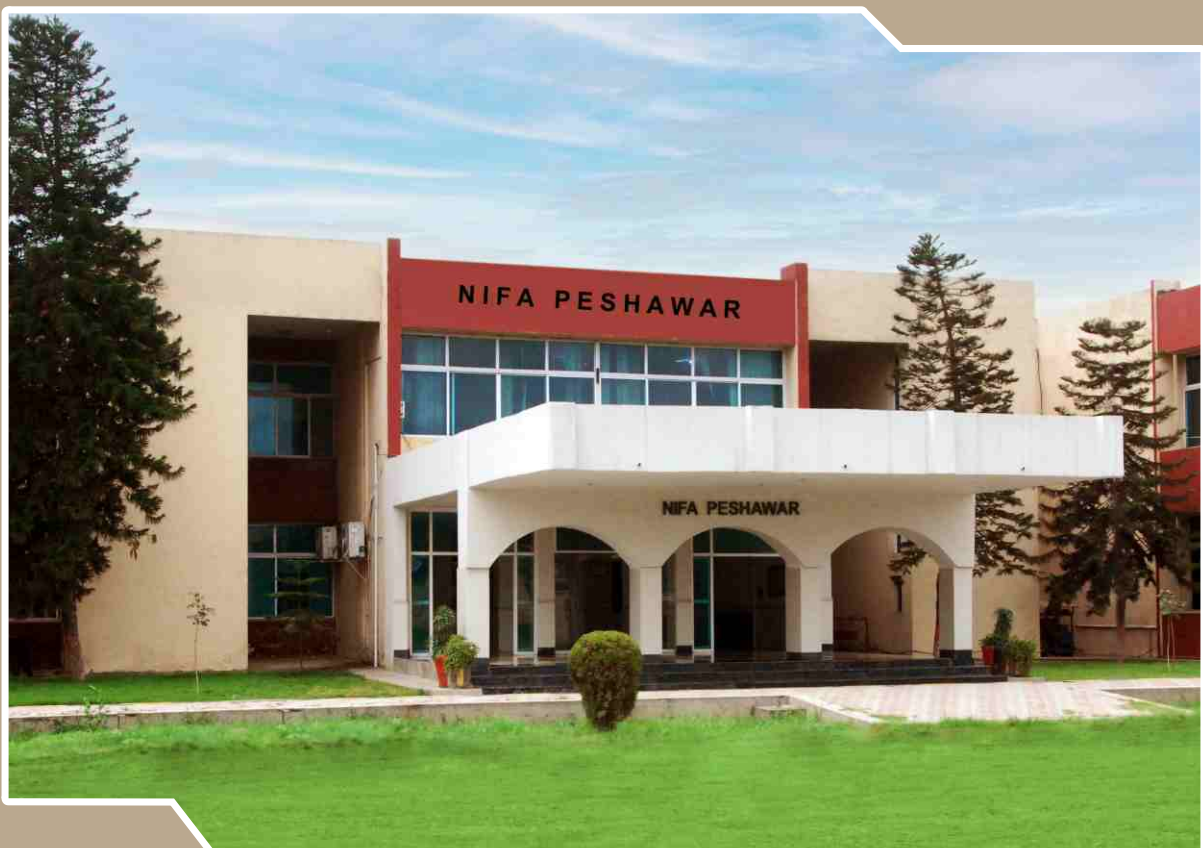
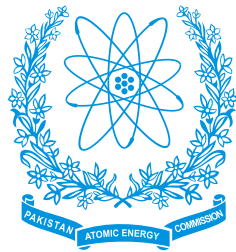


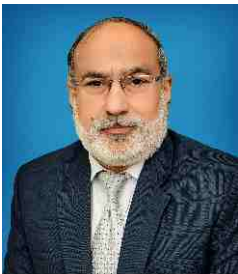
Nuclear Institute for Food and Agriculture (NIFA)



<https://www.nifa.org.pk>



Pakistan Atomic Energy Commission



*Dr. Raja Ali Raza Anwar (HI, SI, PoP)
Chairman,
Pakistan Atomic Energy Commission*

