

Project title:

**Improving Efficiency in Water and Soil
Management**

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Project description

The simultaneous use of nuclear and classical techniques leads to a better understanding of the consequences of climate change on agricultural production, will optimize the use of material resources, protect the environment and reduce analysis time, generating economic benefits and promoting sustainable agriculture. The simultaneous use of nuclear and classical techniques leads to a better understanding of the consequences of climate change on agricultural production.

The efforts will focus on the promotion of advanced nuclear techniques, mass spectrometry, gamma spectrometry, beta counting, which are the basis for the most accurate characterization of agricultural land resources, as well as existing water resources.

The proposed project supports the national priorities and needs of all participating Member States in agricultural research and development and is aligned with the European Union strategy set out in the "A European Green Deal" for 2019-2024, which aims to achieve a resilient economy and society to climate-change challenges, protecting and sustainably managing natural resources and ecosystems and ensuring food security, supplies and sustainable uses of raw materials, to meet the needs of a growing global population within the sustainable limits of natural resources.

SECTION-1: PROJECT BACKGROUND AND JUSTIFICATION

Problem to be addressed

Climate change is a major challenge for humanity as a whole. Ensuring sustainable agriculture in the face of climate change characterized by long periods of drought followed by torrential rains, global warming, is becoming increasingly difficult.

Climate change is a real threat and is one of the biggest environmental problems, with negative consequences for sustainable agriculture due to the accelerated pace of manifestation and the inability to adapt as quickly to these changes and the lack of adapted strategies. to current and future climate change.

In the same time, the increasing pressure of the anthropic activities on soil / land resources caused a severe impact on natural intrinsic quality. Thus, the effects of widespread land degradation due to agricultural practices are magnified by climate changes, resulting in a continuous reduction of self-sustained agricultural fields.

Sustainable development is that development that meets the requirements of the present without compromising the ability of future generations to meet their own needs.

In the field of agriculture and viticulture, we have been facing in the last decades problems related to the poor adaptability of varieties to the alternation of periods of drought with those in which there are climatic accidents, late frosts, hail, etc. In viticulture, there is an advance of the harvest period associated with an increase in the amount of sugars in the must and a decrease in acidity, all this leading to the depreciation of the quality of the wines.

SECTION-1: PROJECT BACKGROUND AND JUSTIFICATION

Problem to be addressed

Annual agricultural crops are also affected by climate change, requiring careful work in improving varieties, in adapting crop technologies to maximize the usage of the abiotic and biotic resources, especially the water and soil resources.

Soil erosion and associated phenomena are a natural source of pollution of water resources, having a permanent character and consisting of penetration into water sources through leaks and erosion of foreign substances such as: soluble mineral salts; plant nutrients; fungicides; solid particles, alluvium resulting from the erosion of the shore surface or depth, leading to the alteration of water quality and to the decrease of the availability of water resources by clogging the surface water sources generally represented by hilly accumulations.

Isotopic and nuclear techniques as well as related conventional ones are used complementary in the development of agricultural practices adapted to climate change, (alternating periods of deficit-excess of precipitation associated with early or late seasons) as well as the development of complex measures, works and agricultural practices to control / reduce land degradation through water erosion and associated processes. When these anti-erosional practices are applied on the entire surface of a watershed they lead to a sustainable development of the region.

Why should it be a regional project?

This regional approach will provide an economic solution to common regional problems and will also promote the best nuclear and classical techniques among regional Member States. For the current situation in which climate change is increasing in intensity from year to year, it is an extremely favourable time for the initiation and implementation of the proposed project in the region. Sharing experience through technical meetings, organizing regional training courses and disseminating information are the methods by which we consider an effective approach to common problems. It will bring socio-economic benefits, better product quality in terms of sustainable agriculture, which will lead to safer management of agricultural land in the region.

Stakeholders

Participating Member States and agricultural end-users are the main stakeholders in the proposed project. In the participating Member States there are well-established groups in the institutions and ministries of agriculture and science, as well as the university, research institutes and research resorts with different specialties.

These groups have the necessary capacity to implement the proposed project. In general, in the participating Member States, these groups maintain good links with end-users and national institutions of interest.

Even though the Chernobyl and Fukushima nuclear accidents in the economy have shown some restraint in the use of nuclear techniques, at present end-users are increasingly interested in the benefits of these techniques.

