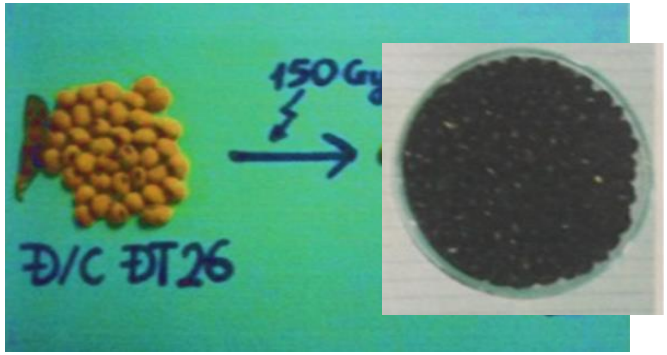
FNCA 2020 Study Panel: Food and Agriculture

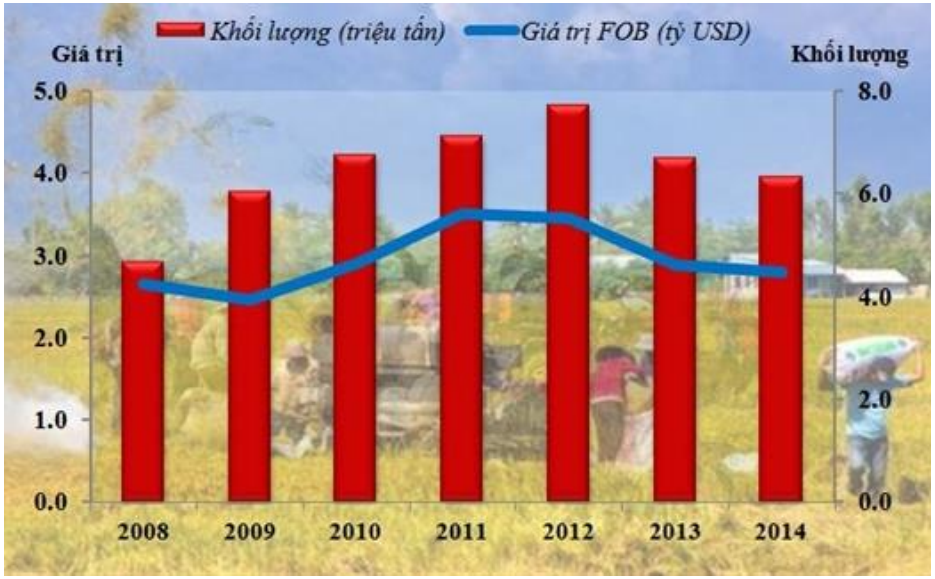
3-5 March 2021

Adaptation and Mitigation of the Climate Change Impacts in Agriculture with Radiation Technology

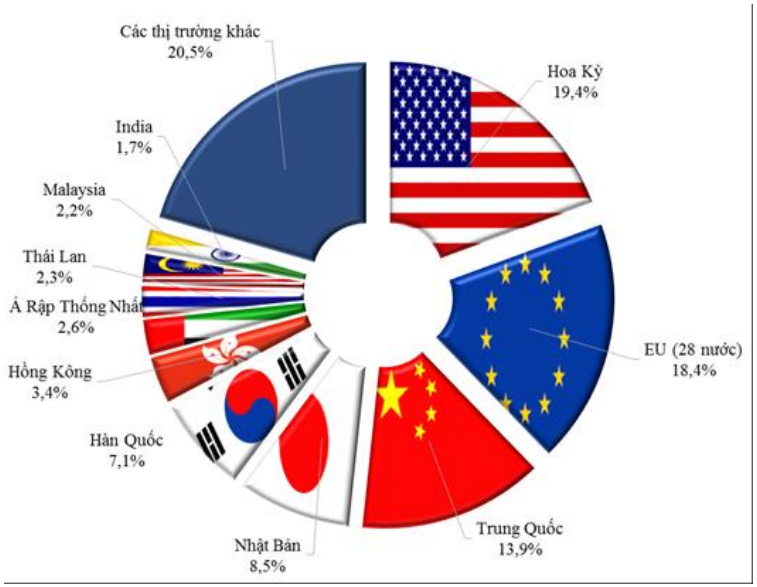


Tran Minh Quynh, **Hanoi Irradiation Center**

Support enough food for the population and reach the millennium goal by reduce poverty



