in agricultural research and development programmes.</li> <li>— Approval of Agency recommended norms and procedures by international institutions.</li> </ul>
Performance Indicators
<ul style="list-style-type: none"> <li>— Number of Member States using Agency recommended techniques, procedures and methods in their agricultural development programmes.</li> <li>— Number of Agency recommended norms and procedures accepted/approved and enforced by international institutions.</li> </ul>

### **Specific criteria for prioritization:**

- Areas where Agency support is required due to scientific or managerial complexity.
- Issues which have global or regional application and relevance.
- Fields of strategic research which are of global or regional importance.
- Areas where nuclear or isotopic techniques play an indispensable role.

### **Subprogramme E.1. Sustainable Intensification of Crop Production Systems**

**Rationale:** In many countries the sustainability of efforts to achieve development goals through agriculture and particularly through intensification and diversification of cropping systems and increased international trade in crop products is undermined by various forms of soil degradation, by the use of plant genetic resources that are low yielding, poorly adapted to harsh environments or produce low quality products, and by the damage and trade restrictions caused by insect pests. Identifying the

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causes, understanding the dynamics and finding solutions to these constraints requires access to the appropriate diagnostic and monitoring tools and plant production and protection-enhancing technologies. It also depends on having the technical and managerial capacities within national agricultural research systems (NARS) and plant protection institutions to develop, adapt and use these: (a) for assessing the risks to production systems, the environment and to trade associated with current or new agricultural practices; (b) for testing and promoting the adoption by extension services and producers of practices and technologies that better serve to optimize the trade-offs between intensification, conservation and sustainable use of natural resources and trade; and (c) for generating the science based information needed by regulators and government authorities for setting standards and regulations and making other policy level decisions.

Nuclear techniques provide essential or value added information and technology for defining and alleviating constraints and for providing opportunities for intensifying and diversifying cropping systems and promoting international trade in products while conserving and using natural resources in a sustainable manner. These include: radioactive and stable isotopes and neutron moisture probes to measure the sources and rates of uptake and losses of major nutrients and water and the dynamics of critical processes within soils such as organic matter turnover and erosion; mutation and molecular marker techniques for widening the diversity of plant genetic resources and developing new varieties of food and industrial crops with improved yield and tolerance to stresses; and the sterile insect technique (SIT) for controlling or eradicating major trade related crop insect pests.

In line with Article II of the Statute and in response to the continued acknowledgement by developing Member States of the value of nuclear techniques for improving the performance of their agricultural sector to meet socioeconomic needs, this subprogramme provides the scientific and technical guidance and co-ordination between the Agency, FAO and national and international partners to develop, and conduct comparative assessments and deploy these and other nuclear techniques within the framework of national land and water management, crop improvement and plant protection research and technology transfer programmes.

**Objective:** To sustainably intensify crop production systems in Member States by developing and deploying nuclear techniques that reduce the constraints and risks.

Outcomes
<ul style="list-style-type: none"><li>— Increased usage by NARS of fallout radionuclide (<math>^{137}\text{Cs}</math>, <math>^7\text{Be}</math>, <math>^{210}\text{Pb}</math>) inventories to measure soil redistribution rates and identify effective soil conservation measures.</li><li>— Increased ability of Member States to meet national and regional demand for reliable isotope analytical services through compliance with Agency quality assurance standards.</li><li>— Increased availability and exchange between Member States of crop breeding lines with improved and diversified quality characters.</li><li>— Increased use by Member States of SIT in area wide interventions against fruit flies and other major crop pests.</li><li>— Increased use of improved quality control and rearing protocols, biological reagents and generic construction design for insect crop pest rearing factories.</li></ul>
Performance Indicators
<ul style="list-style-type: none"><li>— Number of national and regional laboratories demonstrating proficiency in total N and <math>^{15}\text{N}</math> measurements.</li><li>— Number of advanced breeding lines of local crops with agronomic and quality characters improved by mutations.</li><li>— Number of areas of low pest prevalence and areas free of insect crop pests.</li><li>— Number of insect pest rearing facilities using improved protocols, QC procedures, reagents and construction design.</li><li>— Increase in the number of publications produced by and through the subprogramme.</li></ul>