CHAIRMAN'S MESSAGE

Pakistan Atomic Energy Commission has taken the lead in utilizing different technologies to improve productivity of Agriculture sector through the introduction of new crop varieties, pest control technologies, plant nutrition, water management, animal health and productivity, food decontamination and preservation. Agriculture and Biotechnology Institutes of PAEC have contributed tremendously by evolving high yielding, disease resistant, drought, salinity and climate resilient varieties of major and minor crops. More than 150 crop varieties have been released some of which have emerged as the leading crop varieties. Plant diseases / pests and post-harvest losses are key factors limiting crop yields. Nuclear Institute for Food & Agriculture (NIFA) is a subsidiary of Pakistan Atomic Energy Commission (PAEC) working in the field of food and agriculture. NIFA is striving for sufficient, nutritious environment friendly food production in the country as the food security under changing climate is the biggest challenge faced by the country. NIFA is in endeavor to develop climate smart crop production technologies and high yielding, disease resistant, stress tolerant and climate resilient varieties of various field and horticultural crops. NIFA has also identified various climate smart agriculture practices and farming systems for efficient utilization of natural resources (soil, water & nutrients), developed environmentally friendly technologies to manage pests, technologies/services for nutritive, value added and environmentally safe food/products to end users. NIFA is addressing the societal challenges by providing technical assistance to the farming community, extension workers, cottage & food industries and academia through periodic seminars, field days, workshops, training courses, brochures and radio-talks. Agriculture and Biotechnology Institutes also have a fair share in human resource development through training courses, workshops and internships. On average 40 different courses are arranged every year. These courses equally benefit researchers, students and academia from various research organizations and universities. We are committed to improve country's economy by providing quality products and services and develop HR to play their role.



Dr. Masood Iqbal
Member Science
Pakistan Atomic Energy Commission

MEMBER SCIENCE'S MESSAGE

The evolution of new improved crop varieties is the main goal of plant breeding programs of PAEC. The crop varieties evolved by PAEC have significantly contributed towards improvement of economy of the country and socio-economic uplift of the farming community. Nuclear Institute for Food and Agriculture (NIFA) has played an active role to help ensure sufficient, nutritious and environment friendly food production in the country. Its efforts are focused towards genetic improvement/development and release of high yielding varieties of mandatory crops including wheat, mungbean, chickpea, common bean and oilseed brassica to cater the needs of farming communities of both irrigated and rainfed regions. Consistent efforts by utilizing both induced mutation and conventional approaches resulted in the development and release of 29 different crop varieties including twelve of Wheat, six of Oilseed Brassica, four of Chickpea, two of kidney beans and five of Mungbean. These varieties have been well adapted and popular among the farming community of the Khyber Pakhtunkhwa (KP). Apart from the quality seed production of 8-10 tons of these varieties, NIFA is also catering the communes of KP by providing technologies/products viz-a-viz rapid test kits (RTKs), MRE (Meal Ready to Eat), integrated packages for tunnel/ vertical farming, fertigation, compost tea, bio-geyser, dengue control, fruit fly control, termite control, tricho-cards, mushroom cultivation as cottage industry, irradiation services for value addition of gemstones and analytical services. I appreciate the hard work of NIFA employees and presume that these efforts will continue for the food security & safety of the country through provision of quality products and services to improve the socio-economic conditions of the farming community.



*Dr. Zahid Mukhtar
Director General (Agri. & Biotech),
Pakistan Atomic Energy Commission*

DG AGRI & BIOTECH'S MESSAGE

NIFA is working under the umbrella of Pakistan Atomic Energy Commission (PAEC), its foundation stone was laid on August 7, 1976 by the then Chief Minister of the province, Mr. Nasrullah Khan Khattak and started functioning in 1982. As Director General (Agri. & Biotech) I am delighted to highlight the salient achievements of NIFA over the past 41 years. The institute enthusiastically worked for the enhancement of crop production, protection, soil fertility & conservation, water management and value addition of food resources by employing nuclear and other contemporary techniques. NIFA has always played an active role in enhancement of crop production of the region, development of eco-friendly technologies/techniques for pest control, improved plant nutrition and value addition of food products. The overall R & D efforts of the institute carried out by four research divisions, i.e., Plant Breeding and Genetics, Food & Nutrition, Plant Protection and Soil & Environmental Sciences, I can proudly put on record that NIFA has evolved 29 high yielding, climate resilient and well adapted varieties of wheat, oilseed Brassica and pulses. NIFA has devised the technologies of meal ready to eat (MRE), astringency removal and shelf life extension of persimmon fruits, Rapid Test Kits (RTKs) for qualitative determination of added micro nutrients in foods, optimized mushroom cultivation. NIFA has also the pride to initiate first ever production of Ganoderma mushroom in the country which has high medicinal importance. NIFA has also perfected technologies like tunnel farming, fertigation, dual technology of compost & bio-geyser and production of compost tea. NIFA has standardized phytosanitary irradiation techniques and tricho-cards biological control of fruit fly. NIFA has developed strong collaboration with national academia, R & D institutes, extension department and international agencies i.e., IAEA. The prestigious work and large number of research publications has earned NIFA the national and international recognition. These achievements have been due to well-coordinated efforts of scientists, officers and supporting staff. I am sure that NIFA will play an important role in the innovation of food and agriculture in Pakistan.