Vietnam rice export



Markets for Vietnam agriculture products

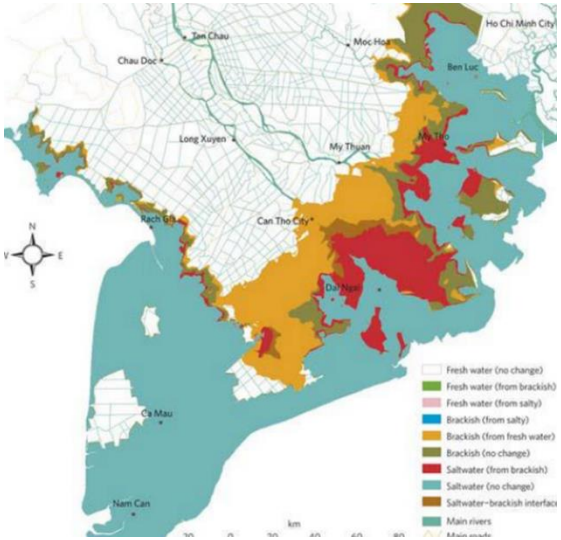
Vietnam is one of the country that has good deal with food security

Recent Climate Change Impacts

Global warming and drought

Rainfall distribution

Insects and pests diseases



Sea level rise and salinity

To be a vulnerable coastal country, our agricultural production continuously suffered from the adverse effects of climate change: temperature rise, change in rainfall, sea level rise and salinization...

Together with CC, number of insects and pests diseases also outbreak and threat to its agricultural sustainable development

Other extreme weather events

- Vietnam is regularly affected by 10-12 natural disasters (typhoons and floods) annually, together with another extreme events they destroyed not only agriculture production, but also other resources
- These extreme events are predicted to be increased both in frequency and intensity

Adverse Effects of CC

The "Big" Delta Issues

Depleted soil fertility & reduced agricultural yields

2

Acidification and degradation of surface water quality

3

Shrinking floodplains, exacerbated flood damages

1

4

Salinisation of surface water sources

Urban flooding, riverbank erosion

7

5

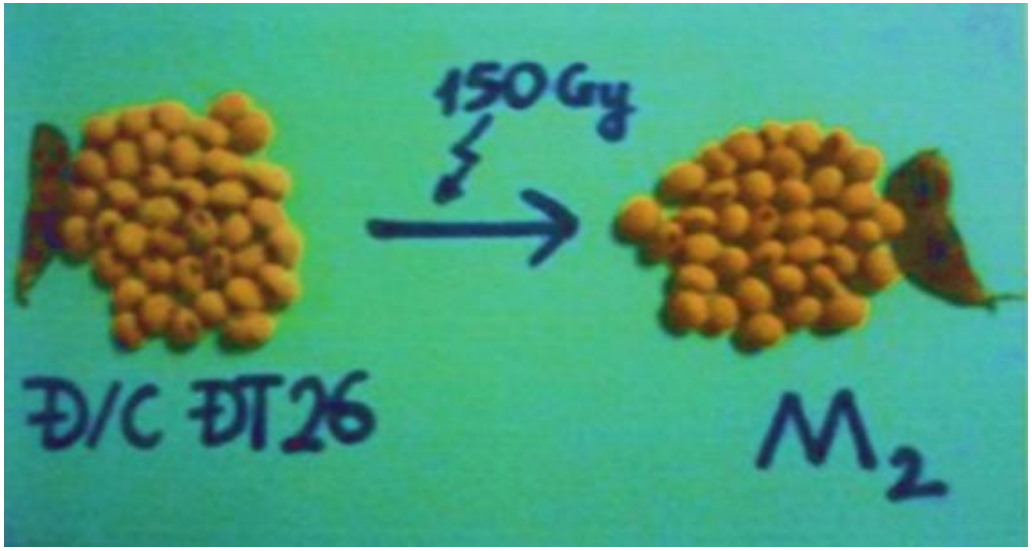
Over-controlled & inflexible farming systems leading to groundwater abstraction