It should be noted that end-users are aware of the benefits of nuclear techniques and ask themselves for national nuclear institutions for assistance and service provision.

Partnerships

international affiliations

SCDVV Murfatlar through its representants is member of International Society of Horticulture (ISHS) and Balkan Environmental Association

SCDCES MM Perieni is a member of European Society for Soil Conservation (ESSC) and World Association of Soil and Water Conservation (WASWC)

SCDVV Bujoru

IFIN-HH is a member of IAEA – ALMERA, (Analytical Laboratories for the Measurement of Environmental Radioactivity) network.

Overall Objective (or Developmental Objective)

Improving and strengthening the regional capacity in diagnosing the real situation, optimizing procedures, using nuclear and classical techniques.

Nuclear technique(s) to be used and role of IAEA

Inductively coupled plasma mass spectrometry – ICPMS. IAEA through its laboratories in Seibersdorf and Monaco can organize training courses and workshops, in order to harmonize the working procedures used by participants in the project on trace elements analyses.

Isotope analysis is the identification of isotopic signature, the abundance of certain stable isotopes and chemical elements within organic and inorganic compounds. Isotopic analysis can be used to understand the flow of energy through a food web, to reconstruct past environmental and climatic conditions, to investigate human and animal diets in the past, for food authentication, and a variety of other physical, geological, palaeontological and chemical processes. Stable isotope ratios are measured using mass spectrometry, which separates the different isotopes of an element on the basis of their mass-to-charge ratio.

Gamma ray spectrometry - ALMERA network plays a key role on organization of meetings, development of standardized methods for sample collection and analysis, and organization of inter-laboratory comparison exercises and proficiency tests. Cs137 and Pb210 are two radioactive isotopes which can be used for erosion and sedimentation processes assessment.

$^3\text{H}/^3\text{He}$ dating of shallow groundwater coupled with nitrate analysis including $^{15}\text{N}/^{14}\text{N}$ ratio determination can provide a feedback how nitrate pollution migrates in the subsurface. $^3\text{H}/^3\text{He}$ dating can be additionally used to determine the recharge rate of the area.

$^{87}\text{Sr}/^{86}\text{Sr}$ ratios determined by MC-ICPMS contributes to identify fake food products.

Outcome (Project Specific Objective)

Capability of Member States in application of nuclear techniques in agriculture enhancement by the improvement of efficiency in water and soil management and crop production

Performance Indicator(s)

Number of Member States that will implement nuclear techniques correlated with classical techniques for sustainable agriculture.

Number of people who will participate in the training courses

Realization of the e-learning platform

Sustainability

In the European Green Deal for 2019-2024 it is stated that:

”Climate change and environmental degradation are an existential threat to Europe and the world. To overcome these challenges, Europe needs a new growth strategy that transforms the Union into a modern, resource-efficient and competitive economy where

- there are no net emissions of greenhouse gases by 2050
- economic growth is decoupled from resource use
- no person and no place is left behind”

This project that promotes modern techniques applied in agriculture will create a common environment for knowledge dissemination, research and development. The project will contribute to future EU programs in agriculture. Agricultural research and development plays a key role in addressing the challenge of meeting food security, the competitiveness of agriculture in the EU Member States and at the same time combating the adverse effects of climate change.

Safety and Regulatory Infrastructure

All Member States participating in this project have an adequate regulatory and safety infrastructure, as well as associated standards and procedures, which ensure the execution and implementation of the project in a safe manner. Training courses will always include a section on radiological safety and good practices.

Requirements for Participation

Basic knowledge of nuclear and classical techniques applied in agriculture. All participating teams applying nuclear techniques are or will be members of the ALMERA network to improve their collaboration and to support sustainable agriculture as part of a regional collaboration.

Other considerations, e.g. environment, gender

The consortium includes very different participants from academic and research institutes. These combine the best expertise in their technical and scientific fields. This guarantees the best possible potential for the exploitation of the results of this project.

There is a clear complementarity of expertise among the scientific partners of the consortium. They are united by common goals and form a community speaking the same language. The project gathers some of the best specialists in the field, working at some of the leading institutes in their countries.

The project has direct benefits for the environment by promoting the application of modern techniques for sustainable agriculture under climate change and global warming.

Both genders are naturally represented in the project. During the duration of the project, all efforts will be made to promote gender equality in an appropriate way.

