Food Security and Biotechnology in Africa

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MODULE 5

ETHICS AND WORLD VIEWS IN RELATION TO BIOTECHNOLOGY

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Course Structure/ Module Content

- Unit 1; Overview of the subject of Ethics
- Unit 2; Diversity of socio-cultural world-views and their impacts on the uptake of biotech
- **Unit 3; Ethical issues in the uptake of Biotech**
- Unit 4; Case Studies of the influence of ethical concerns in the use /adoption of biotech

Total of 20 hours

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Overview / Background to Module 5

- As an important tool for guaranteeing food security, biotechnology comes with ethical challenges
  - Biotech processes & products elicit considerable ethical questions, arguments & concerns
  - These ethical concerns are numerous because of different socio-cultural & religious world views
- Understanding the subject of ethics related to biotechnology will aid quality decision making
- Understanding the ethical concerns & strategies to manage them are essential for uptake of biotech.

Aim of Module 5

To expose the students to ethical considerations and prevailing world views that influence disposition to, and uptake of biotechnology in different countries of the world

Unit 3

Ethical issues in the uptake of Biotechnology (6h).

Lecture /Discussion 1

Rules for Discussing Bioethical Issues;

Emphasis on civility and mutual respect (1h).

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Unit 3: Lecture/Discussion 1; (1hr)
Rules for Discussing Bioethical Issues;
Emphasis on civility and mutual respect.

Students are expected to

- Understand basic rules for discussing ethical issues; what should guide discussions?
- Agree rules for discussing bioethical issues,
- Recognise the multiplicity / diversity of possible positions in bioethics & the need to respect those in decision making.
- Understand the importance of civility and mutual respect in discussing ethical issues

Element of Biotechnology & Bioethics….Recap

- Biotechnology Defined: "any technological application that uses biological systems, living organisms or derivatives thereof, to make or modify products or processes for specific use" (UN Convention on Biological Diversity, Art. 2)
  - Irrespective of whether it is modern or traditional biotechnology ethical issues may arise but more so in relation to modern biotechnology

Bioethics

- Broadly considered- “study of ethical issues associated with life, including medical and environmental ethics”
  - Bioethics and biotechnology have developed concomitantly.
- Bioethics extend beyond the traditional fields of medicine to encompass all issues raised by developments in biotechnology.
- Bioethical issues may be personal, local, national, regional or global.

What should guide ethical decision making? Irrespective of scale…decisions will be made

- Autonomy
  - Bioethics decision should recognise differences between persons which will influence their disposition to biotech and biotech products.
    - Respect for people as equal persons with their own set of values right to make choices is a challenge for all and needs to be recognised in discussions and decisions.

….. guide to ethical decision making..

- Rights
  - Rights related to bioethics are tricky to handle because unlike legal rights, some human rights may not have *attained* legal recognition in a particular society.
    - Ethics is not the same as law; being is a higher pursuit, doing more than the law requires.

….. guide to ethical decision making..

- Beneficence
  - An underlying philosophy of society is the pursuit of progress, particularly in such area as quality of life. *In this pursuit it is assumed often that it is better to attempt to do good than to try not to do harm.* A failure to attempt to do good, working for people's best interests, is taken to be a “sin” or “error” of omission.
    - Beneficence is the impetus for further research into ways of improving health and agriculture, and for protecting the environment.
    - Beneficence supports the concept of experimentation, if it is performed to lead to benefits.
    - Beneficence asserts an obligation to help others further their important and legitimate interests.
    - Beneficence asserts an obligation upon those who possess life-saving technology to share it with others who need it even if they cannot pay for it.

….. guide to ethical decision making..

- Do no harm
  - When benefits and risks conflict it is important to achieve a balance in bioethics (as would be expected when harm is done whereas the motive was to do good).
  - This is the basis for the principles of justice, confidentiality and philanthropy and can also be expressed as respect for human life and integrity.

….. guide to ethical decision making..

- Justice
  - In some societies individual autonomy comes above societal interests; but it is necessary to remember that the reason for protecting society is because it involves many human lives, each of which must be respected.
  - Individual freedom is limited by respect for the autonomy of all other individuals in society.
  - People's well-being should be promoted, and their values and choices respected, but equally, this places limits on the pursuit of individual autonomy.
  - Interests of future generations places limits on this generation's autonomy.
  - At the international level, questions are raised as to how shared genetic resources should be owned irrespective of how much value was added.