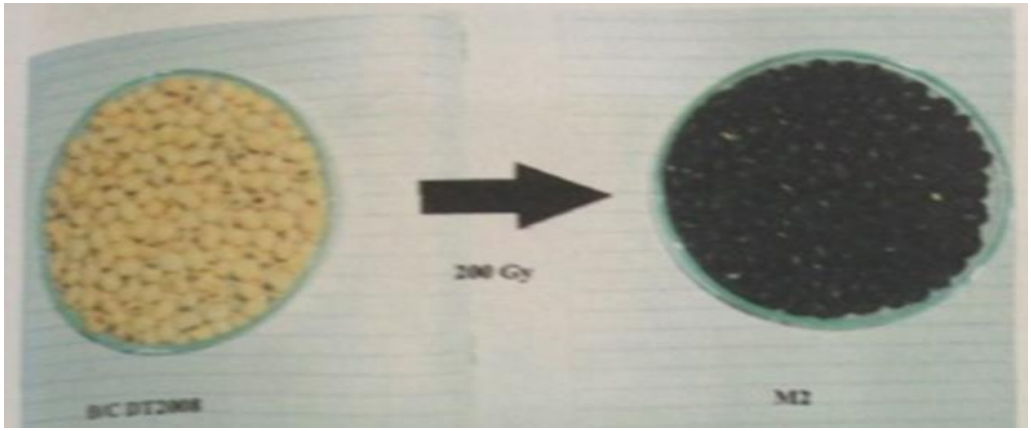
6

Coastal erosion, subsidence and water security concerns

HOW NUCLEAR & RADIATION TECHNOLOGIES CAN MITIGATE CLIMATE CHANGE EFFECTS ?