**Programme changes and trends:** This subprogramme encompasses the five projects previously described under Subprogrammes E.1 and E.2 and project E.4.01 of Subprogramme E.4. It thereby brings together all activities directed at using nuclear technology to improve the productivity of crop production systems in developing countries through: better management of soils, plant nutrients and water resources; the use of plant genetic resources offering better prospects of providing food and industrial raw products; the control of insects that lower yields, impair quality and damage export potential, or through combination of these. With regard to technical direction, there are three main changes. First, with the successful completion of work in agroforestry and comparative assessment of different methods of measuring soil water, a new project, E.1.05, is introduced that builds on the results of previous projects to investigate in detail the value of nuclear and molecular marker techniques as screening tests for early identification and subsequent breeding of plant germplasm that can sustain and increase crop production in harsh environments.

Second, with the phasing out of work on traditional industrial crops and some aspects of mutation induction in bananas, studies will be initiated to screen crop germplasm for important nutritional characters and to investigate the potential of mutation induction for providing added nutritional value. And third, the trend to place less emphasis on R&D on the Mediterranean fruit fly that began in the previous biennium will continue. More emphasis will be placed on activities relating to the codling moth and *Anastrepha* species of fruit flies among the insect pests targeted for control or eradication through SIT.

**Resource changes and trends:** The amount of Agency resources proposed represents an increase of \$417 000 in 2004 compared with the 2003 adjusted budget and a decrease of \$251 000 in 2005 compared with the 2004 budget. The increase is foreseen for work on crop development in harsh environments. The decrease is due to redistribution of funds from this subprogramme to Subprogramme E.2.

#### Financial resources (2003 prices)

E.1.	2003	2004	2005
Reg. budg.	6 323 000	6 739 500	6 488 900
FAO reg. budget	1 073 000	1 082 000	1 082 000
<b>Total</b>	<b>7 448 000</b>	<b>7 821 500</b>	<b>7 570 900</b>

#### **Project E.1.01: Development of integrated plant nutrient and water management practices for increasing soil fertility and crop yields**

**Main outputs:** This project will result in: published guidelines on the use and comparative advantage of nuclear and non-nuclear techniques to estimate crop uptake, losses and residual value of N fertilizers; data on nutrient and water dynamics in agroforestry systems; database and the first version of a decision support system for using organic nutrient sources; quality assured data on total N and <sup>15</sup>N analyses; a newsletter; ten technical co-operation (TC) projects implemented; and ten fellows trained at Seibersdorf through the TC programme.

*Duration:* 2001–2007

*Ranking:* 8

#### **Project E.1.02: Development of soil management and conservation practices for sustainable crop production and environmental protection**

**Main outputs:** The main outputs will be: guidelines on the use and comparative advantages of nuclear and non-nuclear techniques to estimate carbon stocks, carbon sequestration and carbon turnover rates in soil–plant systems and soil redistribution rates at different temporal and spatial scales; a validated decision support system for direct application of phosphate rocks; analysed data on carbon sequestration, water and nutrient dynamics in conservation farming systems; analysed data on nutrient and water dynamics in savannah ecosystems of Africa and Latin America and in rice–wheat systems of Asia; ten TC projects implemented; and

ten fellows trained at Seibersdorf through the TC programme.

*Duration:* 2001–2007

*Ranking:* 5

#### **Project E.1.03: Induced biodiversity for breeding crops with increased adaptability to drought, salinity and other constraints**

**Main outputs:** This project will result in: new mutant varieties and germplasm of selected local crops, including bananas with improved quality or tolerance to drought and salinity; protocols for molecular characterization of mutated genes; protocols for mutation induction and selection of mutants and mutated germplasm with agronomically important characters; a depository of mutated gene resources; cytogenetic and molecular characterization of plant genetic resources; technical publications on the application of biotechnology and mutation techniques for improvement of local food crops in low income food deficit countries, on the identification and pyramiding of genes for quality characters and stress tolerance, and on molecular tools for quality improvement in vegetatively propagated crops; a database on crop mutant genetic resources; a newsletter; ten TC projects implemented; and twelve plant breeders trained at Seibersdorf through the TC programme.

