



**Keynote Address: *Nuclear Science & Technology:
Applications for the Welfare of Mankind***
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Human knowledge and progress go hand in hand. As knowledge expands, the potential for development grows. Over the last century, nuclear science and technology have played an increasingly important role in improving human well-being and the world around us. Today, nuclear applications can be found in almost every social and economic sector and in virtually every corner of the globe.

Yet as the world becomes more reliant on scientific advances, society appears less and less aware of, or perhaps indifferent to, its achievements. If wise use of science in future is to be assured, key applications for everyday use need to be better understood, not only by decision makers, but by the people whose whole lives they touch.

People around the world today are deeply concerned about the dangers posed by nuclear weapons, and some remain skeptical about the safety of nuclear power. But most are unaware of the many positive contributions that nuclear science and technology are making to everyday life.

Food, health, energy, industry and environment - the fields could not be more diverse, yet these are just a few of many examples where nuclear based technologies are helping to understand and provide solutions to to-day's economic and social problems.

Many factors affecting plant growth and crop quality, such as drought, insects and diseases, are often beyond farmers' control. While it is difficult to create ideal growing conditions, for the past three decades it has become possible to produce plants that are better tailored to thrive under imperfect conditions by drawing on the skills of the plant geneticists and maximizing opportunities offered by nuclear technology for inducing subtle changes or mutations in the genetic make up (DNA) in plant seeds, buds or tissues. Thanks to the controlled use of ionizing radiation for producing mutation, to-day it has been possible to produce more than 1800 varieties of 164 plant species including rice, wheat, maize, barley and banana considered as staple food in most of the developing countries of the world. Nuclear science also plays an important role in understanding soil-plant interactions and in helping to increase crop production through better soil management. Insects reduce food production through both direct damage and the disease they spread to crops and livestock. Pesticide which are used routinely for pest control pollute the environment, contaminate food and water, destroy beneficial insects and increase resistance in target species. Nuclear based techniques like sterile insect technique (SIT) can reduce and in some cases eradicate insect pests that are harmful.

Nuclear technology provides unique information about the nutrition of farm animals- data that can be used to find better ways of converting animal feeds into milk and meat. In countries where isotope-based concepts have been widely adopted, research has paid handsome dividends in terms of higher animal productivity and improved nutrition and health of consumers.

Food irradiation allows the complete dis-infestation of grain, spices, vegetable seasonings and dried fruit

destined for long-term storage. It also inhibits sprouting and extends the shelf-life of fresh produce that can spoil in transit. In poultry and red meat, irradiation destroys bacteria associated with food borne diseases.

Nuclear technologies are making sizable contributions in human health through their applications in the fields of Nuclear Medicine, Radiotherapy and Radiology.

Principally nuclear medicine investigations are highly cost-effective diagnostic procedures used for assessment of organ function and early detection of diseases. To this effect, radionuclides or compounds that are labeled with radionuclides (radiopharmaceuticals) are administered to the patients and a specific organ function can be evaluated by tracing the dynamic bio-distribution of such compounds in specific organs. Tracing of the compound is achieved by external monitoring of the photon emitted from the radionuclides by using the gamma cameras. On the other hand Therapeutic nuclear medicine is rapidly developing as an additional treatment modality in oncology and few benign clinical conditions. The treatment of thyroid cancer or hyperthyroidism with I-131 has been in use for more than 50 years.

There has been a dramatic increase in cancer cases world-wide, especially in industrialized nations. The number of new cases is expected to climb to 15 million by the year 2015, and roughly two thirds of these will occur in the developing countries, where the average life span is quickly increasing. About half of all cancer patients today receive radiotherapy as part of their treatment.

Nuclear techniques during the last decade have been extensively used in human nutrition research. Using such techniques, it has been possible to analyze micro-nutrient status of humans in health and disease and also provide advisory on diet therapy.

To-day millions of tonnes of one time use medical products, ranging from scalpels to syringes, are being sterilized in more than 200 facilities in 50 countries all over the globe. Radiation kills disease producing bacteria without leaving a residue. Penetrating gamma radiation allows products to be sterilized on-line, in bulk and in their final packaging. Irradiated products are not radioactive, and they can be used straight from the treatment unit.

Nuclear techniques play an important role in environmental protection by providing assistance in promoting alternate sources of energy, reducing air pollution, managing fresh water resources, controlling water pollution and guarding the oceans and seas. They are also used to analyze minerals, soils, gases, water and other substances used in industry, and the results often influence economic, ecological, medical and legal decisions.

The International Atomic Energy Agency works to foster the role of nuclear science and technology in support of sustainable human development. This involves both advancing knowledge and exploiting this knowledge to tackle pressing world-wide challenges - hunger, disease, natural resources management, environmental pollution and industrial quality control.