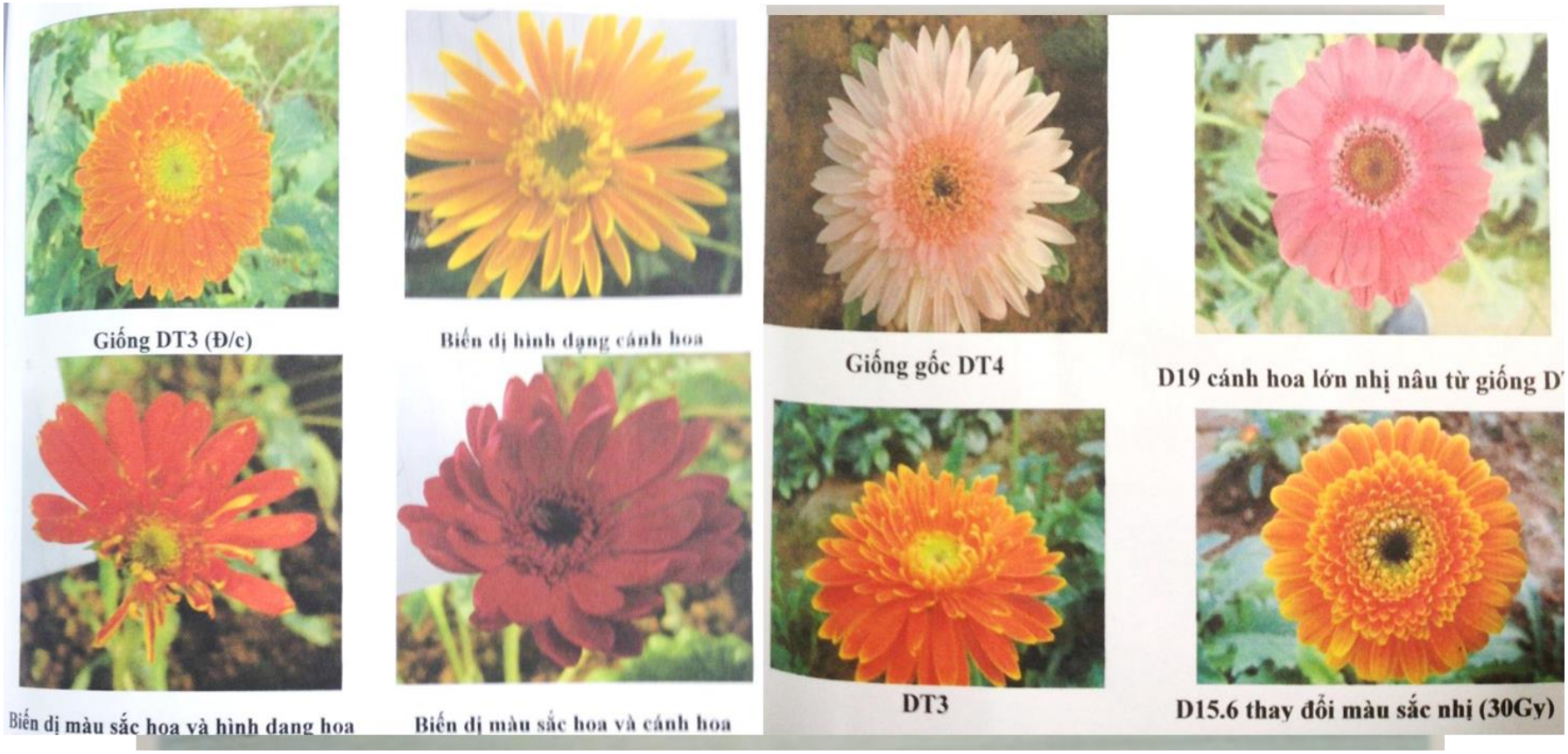
1. Radiation induced mutation





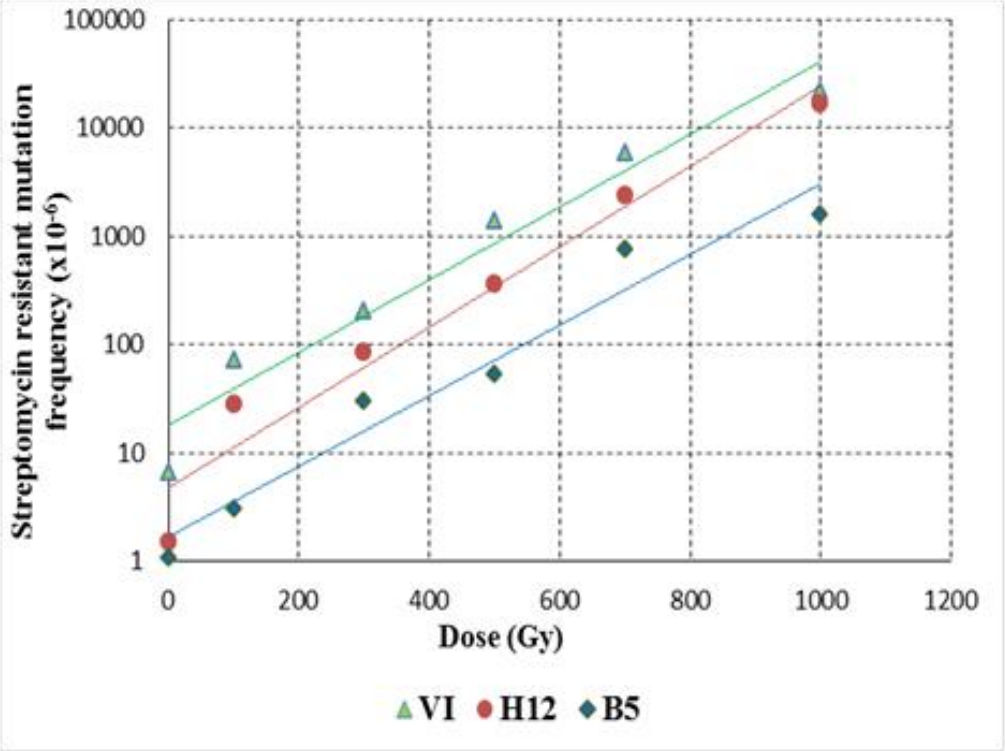
New varieties with special traits that can adapt to climate change:
Saline tolerant rice, insects resistant soybean, stress resistant crops…