*Dr. Gul Sanat Shah
Director,
NIFA Peshawar*

DIRECTOR'S MESSAGE

Agriculture is linked to biodiversity loss and climate change, and the impact of this climate change is creating serious challenges to the future food security of millions of people in Pakistan. The agro-based economy of the country is extremely vulnerable to climate change impacts. Evidently, these impacts are causing a decline in agricultural productivity and thus stressing the country's food security. Therefore, the need for attuning the existing research and development according to climate compatible development is crucial. Nuclear Institute for Food & Agriculture (NIFA) is working under the auspices of Pakistan Atomic Energy Commission. NIFA is striving to introduce climate smart agriculture and high yielding crop varieties resilient to climate change through innovative R&D plans. NIFA is committed to achieve food security and ensure food safety by undertaking R&D, through application of nuclear and other contemporary techniques, in different areas like development of high yielding, disease resistant and climate-resilient varieties of various crops; plant nutrition and soil health; crop protection and medical entomology; food preservation and human nutrition. NIFA is striving to address the societal challenges by providing technical assistance to the farming community, agriculture extension workers, cottage & food industries and academia through periodic seminars, workshops, training courses, brochures and radio-talks. These endeavors resulted in development of 29 varieties of various crops that have wide adaptability in the region and are very popular among the farming community of KP. The development of rapid test kits for on spot detection of vitamin-A, iron, iodine and peroxide value in food items is another milestone achieved by the institute. NIFA has also perfected and introduced various techniques/ technologies like MRE (meal ready to eat), integrated packages for tunnel/ vertical farming, fertigation, compost tea, bio-geyser, dengue control, fruit fly control, termite control, tricho-cards and mushroom cultivation as cottage industry. NIFA is also providing irradiation services for value addition of gemstones, analytical services for soil, fertilizer, water & plant samples and advisory services to farming community. The contribution of scientists to achieve these milestones is highly acknowledged.



a. Background / History of Institute (since establishment)

Nuclear Institute for Food and Agriculture (NIFA) is a subsidiary of Pakistan Atomic Energy Commission (PAEC) and is located on G. T. Road Tarnab, Peshawar. The project “Nuclear Institute for Food and Agriculture (NIFA)” was approved in 1974 at a cost of Rs. 7.4 million. The foundation stone was laid on August 7, 1976 by the then Chief Minister of the province, Mr. Nasrullah Khan Khattak. The cost estimates were, however, revised and the project was approved at a cost of Rs. 25 million in 1979. NIFA started functioning in 1982 with two research divisions namely, Nuclear Agriculture and Food Science. The Nuclear Agriculture Division carried out its R&D in the areas of Mutation Breeding, Soil Science and Entomology, while the areas under Food Science included Food Chemistry, Food Engineering, Food Microbiology and Nutrition.

Initially, five acres area of land was provided by Provincial Government and four acres were purchased at cost of 0.2 million to meet the requirements of main structure and allied facilities. As the institute had no experimental farm for executing R&D activities, fourteen acres of land were temporarily provided by Agriculture Research Institute (ARI), Tarnab, however, it was returned back to ARI owing to its repeated requests. NIFA then acquired 304 Kanal and 12 Marla (about 38 acres) of land from adjacent farmers in 2007 for field experiments and seed multiplication.