SECTION 3: IMPLEMENTATION ASPECTS

Implementation Strategy

Training of appropriate skills, through knowledge and experience.

Certification of staff trained by trainers with experience in the field

Project planning and control with discussions with project managers from each participating Member State and the IAEA

Presentation of the use of nuclear techniques for good practices in agriculture.

Stay in touch with end users through communication, newsletters and advertising.

Monitoring and Reporting

A task force will be set and will develop the specific work plan and the steering committee consisting of task groups leaders, Project Monitor Officer, Technical Officers and experts will govern whole project assuring relation and collaboration between project counterparts.

Feedback will be a basis for evaluating the project action plan and possible deviations. Monitoring and reporting of project activities will be ensured through regular coordination meetings and annual reports from each head of project to the IAEA.

The process will be facilitated by the IAEA. The Project Leader will be responsible for collecting and consolidating the feedback received from all counterparts in an annual Project Progress Assessment Reports, to be submitted electronically through the e-PPAR platform.

Risk Management

No technical risks are foreseen. A very low risk could come from insufficient commitment of the national participating institutions or regulatory authorities or stakeholders which may limit the application of nuclear techniques.

IAEA basic safety standards will be applied for any application and national safety authority will be encouraged to apply an adequate response to the radiological risk induced by nuclear techniques applications.

An unforeseen risk is the COVID19 pandemic, which could jeopardize the project. It should be noted that, at present, humanity as a whole seek medical treatments and vaccines to reduce the threat to his disappearance