*Duration:* 2001–2007

*Ranking:* 4

#### **Project E.1.04: Identification, characterization and transfer of mutated genes**

**Main outputs:** The main outputs will be: technical documents on the molecular characterization of mutated genes controlling traits for seed crop improvement, for improving tropical fruits through mutations and biotechnology, and on the effect of various mutagens on DNA structure; DNA fingerprints and irradiated seeds; fifteen TC projects implemented; and ten crop breeders and plant scientists trained on molecular methods at Seibersdorf through the TC programme.

*Duration:* 2001–2007

*Ranking:* 6

#### **Project E.1.05: Identification and development of crop germplasm with superior resource use efficiency and nutritional value and adapted to harsh environments**

**Main outputs:** This project will produce: refined nuclear and molecular techniques for screening large populations of crop germplasm for superior agronomic water use efficiency under saline and drought conditions; better understanding of the physiological basis of plant tolerance to soil acidity and salinity; data on genotypes supporting N fixation; and six fellows trained at Seibersdorf.

*Duration:* 2004–2010

*Ranking:* 12

***Project E.1.06: Improved procedures and capacities for risk assessment and management of major trade related insect pests of crops through the integration of sterile insect technique in control and eradication programmes***

*Main outputs:* The project will result in: publication of methodologies and guidelines for the production, handling and shipping of sterilized natural enemies of crop insect and pest and for quality assurance of mass produced and released fruit flies; a draft standard on transboundary shipment of sterile insects under the International Plant Protection Convention; guidelines for fruit fly packing, release and trapping in area-wide programmes; a manual and CD-ROM for assessing the economic returns of fruit fly SIT programmes; a world directory and information system for fruit fly workers; a pest control newsletter; and ten to fifteen TC projects implemented.

*Duration:* 2002–2008

*Ranking:* 1

**Subprogramme E.2. Sustainable Intensification of Livestock Production Systems**

**Rationale:** Systems of livestock production in developing countries are becoming progressively more intensified as producers and traders respond to the increasing demands of higher income consumers within urbanized societies for milk, meat and other livestock products. At the same time, government authorities and their institutions are having to grapple with the risks accompanying this “livestock revolution” and in particular with the challenges of increasing productivity without degrading the feed and genetic resources upon which production depends, and ensuring that diseases, particularly those of a transboundary nature and which impact on trade and human health, are brought progressively under control or eradicated. To succeed, they need to be able to assess and manage both the risks and the opportunities arising from intensification. This, in turn, requires capacities to develop, adapt and foster the application of appropriate production and protection-enhancing technologies as well as sound and mutually supportive policies for their use at national levels; increasingly, these must be consistent with internationally accepted standards and guidelines.

The SIT and isotope and related biotechnological methods (RIA, ELISA, PCR and molecular markers), when appropriately integrated with other methodologies, provide substantial added value to national and international efforts to enhance livestock productivity and protect human health and the environment through more effective feed and genetic

resource utilization, breeding management and control or eradication of both trade and poverty related transboundary animal diseases.

The activities included in this subprogramme involve a combination of strategic and applied research, technical co-operation and decision support initiatives targeted to help NARS, veterinary authorities, regulators and the international community. The techniques used are advanced, involve substantial international harmonization of protocols, standards and policies and, hence, building of coalitions with the international community involved in both the trade and poverty alleviation aspects of livestock development (e.g. OIE, AU, IFAD). The Agency’s involvement in these activities is critical given that, along with FAO, it is recognized as the sole organization within the UN system with the required technical knowledge and experience to ensure the safe and appropriate use of the techniques concerned. Also, substantial Member State interest in these activities is indicated by the continued high level of requests for technical co-operation.

**Objective:** To enable Member States to sustainably intensify livestock production systems by developing and applying nuclear techniques which alleviate constraints and risks.