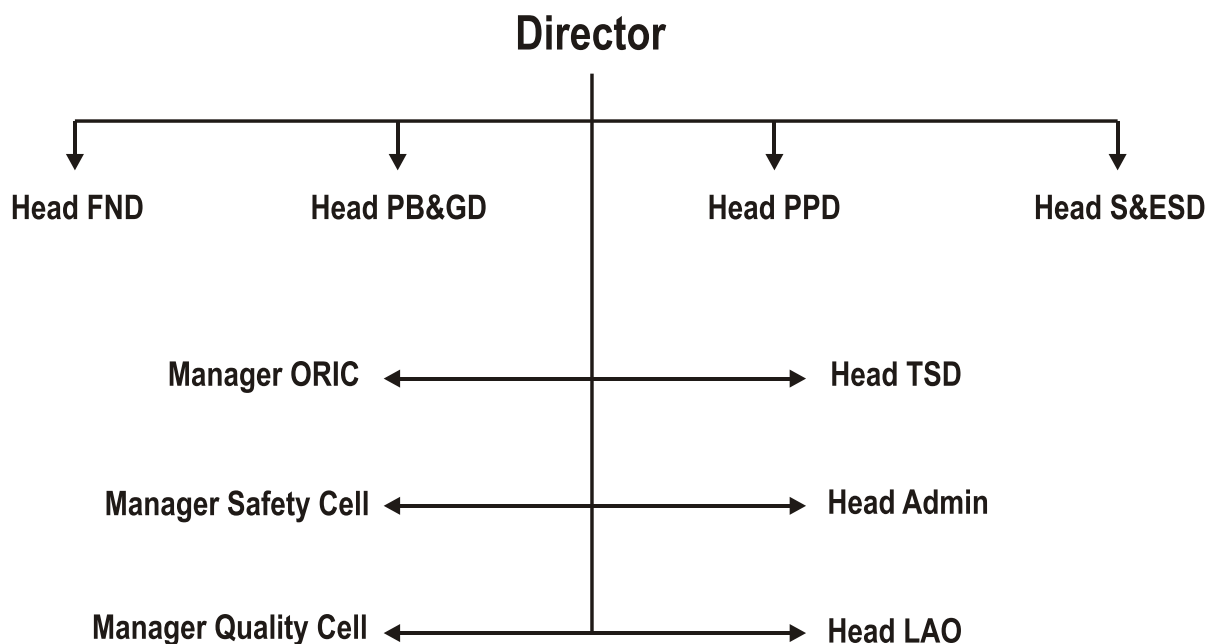
The main objective of the institute is to conduct research in food and agricultural related areas where nuclear techniques have an edge over the conventional methods. Currently NIFA has four research divisions, namely, Plant Breeding & Genetics Division, Food & Nutrition Division, Plant Protection Division and Soil & Environmental Sciences Division. The institute has been pursuing goal oriented research and development efforts related to crop improvement through mutation breeding, soil health & plant nutrition, pest management, food preservation, food safety and security. The research work done in the institute is regularly published in national and international journals. A detailed annual report showing the progress in various projects of the institute is also being published. Reports on completed projects and pamphlets on new technology developed at the institute are also produced for the benefit of end-users.



