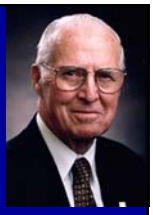
Lecture 15
Tropical Agricultural Research

- Agricultural development is a key component for the improvement of living standards and economic growth in the tropical world.
- However, it has been considered more difficult to improve agriculture than to establish a modern steel industry (because to improve agriculture the whole fabric of society must be changed).
- In the l960s and l970s achievements in the transfer and diffusion of agricultural technology to the tropical world has been coined the "green revolution."
- The basis was the development of high yielding wheat and rice.



Norman E. Borlaug, 1970 recipient of the Nobel Prize for Peace, working with hybrid wheats at the CIMMYT Toluca station, Mexico.

- These improved grains were short stemmed, photoperiodically insensitive, and both fertilizer requiring and responsive.
- The green revolution has an enormous impact in preventing famine and increasing food production in tropical countries that were beset with exploding populations.
- The greatest results were achieved in India, Pakistan, and Mexico, once food deficit countries, but presently producing modest surpluses in feed grains.
- Food production has also increased in China but this was largely due to their own efforts in agricultural research (e.g. hybrid rice).

- At the present time only Africa still remains a serious problem.
- The model for this change has been the development of international agricultural research centers that are focused on individual crops.
- The greatest results have come from CIMMYT (International Maize and Wheat Improvement Center) in Mexico emphasizing research in maize, wheat, and sorghum and IRRI (International Rice Research Institute) located in the Philippines and dealing almost exclusively with rice.

The International Rice Research Institute (IRRI), established at the University of the Philippines, Los Baños, Laguna.

- Both of these organizations were originally supported by Foundations such as the Ford and Rockefeller plus government support principally of the United States but are now financed by broader participation.
- Originally the basic work was in genetic improvement concentrating on increasing yields through response to fertilizer and disease resistance with broad adaptability achieved by photoperiod insensitivity.
- In addition the improved wheat and rice were short stemmed so that they did not fall over (lodge) and were thus responsive to increased fertilization.

Lodging susceptible and resistant rice

However, the green revolution was not a simple substitution of improved new cultivars but rather the imposition of a new technological system that involved increased inputs such as fertilization and pesticides, and improved management.

This required increased credit and education and put subsistence farmers further behind.

Structure of the International Agricultural Research Network

Center	Location	Research	Coverage	Date
IRRI (International Rice Research Institute)	Los Baños, Philippines	Rice under irrigation, multiple cropping systems; upland rice	Worldwide, special emphasis on Asia	1959
CIMMYT (International Centre for the Improvement of Maize and Wheat)	El Batan, Mexico	Wheat (also triticale, barley); maize (also high-altitude sorghum)	Worldwide	1963
IITA (International Institute of Tropical Agriculture)	Ibadan, Nigeria	Farming systems; cereals (rice and maize as regional relay stations for IRRI and CIMMYT); grain legume (cow-peas, soybeans, lima beans, pigeon peas); root and tuber crops (cassava, sweetpotatoes, yams)	Worldwide in lowland tropics, special emphasis on Africa	1965
CIAT (International Centre for Tropical Agriculture)	Palmira, Colombia	Beef; cassava; field beans; swine (minor); maize and rice (regional relay stations to CIMMYT and IRRI)	Worldwide in lowland tropics, special emphasis on Latin America	1968
WARDA (West African Rice Development Association)	Monrovia, Liberia	Regional cooperative effort in adaptive rice research among 13 nations with IITA and IRRI support	West Africa	1971

Center	Location	Research	Coverage	Date
CIP (International Potato Centre)	Lima, Peru	Potatoes; sweetpotatoes; other tuberous vegetables (for both tropical and temperate regions)	Worldwide, including linkages with developed countries	1972
ICRISAT (International Crops Research Institute for the Semi-Arid Tropics)	Hyderabad, India	Sorghum; pearl millet; pigeon peas; chickpeas; farming systems; groundnuts	Worldwide, special emphasis on dry semiarid tropics, non-irrigated farming. Special relay stations in Africa under negotiation	1972
IBPGR (International Board for Plant Genetic Resources)	FAO, Rome, Italy	Conservation of plant genetic material with special reference to crops of economic importance	Worldwide	1973
ILRAD (International Laboratory for Research on Animal Diseases)	Nairobi, Africa	Trypanosoiasis; theileriasis	Mainly Africa	1974
ILCA (International Livestock for Africa)	Addis Ababa, Ethiopia	Livestock production system	Major ecological regions in tropical zones of Africa	1974

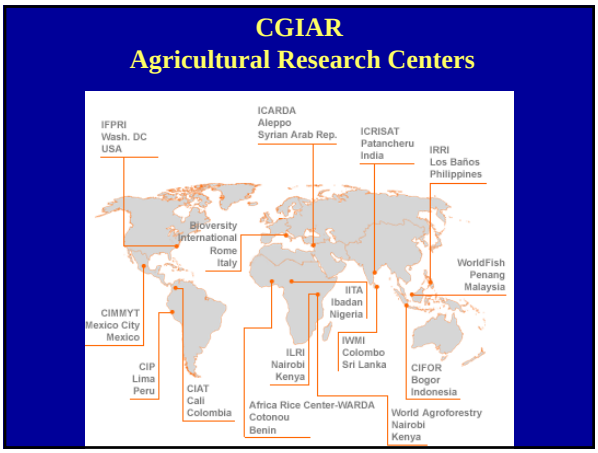
Center	Location	Research	Coverage	Date
ICARDA (International Centre for Agricultural Research in Dry Areas)	Lebanon, Syria, Iran	Crop and mixed farming systems research, with focus on sheep, barley, wheat, broad beans, and lentils	Worldwide, emphasis on the semiarid winter precipitation zone	1976
IFPRI (International Food Policy Research Institute)	Washington DC, United States	Food policy	Worldwide	1975
ISNAR (International Service for National Agricultural Research)	The Hague, Netherlands	Strengthening the capacity of national agricultural research programs Associate Centers	Worldwide	1979
AVRDC (Asian Vegetable Research and Development Centre)	Shanhua, Taiwan	Vegetable improvement (mung beans, soybean, tomato, sweetpotato, Chinese cabbage, potato); cropping systems	South and Southeast Asia	1971
IFDC (International Fertilizer Development Centre)	Muscle Shoals, United States	Development of new and improved fertilizer materials and processes	Worldwide	1975

FAO Food and Agricultural Organization of the United Nations

CGIAR Consultative Group on International Agricultural Research

Priorities

1. Reducing hunger and malnutrition by producing more and better food through genetic improvement
2. Sustaining agriculture biodiversity both *in situ* and *ex situ*
3. Promoting opportunities for economic development and through agricultural diversification and high-value commodities and products
4. Ensuring sustainable management and conservation of water, land and forests
5. Improving policies and facilitating institutional innovation


CGIAR
Agricultural Research Centers
IFPRI
Wash. DC
USA
ICARDA
Aleppo
Syrian Arab Rep.
ICRISAT
Patancheru
India
IRRI
Los Baños
Philippines
Bioversity
International
Rome
Italy
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IITA
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