Outcomes
<ul style="list-style-type: none"> <li>— Increased use of locally available feed resources and appropriate reproductive management practices that improve livestock productivity in smallholder dairy production systems.</li> <li>— Increased ability of NARS and veterinary authorities to assess and manage risks from transboundary infectious diseases.</li> <li>— Expanded use of the area wide concept for intervention against tsetse flies in Africa coupled with wider use of improved mass rearing and quality control procedures.</li> <li>— Wider use of tools and procedures developed through the programme for screwworm risk assessment and cost–benefit analysis.</li> </ul>
Performance Indicators
<ul style="list-style-type: none"> <li>— Number of farms introducing management changes based on methods and guidelines developed through the subprogramme.</li> <li>— Number of Member States obtaining OIE recognition of freedom from rinderpest.</li> <li>— Number of veterinary laboratories having quality management systems in place and meeting international accreditation.</li> <li>— Number of planned or implemented area wide intervention programmes against tsetse and screwworm flies where SIT is a significant component.</li> <li>— Number of insect production facilities complying with improved rearing techniques and quality control protocols.</li> </ul>

**Programme changes and trends:** As with Subprogramme E.1, this subprogramme brings together projects previously described under

Subprogramme E.3 and project E.4.02 of Subprogramme E.4, thereby tackling the assessment and management of risks and constraints to livestock production systems through nuclear technology in a more integrated and interdisciplinary manner. The main changes in technical direction include curtailment or significant downsizing of research involving radio and enzyme linked immunoassays (RIA and ELISA) within projects E.2.01 and E.2.02 in favour of work within a new project E.2.03 to determine the value of radionuclide based molecular methods for characterizing and eventually using genes associated with useful production characteristics and disease-causing pathogens and pests. The objectives are to assist in selecting animals with superior traits, developing improved diagnostic tools, and improving the effectiveness of SIT and other control methods. Support for the sustainable use of immunoassay techniques will, however, continue through technical co-operation projects which will focus on developing regional capacities both in terms of human resources and reagent and kit supply.

**Resource changes and trends:** An increase in the Agency's resources of \$110 000 in 2004 compared with the 2003 adjusted budget and \$345 000 for 2005 compared with the 2004 budget is foreseen for the use of molecular techniques for improving productivity in small holder livestock systems.

#### Financial resources (2003 prices)

E.2.	2003	2004	2005
Reg. budg.	3 226 000	3 335 700	3 680 700
FAO reg. budget	859 000	896 000	836 000
<b>Total</b>	<b>4 033 000</b>	<b>4 231 700</b>	<b>4 516 700</b>

#### ***Project E.2.01: Technologies for integrated management of natural resources in small scale dairy production systems***

**Main outputs:** This project will result in: a publication on the use of tree foliages containing tannins for feeding livestock in smallholder farms; customized database applications for measuring livestock productivity; a newsletter; and between six and eight national and two regional TC projects implemented.

*Duration:* 2002–2006

*Ranking:* 9

#### ***Project E.2.02: Technologies for reducing risk from transboundary livestock diseases and those of veterinary public health importance***

**Main outputs:** This project will result in: the publication of (a) validated methodologies for separating the vaccinated animals from the naturally

foot-and-mouth disease infected animals, and (b) results of studies to assess the effectiveness of vaccination strategies against Newcastle disease in village poultry in Africa; manuals for sampling animals for the presence of veterinary drugs as well as on approaches for evaluating and standardizing residue detection assays; a thematic plan for techniques and strategies for progressively controlling transboundary diseases in Member States; an international animal disease diagnosis assay information system; a set of procedures for EMPRES diseases providing information on diagnostic assay and reagent sources; twelve to eighteen TC projects implemented; and eight veterinary personnel trained at the Seibersdorf Laboratory through the TC programme.