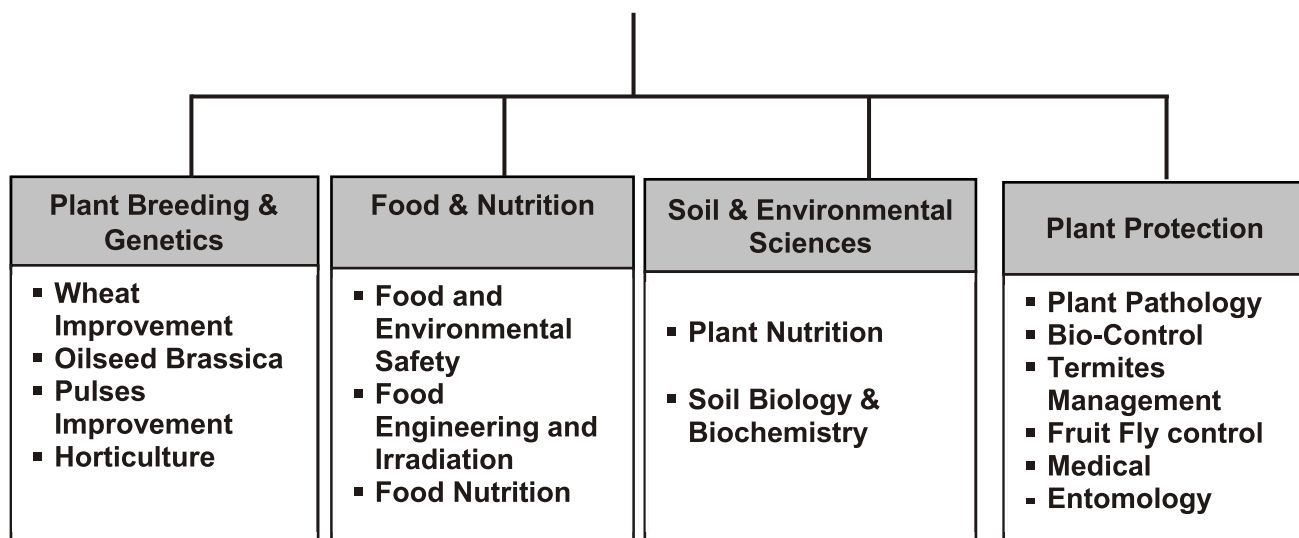


b. Organogram / Areas of R&D

NIFA Organogram



NIFA Research Areas





c. Achievements of Institute (since establishment)

Plant Breeding and Genetics Division

The primary goal of Plant Breeding & Genetics Division (PB&GD) is to develop high yielding, disease resistant and climate smart varieties of different crops. The division has been working on wheat, mungbean, chickpea, oilseed brassica, peach and plum as these crops are much demanding in Khyber Pakhtunkhwa (KP). Due to small land holdings and favourable climatic conditions, vegetables cultivation is a traditional practice in the region and there is a great demand for vegetables seed. NIFA has taken initiative to develop okra variety for the vegetable growers of the region. Kidney bean is the most common poor man food in KP and a lot of foreign exchange is being spent on its import. Considering this fact, NIFA initiated work on kidney bean and has recently developed 02 kidney bean varieties. Other salient achievements of five research groups of the division are as follows:

- Developed 07 high yielding, disease resistant and climate smart wheat varieties for rainfed area and 05 for irrigated area of KP.
- Developed 05 high yielding and disease resistant mungbean varieties including 02 first-ever black seeded varieties, particularly for Kurram and adjacent areas of Afghanistan.
- Developed 04 high yielding and insect resistant chickpea varieties for chickpea growing areas of KP.
- Developed 06 high yielding and high oil content rapeseed varieties for general cultivation in KP.



Wheat Variety NIFA Nijat-23



Wheat Variety NIFA Aman-17





Wheat Variety Fakhre NIFA 2023



Wheat Variety NIFA Insaf 2015



Black-seeded mungbean variety
NIFA Mung Sikaram-21



Black-seeded mungbean variety NIFA
Mung Spinghar-21



Kidney bean variety
NIFA Lobia Red-22



Kidney bean variety
NIFA Lobia Yellow-22





Rapeseed variety NIFA Sarsoon-T23



Rapeseed variety NIFA Sarsoon-T20

Food and Nutrition Division

Food and Nutrition Division (FND) is working on the development and transfer of technologies/services for nutritive, value added and environmentally safe food/products to end users. FND efforts are aimed to achieve food security and ensure food safety through research and development (R&D) by applying nuclear and other advanced techniques through its three research groups. The salient achievements of the division are listed below:

- Developed Meal Ready to Eat (MRE) technology as an emergency food to be used by the army particularly in Siachen and by the people during natural calamities as well.
- Developed technology for astringency removal and shelf life extension of persimmon fruits.
- Developed Rapid Test Kits (RTKs) for qualitative determination of added micro nutrients in foods to meet quality assurance
- Optimized cultivation techniques for different nutritious mushrooms like Pearl, Grey, Pink Oyster, Milky and Button as well as for Ganoderma having medicinal importance.
- Providing irradiation services to the local gemstones traders for gemstone value addition.
- Providing food based analytical services to different stakeholders.