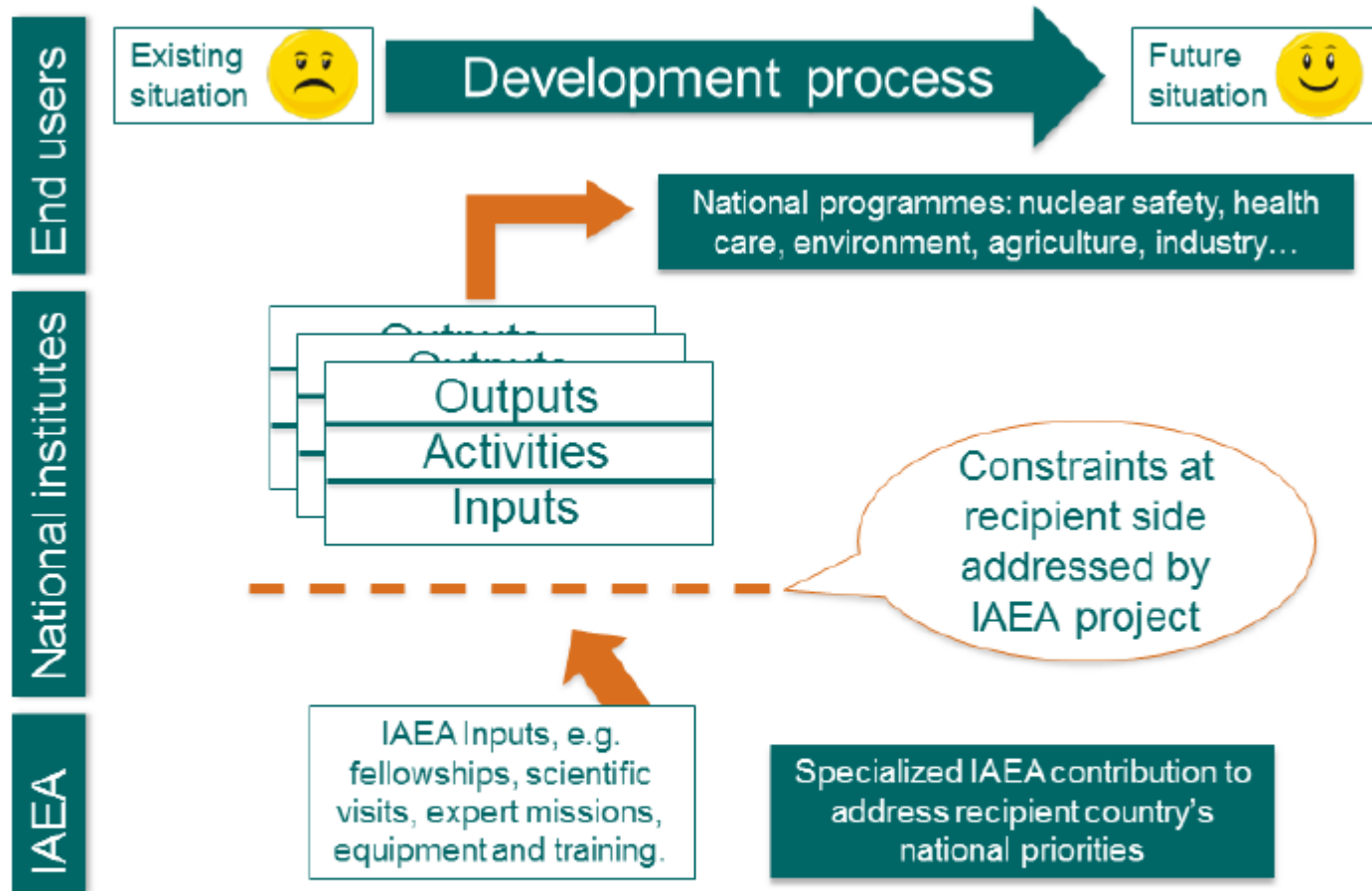


Fig. 1. The TC programme: A shared responsibility!

