Food and Agriculture

From the Green Revolution to the Second Green Revolution

Outlook

• Monopolisation of global seed and agrochemicals trade. Even stronger monopolisation of GM crops.
• Loss of agro-biodiversity.
• Dissappearing small peasant farms.
• Expected influences of climatic change.
• Stress over farmlands due to changing diets and agro-fuel production.
• Debate on whether farmers or corporations will be in control. Debates over UPOV, TRIPS and Turkish seed law, 2006, no: 5553.
Patterns of Food Production

• BC 10000 – Neolithic Revolution
  – Virtually all major crops and domestic animals were established in the first thousand years of agriculture.

• 1450-1700 Intercontinental exchange of food
  – Massive exchange of food between Americas and Europe and East Asia
    • Potatoes, maize, beans, squash, tomatoes, pineapples, cocoa (from Americas)
    • Rice (from Asia)
    • Wheat, onions, sugar cane, horses, pigs, cattle, sheep, goats (from Europe and Middle East)

• After mid 1800s – Industrial revolution
  – Fertilizers, agricultural machinery.

• After 1930’s – Invent of Industrial Agriculture
  – Increasing farm size with decreasing number of landholdings.
  – Massive production surplus.
  – Fossil fuel machinery; fertilizers; synthetic pesticides (the DDT); massive irrigation; high yield varieties (HYVs).
• Global statistics (by year 2000)
  – Almost all arable land under cultivation – 0.3% annual growth rate over the past 30 years.
  – Diminishing returns on fertilizer consumption due to nutrients saturation; today increasing in “under-fertilized countries” such as China, India and Brazil.
  – Diminishing returns on pesticides consumption; due to increased resistance in pest species. Consumption triples since 1970s.

  – Massive irrigation projects and large dams with multiple short and long term environmental effects. Today 17% of croplands irrigated. Irrigation constitutes 70% of world’s freshwater consumption.
  – HYVs after 1960s – the strains that divert more of the photosynthetic activity away from the stems, leaves and root to the seed; their hybrids.
Green Revolution

• 1943 – Rockefeller Foundation in Mexico.
  – Norman Borlaug the Nobel Laureate (1970)
• 1960 – In India
  – Tripled food production in three years
• In 35 years, global food production doubled
  – Food production growth outpaced population growth (the former 4% the latter 2% annually)

• Observed benefits
  – Relief for world hunger
  – Relief on deforestation and other undesired land conversion

• Observed costs
  – Water problems
  – Agricultural pollution
  – Soil conservation problems
  – Lost of traditional crop gene pool
  – Lost of traditional, diverse production methods
  – Concentration of wealth on landlords.
Future

- IFFR, International Food Policy Research Institute Report
  - Land limits almost reached.
  - Photosynthetic potential almost reached.
  - Developing world will be the major demander and the developed world will be the major supplier of food.
  - Genetic Revolution?
- Global structural problems
  - 70% of grain fed to cattle in US
  - Major land under cash crops cultivation rather than food.

Genetic Engineering

- Now, Rockefeller Foundation called for a Second Green Revolution:
  - “Double green revolution” by the emergence of biotechnology and genetic manipulations.
• GE:
  – Makes it possible to crossbreed genetically different plants and to incorporate desired traits into crops and animals.
  – No more limited to existing gene pool like the first green revolution; crosses the boundaries of species and plants animals and bacteria.
- **Promises**
  - Keep food fresh in market (FlavSavr tomato)
  - Built in resistance to insects that come from bacterium BT (Bt-crops of Monsanto) – reduced pesticide use.
  - Numerous plants resistant to Roundup herbicide – allows no till methods (Roundup crops of Monsanto)
  - Increase tolerance to certain environmental conditions, such as salt, draught etc.
  - Increase nutritional value, vitamins content of food crops
  - Incorporate certain vaccines into human diet.

- **Environmental problems**
  - Pests may develop resistance to built in toxins (superpests)
  - BT crops can genetically pollute the environment, creating superpests elsewhere.
  - Genetic pollution creating superweeds elsewhere
    - The story of the Canadian farmer, Percy Schmeiser; brought to court by Monsanto, he lost the case.
  - Other unanticipated “introduced species” effects.
• Food safety problems
  – Allergic responses
  – Transfer of antibiotics resistance
  – Plants themselves may create toxic tissues in response to gene transfer
  – Influence on immune systems?

• Equity problems
  – Corporations and intellectual property rights
    • The terminator technology
  – Spreading the technology in China, India, Philippines can make it cheap; but it further spreads
  – Seed “piracy”, further spreading of GM crops and genetic contamination.
• Further reading, Vandana Shiva, Stolen Harvest, Chapter 6.

Seed and Biodiversity Issues

• Should seed be conserved by farmers or corporations?
  – TRIPS of WTO – Agreement on Trade Related Intellectual Property Rights (1994)
  – Seed law of Turkey, year 2006, No: 5553.
• Protocols and laws on biodiversity and biosecurity
  – UN Convention on Biological Diversity (1992)
  – Cartagena Protocol on Biosafety, Montreal, Jan 2000 (Entry into force, September 2001)
    • Precautionary principle: lack of scientific certainty due to insufficient relevant scientific information and knowledge … shall not prevent [a country] from taking a decision on the import of genetically modified organisms.

• Where there are threats of serious or irreversible damage lack of scientific certainty should not be used as a reason for failing to take measures to prevent potential damage.
  • Shipments containing GM food must be labeled.
  – Biosecurity law of Turkey, year 2010, No: 5977