NIFA Rapid Test Kits (RTKs)



Mushroom Products





Mushroom Products

Mushroom Spawn

Soil & Environmental Sciences Division

The mission of Soil & Environmental Sciences Division (S&ESD) is to work out ways and means for efficient utilization of scarce and depleting natural resources like soil, water and nutrients. Availability of nutrients and water to crops in proper quantity and at proper times is absolutely essential. Any variety, howsoever good, it would not yield properly if nutrients and water are not provided as per the judicious requirement of the crop. Soil & Environmental Sciences Division has the uniqueness in solving these problems by the application of various conventional and nuclear techniques through its two distinct groups. The salient achievements of the division are as follows:

- Perfected the integrated nutrient management package of technologies of various field and horticultural crops.
- Developed an efficient and economical nutrient & water management technology package for tunnel / vertical farming of high value crops.



- Identified about 40 zinc-efficient wheat genotypes through bio-fortification that can be successfully grown on zinc-deficient soils and may help in reducing the zinc malnutrition in humans.
- Developed scientific irrigation scheduling technology and identified the most sensitive & tolerant stages of various crops for irrigation.
- Perfected dual technology of bio-geyser and agro-waste composting for compost making as well as for warming water in energy deficient areas.
- Converted 80% of non-cultivable saline land in southern region of KP into productive cultivable land through saline agriculture technology under Farmers Participatory Saline Agriculture Development Project (FPSADP).
- Established pilot scale production facility for compost and optimized/standardized the protocol for the formulation of aerobic compost tea.
- Provision of advisory and analytical services to different stakeholders.



Tunnel farming technology



Dual technology of agro-waste compost and bio-geyser



NIFA Compost



Compost Tea

Plant Protection Division

The main goal of this division is to increase the production of vegetables, fruits and arable crops by protecting them from insect pests and pathogens. The focus is on developing environmentally friendly technologies to manage these pests and pathogens, including those that transmit human diseases through five distinct groups. The salient achievements of the division are as under:

- Standardized tricho-cards technology for biological control of fruit worm and borers.
- Developed NIFA Dengue Guard for dengue vector control and is being processed for commercialization with the help of private sector.
- Standardized phytosanitary irradiation doses for controlling insect pests in exportable agriculture commodities.
- Standardized sterility dose of 70 Gy in local Aedes mosquitoes for use in Sterile Insect Technique (SIT) program.
- Developed NIFA-Termap for termite management and termite colony delineation method.
- Fostered the development of 100 disease resistant wheat varieties.



Medical Entomology Laboratory



NIFA Fruit Fly Trap



Tricho-card developed for fruit worm



Mosquito repellent-NIFA Dengue Guard





Practical demonstration of wheat rust technological use for wheat

d. International collaborations, MoUs / Agreements

This institute have two international MoUs / Agreements and the detail is given below.

1. Co-operative frame work agreement on Rapeseed Mutation Breeding between Sichuan Institute of Atomic Energy (SIAE), and NIFA during 2016-2018.
2. Co-operative agreement for Mutual Trial Planting of Wheat Varieties between Chengdu Institute of Biology (CIB), Chinese Academy of Sciences (CAS), China and NIFA during 2021-2025.

e. Research work collaborations and contributions

NIFA is actively collaborating with national and international institutes in R&D activities for the development of improved crop varieties and agriculture based products/ technologies along with their dissemination to end-users. The national institutes include PARC, NARC, KP Agricultural Research System, KP Agricultural Extension Department, Agricultural universities, Federal Seed Certification and Registration Department, Nutrition International (NI) Pakistan, Pakistan Science Foundation (PSF), Directorate General Science & Technology (DGST), Bureau of Agriculture Information (BAI), etc. At international level, working collaboration has been extended up to IAEA/FAO, CIMMYT, Pest Information Wiki, International Foundation for Science, American Phytopathology Society, Expert Working Group on Control of Wheat Pathogens, etc.



f. Salient visits of international delegations / dignitaries / fellowships & Training courses