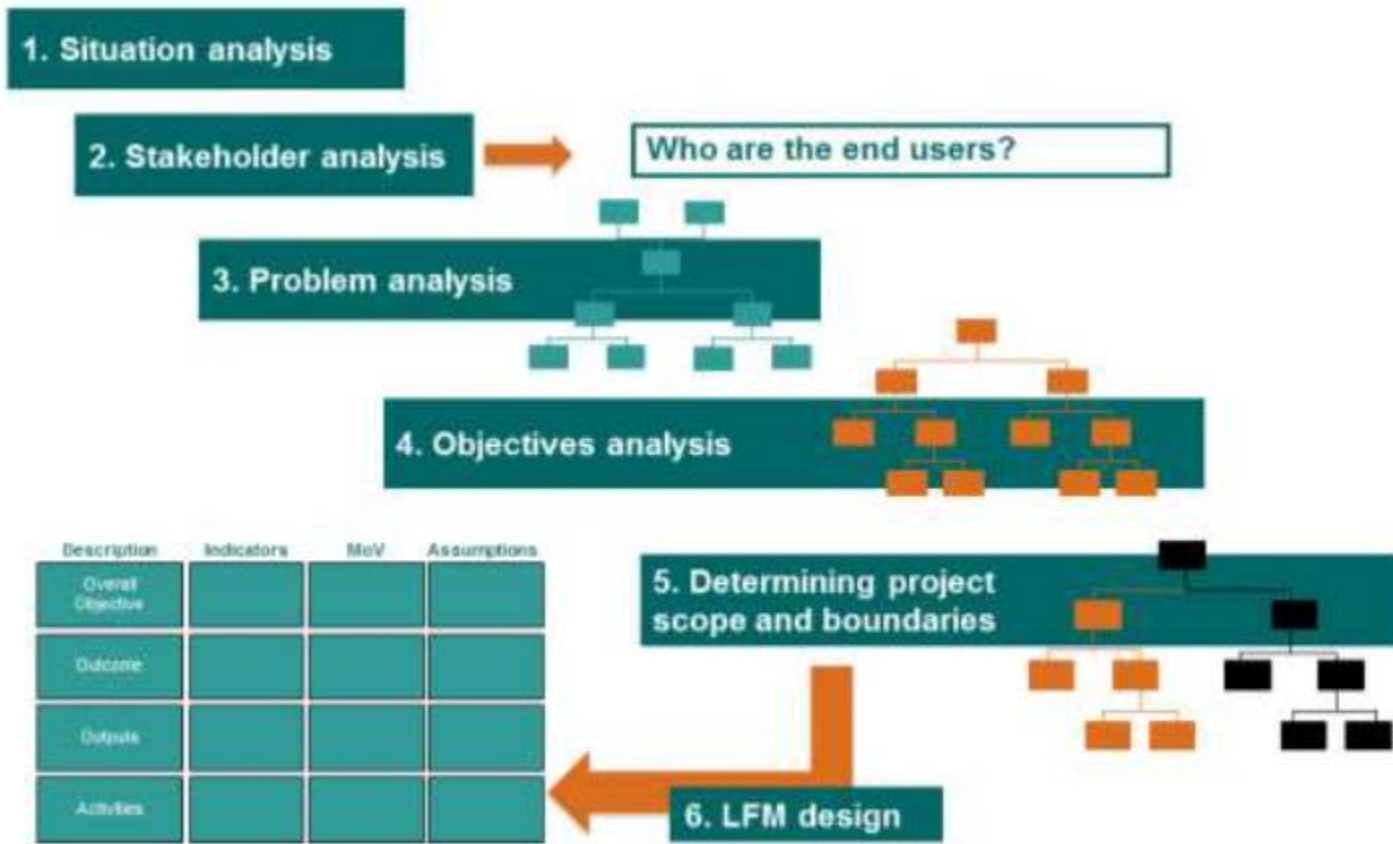


Fig. 5. The logical framework approach: A step-by-step overview.

Logical Framework Matrix

	Design Element	Indicator	Means of Verification	Assumptions
Outcome	Capability of MSs in application of nuclear techniques in agriculture enhanced for the improvement of efficiency in soil and land management	A number of recipient MS applying nuclear techniques	Country reports	Institutional support of the activities at recipient countries Available staff and infrastructure of IAEA to support international recognition of good practice in agriculture
Output	1. Training modules on nuclear techniques	several nuclear techniques introduced in recipient MS	Country reports	Producing timely quality training materials Collaboration with certifying organizations
	2. Developing an e-learning platform	the platform is created and hosts courses and course content	Content presented by experts who explain essential ideas clearly and completely	an integrated set of interactive online services that provide trainers and learners involved in education with information and resources to support and enhance education
	3. Trained personnel in nuclear techniques applications in agriculture available.	An important number of people trained and certified	Training reports and certificates	Available specialists to attend training activities Trainees willing to undertake certification tests

Logical Framework Matrix

	Design Element	Indicator	Means of Verification	Assumptions
Output	4. Trained personnel in modern techniques on environmental monitoring, field sampling and data modelling in agriculture	An important number of people trained and certified	Training reports and certificates	Available specialists to attend training activities.
				Growing demand from agriculture in using such modern techniques.
	5. Increased awareness of agriculture end users in the field of nuclear techniques applications.	nuclear techniques procedures adopted by recipient MS institutes	Counterpart reports	Increased demand from agriculture and availability of these techniques in the participating MS. Regulatory bodies allow the use of these techniques

Logical Framework Matrix

	Design Element	Indicator	Means of Verification	Assumptions
Activity	1 To develop and validate training materials in nuclear techniques			experts are available
Activity	2 To develop and validate e-training modules for online platform for training of nuclear and classical techniques		e-learning platform is operational	IT experts are available
	3. To develop procedures on classical techniques applications in soil erosion and sedimentation assessment			experts are available
	4. To train specialists in the field of water resources management			Available training institutions Specialist available for training activities
	5 Promoting and preparation of publications materials on nuclear techniques			experts available
	6 promoting good practices in water and soil management			experts available, positive response of national regulatory bodies

Logical Framework Matrix

	Design Element	Indicator	Means of Verification	Assumptions
Input	1: Expert home based assignment for developing a technical document on nuclear techniques application in agriculture			
	2: Expert home based assignment for developing training materials for nuclear techniques application in agriculture			
	3 Expert home based assignment for developing training materials for classical techniques application in agriculture			
	4 Expert home based assignment to adapt training materials for e-learning platform			
	5 Regional workshop for the evaluation and validation of training materials and e-learning modules by counterpart institutions			
	6 Expert meeting to define training programs and equipment needs for Regional Training Courses			

Logical Framework Matrix

	Design Element	Indicator	Means of Verification	Assumptions
Input	7 Regional Training Course in gamma ray applications in erosion and sedimentation assessment 2022			
	8: Regional Training Course in ICP-MS application in soil, water and biological materials assessment 2022			
	9 Regional Training Course in GC-MS application in soil, water and biological materials assessment 2022			
	10 Regional Training Course in LC-MS application in soil, water and biological materials assessment 2022			
	11 Regional Training Course in assessment of environmental factors in vineyards 2022			
	12 Regional Training Course in erosion, water quality and sedimentation assessment 2022			
	13 Regional Training Course in modern environmental monitoring and sampling techniques applied in agriculture 2022			