*Duration:* 2002–2007

*Ranking:* 3

#### ***Project E.2.03: Use of molecular techniques for improving productivity in small holder livestock systems***

**Main outputs:** This project will produce: proceedings of an international symposium on gene based technologies for improving animal production and health; plan for a thematic CRP to use gene based technologies in livestock breeding through the initial characterization of small ruminant genetic resources in Asia; a database on characteristics and status for key breeds of sheep and goats in Asia; thirty scientists from developing countries trained (through the TC programme) at Seibersdorf in the relevant technologies for improving productivity in small holder livestock; and two to five TC projects implemented.

*Duration:* 2004–2010

*Ranking:* 11

#### ***Project E.2.04: Enhanced risk assessment and management procedures for tsetse and screwworm flies through integration of the sterile insect technique in intervention campaigns***

**Main outputs:** This project will result in: publication of results of studies to assess the value of molecular methods for defining tsetse populations genetically, for defining the criteria needed to decide on the locations of tsetse mass rearing facilities and for deciding on release densities of different tsetse species during SIT operations; definition of the optimal radiation sterilization procedures for selected insect pests; an international conference; and ten to fifteen national and regional TC projects implemented.

*Duration:* 2002–2007

*Ranking:* 2

**Subprogramme E.3. Risk Analysis Methodologies and Capacity Building for Compliance with Food Safety Standards**

**Rationale:** Ensuring the safety and quality of food supplies is an integral part of food security and consumer protection in all countries. It is also essential for countries wishing to pursue social and economic objectives through greater access to world markets in food and agricultural commodities and export earnings. Countries are increasingly giving priority to implementing food control systems that are designed to ensure quality and safety throughout the food chain, i.e. from “farm to fork”. In doing so, they recognize the need to harmonize their food safety and phytosanitary regulations around the standards and guidelines established by the FAO/WHO Codex Alimentarius Commission and the FAO Interim Commission on Phytosanitary Measures since these are used as references by the WTO for trade related issues under the Sanitary and Phytosanitary (SPS) Agreement. They also attempt to implement related international codes of conduct to promote good agricultural practice (GAP) and good manufacturing practice (GMP) and thereby reduce the chances of unacceptable risks to health arising, for example, from inappropriate use of pesticides and the presence of pathogenic microorganisms.

Nuclear and related analytical methods are used by food and environmental control and pesticide registration and monitoring authorities for analysing food and environmental samples and commercial products for compliance with standards, specifications and codes of conduct relating to agricultural and processing practices. At the same time, analytical laboratories and trained staff are an integral component of food control systems providing the fundamental support for risk assessment through hazard identification, characterization and exposure assessment and risk management by providing policy makers at national, regional and international levels with the necessary data to support decision making. Additionally, irradiation is an effective method to control food-borne pathogens in solid food such as poultry, meat, seafood and spices without affecting product quality, and it is a broad spectrum control method for insect pests that is endorsed as a phytosanitary treatment for agricultural products.

The Agency is the only organization within the UN system with expertise in food irradiation and through the FAO/IAEA Training and Reference Centre for Food and Pesticide Control it has the relevant laboratory facilities, expertise and mechanisms to promote analytical method validation and build national capacities through research, training and proficiency testing.

**Objective:** To strengthen Member State capacities for implementing international standards and codes of conduct for consumer and plant protection through food irradiation and nuclear and related analytical techniques.

Outcomes
<ul style="list-style-type: none"> <li>— Greater harmonization of national food regulations based on the revised Codex General Standard for Irradiated Foods (with no maximum absorbed dose limit).</li> <li>— Wider acceptance of harmonized national plant protection and quarantine regulations based on the adopted IPPC International Standard on Irradiation Phytosanitary Treatment.</li> <li>— Expanded use of irradiation as a sanitary and phytosanitary treatment for food in Member States.</li> <li>— Enhanced national capacities to implement agreed sampling and analytical procedures and to contribute to validation studies for contaminants and residues covered by the Codex Alimentarius.</li> <li>— Improved preparedness for maintaining food safety in the event of a nuclear accident or radiological emergency.</li> </ul>
Performance Indicators
<ul style="list-style-type: none"> <li>— Number of Member States implementing the revised Codex General Standard for Irradiated Foods and International Standard on Irradiation as a Phytosanitary Treatment.</li> <li>— Number of Member States applying food irradiation on a commercial scale.</li> <li>— Number of personnel trained through the TC programme and laboratories complying with standards established for proficiency testing programmes.</li> <li>— Number of Member States with improved procedures in place.</li> </ul>