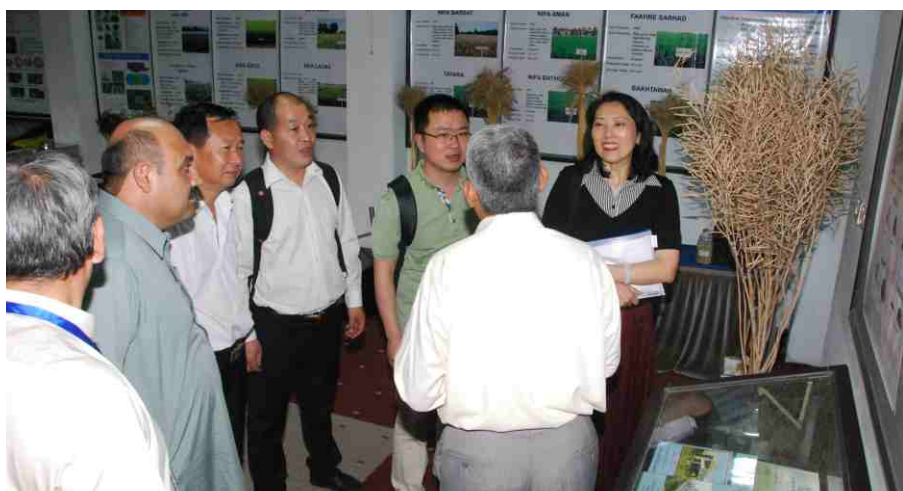


Inaguration of Cobalt-60 Source at NIFA on Dec 15, 2012 by Deputy Director General IAEA, Dr. Daud Mohamad



Visit of IAEA Delegation to NIFA on July 06, 2013





Chinese Delegation Visit to NIFA on April 25, 2017



IAEA REGIONAL TRAINING COURSE ON NUTRIENT AND WATER MANAGEMENT FOR BIO-ENERGY CROPS IN MARGINAL LANDS

Islamabad, Pakistan, 09-13 April 2018



Mr. Muhammad Naeem, H.I., S.I.
Chairman, Pakistan Atomic Energy Commission
with the Participants & Organizers of The Training Course





Chinese Delegation Visit to NIFA on July 04, 2019



Visit of Scientists from SIAE, China to NIFA on December 1-7, 2019



Visit of Country Representative (CIMMYT), Mr. Thakur Prasad Tiwari, on March 03, 2022





Dr. Zaman (Technical Officer IAEA / FAO) Visit to NIFA on August 30, 2022 to discuss CSA technology for On-field Demonstration Trials

g. Future R&D plans / projects

To address the future challenges of the farming community, NIFA intends to extend its breeding program for achieving high yield, disease resistance and biotic/ abiotic stress tolerance in wheat, oilseed brassica and pulses. Development of enriched organic fertilizer products and optimized technologies for field & horticultural crops, tunnel / vertical farming are forthcoming R&D targets of the institute. NIFA is also working on strengthening its mushroom cultivation program for cottage industry, developing indirect type solar dryer for fruits and vegetables preservation, producing probiotic foods and quantitative determination of micronutrients through indigenous technologies. For effective pest management & control, researchers are devising innovative strategies like using the black soldier insect as poultry feed, development of bait matrix & toxin delivery system for termite, commercial scale production of Dengue Guard (a mosquito repellent), development of bio-pesticides for dengue vector & fruit worm control, and bait development for female fruit fly trapping.

h. Products ready for commercialization.

- Rapid Test Kits (RTKs)
- Meal Ready to Eat (MRE)
- Mushroom & Mushroom Spawn
- NIFA Dengue Guard
- NIFA Fruit Fly Trap





i. Lab facilities/services open for all

- NIFA Food Testing Services
- Analytical facility for soil, fertilizer, water and plant samples
- Gemstone Radiation Facility
- Qualitative Analysis of Added Micronutrients through RTKs.



Food Testing Laboratory



Soil, Fertilizer, Water and Plant Analysis Laboratory

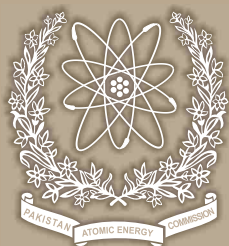
- j. Human Resource Development:** NIFA is providing technical guidance and R&D facilities to academia in the country.





LOCATION & LINKS OF NIFA

Nuclear Institute for Food and Agriculture is located in Peshawar, a pivotal place for agricultural activities having prestigious institutions like Agriculture Research Institute Tarnab, The University of Agriculture Peshawar, Agricultural Extension Department, Pakistan Council of Scientific and Industrial Research, Pakistan Forest Institute, Pakistan Tobacco Board, Federal Seed Certification & Registration Department, Pakistan Agricultural Research Council, Water Management Department and Pakistan Academy for Rural Development. NIFA is working in close collaboration with these institutes by sharing technologies and services. NIFA is proud of hosting local as well as foreign visitors and experts.



NUCLEAR INSTITUTE FOR FOOD AND AGRICULTURE (NIFA)

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