MODULE II
Social and Environmental Impacts of Biotechnology
Trends in Modern Biotechnology and Impacts on Developing Countries

Lecture 1
INTRODUCTION TO THE MODULE

The lecture will discuss biotechnology with an STS perspective. General overview of the module will be provided with focus on biotechnology in agriculture and food concentrating mainly on the politics. Various areas of applications of biotechnology, actors involved, institutional mechanisms, developed and developing country policies, risk assessment and regulations will be introduced. The prospects of biotechnology for developing countries with specific reference to plant agriculture will be discussed.

Basic References:

- Gözen, A., From Green Revolution to Plant Biotechnology. Technological Change in the Agriculture of Turkey, University of Amsterdam, MRC, Kocaeli, 1997

Additional Readings:

- OECD, Biotechnology, Agriculture and Food, Paris, 1992
Lecture 2

INTRODUCTION TO GENETICS AND BIOTECHNOLOGY:
HOW TO, WHY?

This lecture will start with basic information about DNA, genes, the genetic code and briefly cover the short history of genetic research. The major improvements, the 'dreams' and the 'nightmares' of the genetic technologies will be discussed. The 'ideals' of nature will be compared to the ideals of human societies. This will be connected to rapid developments in the field and the kind of ethical questions along with it. What is genetic equality?

Bioethical issues regarding human cloning, stem cell research, the danger of re-birth of eugenics and the possible consequences of genetic screening will be discussed. Will genetic screening save lives or will it create discrimination at work place? Or will genetic screening cause sexual discrimination before birth? What is the importance of non-directive genetic counselling? Public concerns on genetic research and the media approaches will also be discussed.

Can genetic research be used for dangerous political trends such as nationalism? Can it create a second eugenics era?

The threat of biological weapons and their history will be discussed. On the other hand, also the paranoia of biological weapons as a negative influence on the publication and distribution of scientific research will be analysed.

Basic References:

Alcamo IE (1996) DNA technology: The awesome skill, WCB Publishers


Lecture 3

BIOETHICAL PERSPECTIVES AND INTERNATIONAL REGULATIONS ON RECOMBINANT DNA TECHNOLOGY

The first part of the lecture will continue focusing on the major problems of bioethics: A feminist approach to reproductive rights regarding genetic applications will be a part of the lecture: Is genetic research gender-free? *In vitro* fertilization, genetic screening tests are practices performed through women's bodies: Women's choice or obligation?

This second part of the lecture will focus on the regulatory policies of recombinant DNA research/technology and applications in Europe and United States and policy-making process. The patenting issues of genetically engineered products or special organisms will also be discussed.

Are genetically modified crops another name for colonizing? What is the situation and risks in developing countries in connection with multi-national companies? How is GM forced upon farmers and the hungry? Is eco-tourism another name for genetic smuggling?

Basic References:


Lecture 4

APPLICATIONS OF BIOTECHNOLOGY IN ENVIRONMENTAL POLLUTION CONTROL

This part of the module will focus on the applications of biotechnology in environmental pollution control. In this context, biological treatment processes that employ aerobic and anaerobic decomposers to breakdown the organic matter will be introduced. Biotechnological treatment mechanisms related to oxidation ponds, activated sludge processes, trickling filters, biodiscs and anaerobic digestors (applied to wastewaters); and sanitary landfills and composting (applied to solid wastes) will be summarized. The future of new research approaches in environmental biotechnology involving the development of genetically engineered microorganisms will be discussed.

Basic References:


Lecture 5

AGRICULTURAL APPLICATIONS OF TRANSGENIC CROPS AND GM INGREDIENTS IN FOOD

After a brief summary of the potential and beneficial contributions of genetically modified agricultural products to world food production, the kinds of GM food products already available on the markets, their possible risks with regard to food safety and unpredictable environmental hazards (ie.the feared transfer of toxins or allergens and unintended negative effects on non-target species) in the long term, as well as the ethical aspects involved in producing and trading these products will be discussed.

Basic References:


Basic References:


Lecture 7

INTERNATIONAL ORGANIZATION POSITIONS on GM FOODS
THE CARTAGENA PROTOCOL and INTELLECTUAL PROPERTY RIGHTS ISSUES

The need to take steps to rebuild trust concerning GM foods among the various actors, particularly governments, industry, scientists, regulatory agencies and the public has resulted in preparation and publication of "position papers" on GM food safety by objective scientific international bodies like OECD, WHO and FAO. The first international agreement on this subject -the Cartagena Protocol- as well as the reports prepared by consultative groups of these international organisations to identify common ground on whether and how applications of GM technologies in the food and crops sector serve the needs of society will be discussed, specifically focusing on their individual perspectives on the safety of GM crops now in use for food, the environmental impacts, trade and developmental effects, ethical and societal concerns.

Views on how GM technology can be democratically managed (to the benefit of the needy and not solely to the advantage of specific profit groups holding vital political, economic and technological power), as well as the current system of intellectual property rights (patents, plant breeders' rights, copyrights, trademarks etc.) and similar barriers to the ready transfer of modern biotechnologies will be discussed.

Basic References:


Additional Readings:


Lecture 8

BIOTECHNOLOGY IN THE DEVELOPING WORLD: ASIA, AFRICA, LATIN AMERICA

Biotechnology is the new generic technology that may open windows of opportunity for developing countries in their struggle for economic development. At the same time, this technology carries along many threats for such countries. The lecture will assess these opportunities and threats for developing countries. The concentration will be on agricultural biotechnology considering the dominance of the agricultural sector in their economies and the abundance of plant and animal genetic resources. The capabilities of some developing countries in biotechnology will be examined in comparison with the developed world. As such, the lecture will provide an overall understanding of developing country perspective with respect to biotechnology.

Basic References:


- Pistorius, R. and van Wijk, J., The Exploitation of Plant Genetic Information, Print Partners IpsiKamp, Amsterdam, 1999


Additional Readings:


POLICY MAKING FOR TECHNOLOGICAL CAPACITY BUILDING

Planning and targeting are important for firms and countries alike for biotechnology, with various techniques and applications serving different ends. Setting priorities in biotechnology is significantly important for developing countries with limited financial and scientific resources. Priorities must be set from bottom-up with all the technology actors involved. Both social and economic considerations must be made beside technical feasibilities. As such, strategic targets has to be decided with the concensus of the public at large. The concentration will be on agriculture as still a major sector of the economy in the developing world.

**Basic References:**


**Additional Readings:**

### SCHEDULE for MODULE II (2003/2004)

**Social and Environmental Impacts of Biotechnology**

(at 18:00-21:00 hours)

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<td>March 9, 2003 Tuesday</td>
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