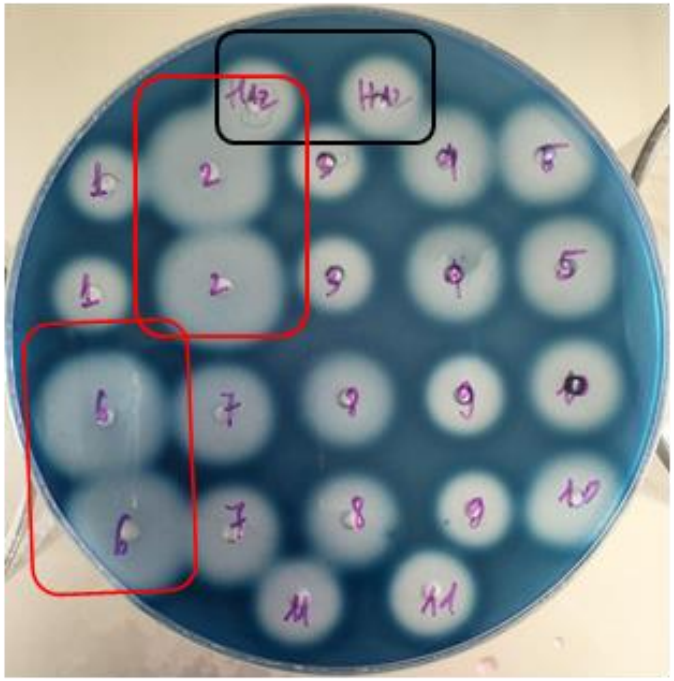
Radiation mutation for plan breeding



Collaborate with agricultural research institutes to produce and deliver high quality flowers and bonsai trees

Improve production of bioactive substances





- New bacterial mutants (*Bacillus, Azotobacter, Trichoderma*) which can produce higher amount of secondary metabolites such as protease, IAA for production of bio-fertilizers, bio-pesticides…

2. Food Irradiation for Food Safety

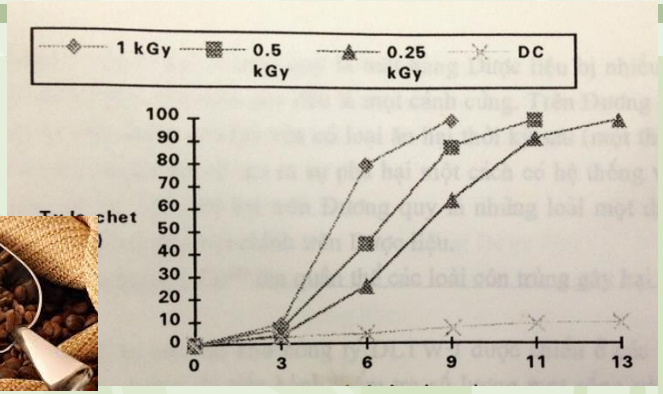
Sprouting inhibition of bulbs, tubers

Ripen Delay Insect disinfestation

Microbial decontamination

INSECT DISINFECTATION FOR (RICE, MAIZE, BEANS…) FOR FOOD SECURITY

Irradiated at 60 Gy Non-irradiated



Death rate (%) of coffee bean weevil by gamma irradiation during with storage

Non-irradiated Rice

Gamma Irradiation for infected rice with doses of 50-75Gy

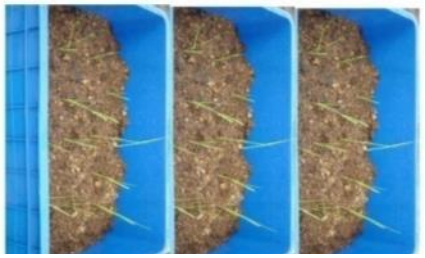
Radiation phytosanitary

Control fruit flies *B. Dosalis* Hendel existing in dragon fruits

B. Correcta infesting in grape fruits

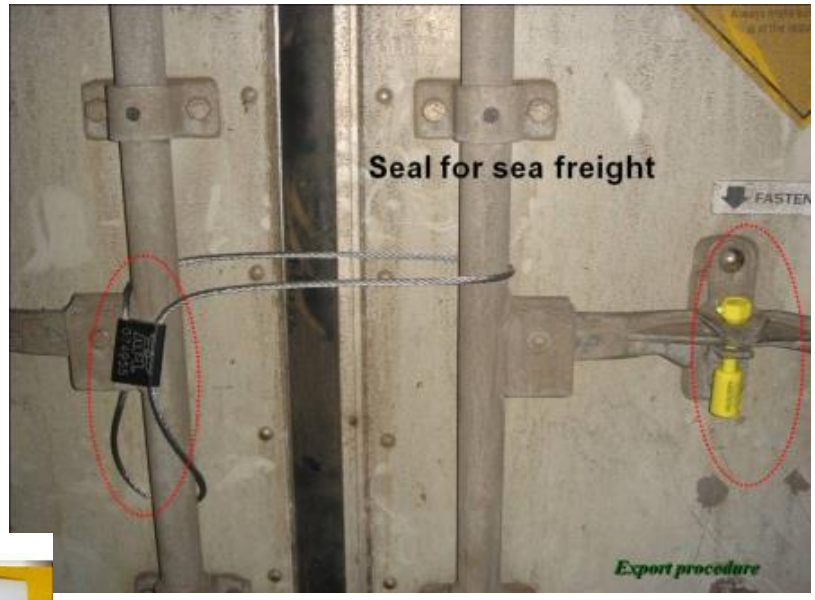
and *Conopomorpha Sinensis* Bradley borers infesting in lychees