**Programme changes and trends:** Given the expected adoption in 2003 of the revised Codex General Standard for Irradiated Foods by the Codex Alimentarius Commission and of the International standard on Irradiation Phytosanitary Treatment by the Interim Commission on Phytosanitary Measures (ICPM) of the International Plant Protection Convention (IPPC), the future activities in food irradiation will be restricted to providing science based information on the process and assisting national food control and plant quarantine authorities in harmonizing their national regulations related to food irradiation around these standards. Also, activities directed at supporting end product testing for food contaminants will be reduced in favour of training and providing technical information for the control of food production through Good Agricultural Practices using the principles of Hazard Analysis Critical Control Points (HACCP) and sustainable environmental management, applying statistically based surveys using reliable and cost effective analytical methods to verify compliance with national and international standards and

regulations. As part of the overall strengthening of food safety systems, a co-operative arrangement will be elaborated to enable FAO and the IAEA to address food security issues in the event of a nuclear emergency. Related issues arising from GC (XXXVII)/RES/616 (practical utilization of food irradiation in developing countries) will be addressed by establishing internationally agreed intervention levels for radionuclides in food through Codex procedures. Finally, arrangements should also be in place at the national level to automatically apply actions according to local prearranged plans during the period of acute radionuclide deposition.

**Resource changes and trends:** A decrease in resources of \$190 000 is foreseen in 2004 compared with the 2003 adjusted budget and of \$94 000 for 2005 compared with the 2004 budget reflecting a reduced need for research and development in food irradiation.

#### Financial resources (2003 prices)

E.3.	2003	2004	2005
Reg. budg.	1 739 000	1 549 200	1 454 800
FAO reg. budget	902 000	856 000	916 000
<b>Total</b>	<b>2 641 000</b>	<b>2 405 200</b>	<b>2 370 800</b>

#### **Project E.3.01: International standards and guidelines on irradiation as a sanitary and phytosanitary treatment for food and agricultural commodities**

**Main outputs:** This project will result in: publications on the effectiveness of irradiation to ensure hygienic quality of fresh, minimally processed food of plant origin, the safety and quality of prepared meals, and quarantine security against insect pests in food and agricultural commodities; food control and plant quarantine personnel trained on harmonized regulations based on the revised Codex General Standard for Irradiated Foods and the new IPPC Standard on Irradiation as a Phytosanitary Treatment, and on the application of a single dose of radiation to

ensure quarantine security; a newsletter; science based information on the food irradiation process on the Internet; and five TC projects implemented.

**Unfunded activities/means of implementation:** Provision of training in the use of applied irradiation as an integral component of HACCP.

**Duration:** 2001–2005

**Ranking:** 10

#### **Project E.3.02: Analytical methods and strengthened capacities for risk analysis related to food safety and pesticide management**

**Main outputs:** This project will result in: (a) publication of guidelines or guidance documents on: facilitating quality control measures utilizing <sup>14</sup>C-labelled compounds, estimating sampling uncertainty and analysing multi-component active ingredients/metabolites and the stability of pesticide residues; (b) validated methods for analyzing mycotoxins, pesticide residues and radionuclides, and on the use of preventive measures to reduce mycotoxin concentrations in staple commodities; (c) training materials covering the areas of pesticide residues, mycotoxin and radionuclide analyses and pesticide formulation control, application of HACCP principles in food production, and risk assessment; (d) a database on radionuclide transfer factors; (e) national food safety and security plans for dealing with a nuclear accident or radiological emergency; (f) sixty personnel trained through the TC programme in analytical methods and issues underpinning food safety; and (g) ten TC projects implemented.

**Unfunded activities/means of implementation:** Preparation of an exercise on FAO/IAEA co-operative arrangement for food security support in a nuclear emergency.

**Duration:** 2001–2007

**Ranking:** 7