Quarantine of rye-grass *Lolium temulentum* L. in Pakistan imported wheat



Irradiated at 2 kGy

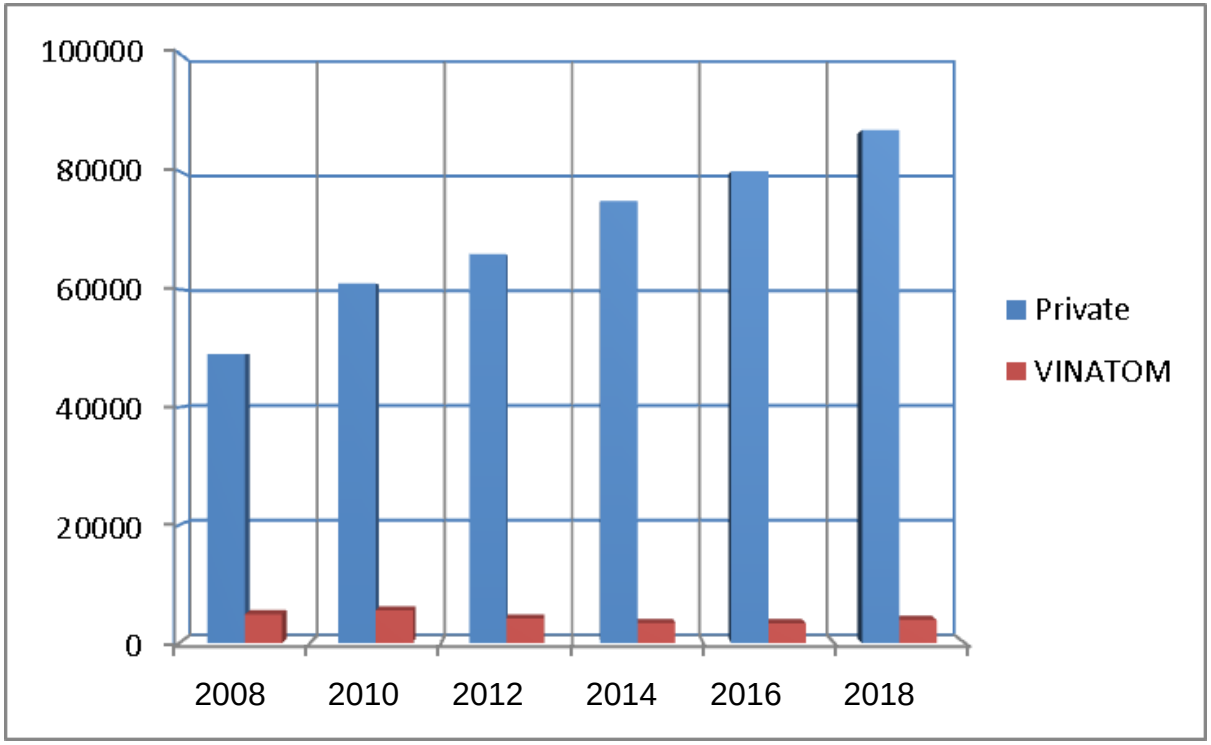
And facilitate to Food Trade



Phytosanitary treatment of exported lychees

HIC's irradiator have been permitted by Australia Department of Agriculture and Water Resource for quarantine treatment of fresh lychees (2016), mango (2017)

Food irradiation application in Vietnam



Vietnam is a tropical country with variety foods and delicious fruits. Even irradiated foods are not available in domestic market, total amount of the irradiated foods for export ever-increasing from beginning of this century, and reached near **100 thousands tons per year**, with rapid development of private sectors.

Main products include frozen sea-foods, dried fishes, dehydrated spices and vegetables, fresh fruits, functional foods and others…

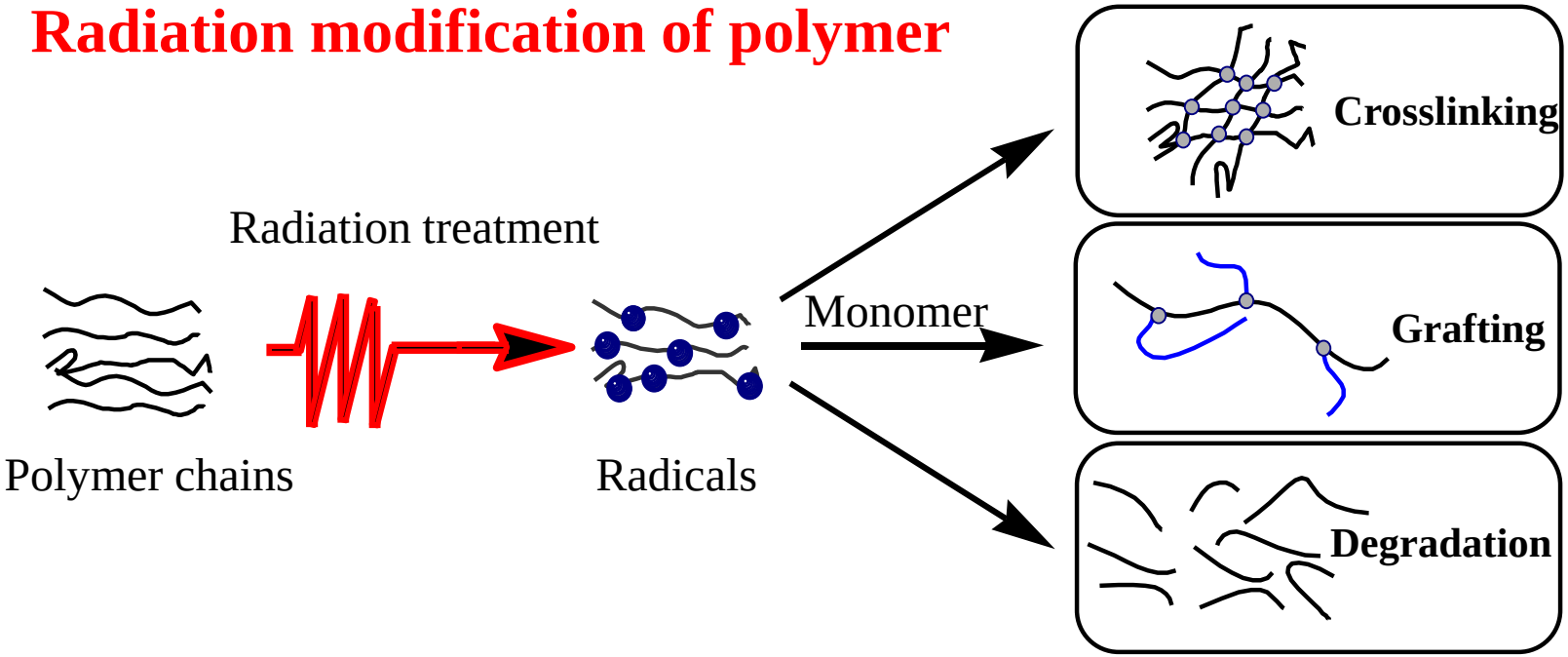
Sterilize instant food and meals for patients

Sanitary and phytosanitary treatment of instant foods

Sterile meals for high suffering patients, and produce functional foods

3. High performance food packaging

Radiation modification of polymer



- Radiation modification of biopolymers (PLLA, starch) for high performance food packaging
- Prepare bioactive substances (PGP, SWA) for agriculture

Low Mw and oligo-saccharide for agriculture

Foliar fertilizers, pests and disease protector and immune stimulating agents for crops

SUMMARY

- Vietnam is a vulnerable country, which much affected by the climate change effects, especially for its agriculture production;
- Therefore, VINATOM had close collaborated with research institutes in agriculture for promote nuclear techniques and radiation technology to mitigate the adverse effects of CC in coming years;
- Preliminary results indicated that new crops with the traits adapted to climate change, mutant strains with high production of bioactive can be produced by radiation mutation combining with bio-technology;
- Food Irradiation have been applied to ensure food safety and security, phytosanitary for facilitate to food trade in Vietnam;
- Radiation processing also studied for prepare high performance food packaging materials, plant growth promotor, crop protection substance and immune stimulating agents for agriculture use;

⇨ Thus, radiation technology is useful for mitigate the CC impacts.

Thank you very much for attention!