….. guide to ethical decision making..

- Confidentiality
  - Personal information should be private; except when criminal activity is involved; when third parties are at direct risk of avoidable harm.
  - A feature of the ethical use of new genetics is the privacy of genetic information; one of the residual features of the existing medical tradition that needs to be reinforced.

….. guide to ethical decision making..

- Animal Rights
  - How do we interact with animal in the pursuit of human good using biotechnology?
  - The moral status of animals, and decisions about whether it is ethical for humans to use them, depends on several key internal attributes of animals;
    - the ability to think,
    - the ability to be aware of family members,
    - the ability to feel pain (at different levels), and the state of being alive.

      All will recognise that inflicting pain is bad; so if we do use animals we should avoid pain.

….. guide to ethical decision making

- Environmental Ethics.
  - Humans have interactions with the environment, and in fact depend upon the health of the environment for life.
    - The easiest way to argue for the protection of the environment is to appeal to the human dependence upon it.
  - The variety of uses of the environment supports the preservation of biodiversity.
    - The ecosystem is delicately balanced & the danger of introducing new organisms into the environment if that may upset this balance is the key environmental concern of modern biotech.
  - A key concern for preservation of the environment is to ensure that the future generation inherit habitable environment that is not irreversibly damaged.

ENVIRONMENTAL ETHICS

Taking Bioethics Decisions

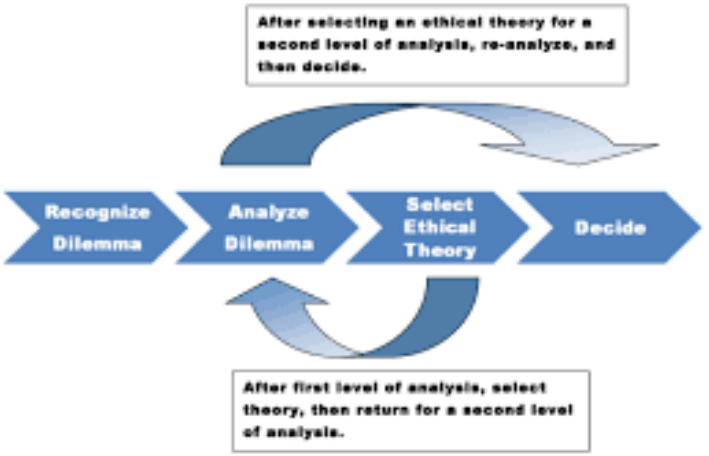
- Balancing conflicting principles of bioethics is central to quality decision making in biotechnology.
  - Innovations (such as biotech) come with risks & benefits; assessment and tolerance levels based on ethics are at stake
  - Human beings are challenged to make ethical decisions to balance the benefits and risks of alternatives
  - utilitarianism (*attempt to produce the most happiness & benefit)*, will always have some place, though it is difficult to assign values to different degrees of "happiness" or "harm".
  - Decisions must be made with careful consideration of the values of all persons; bear in mind that ethics is not synonymous with morality.
    - Even when it may be difficult to do the most good to the most people, it may be possible to do the least harm

Taking Bioethics Decisions….. Some guides

- Having the facts- where to get them? How to know you have the correct fact? Is it the latest, most reliable? How to handle contradictions in fact?
- Managing Values and Beliefs-We all operate with beliefs and values because they give meaning to our lives; they are cultural and need to be respected
- Rational Principles; are the decisions consistent with-
  - Non-Maleficence
  - Individual autonomy
  - Beneficence
  - Justice
- Extrinsic factors
- Intrinsic factors

Ten Step process model for ethical decision making

- **Stop, think and identify the situation problem**
- **Construct a description**
- **Whose problem is it?**
- **Review in terms of the ethical framework**
- **Consider legal, moral principles and values**
- **Identify the support that is available**
- **Identify courses of action**
- **Evaluate the outcome (with the use of supervision where appropriate)**
- **Regularly check the personal impact of these events**



Unit 3

Ethical issues in the uptake of Biotechnology (6h).

Lecture 2;

Ethical issues associated with crop, animal and environmental biotech. (2h).

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Unit 3: Lecture 2; Ethical issues associated with crop, animal and environmental biotech. (2h)

- Students are expected to
  - Understand major ethical issues relating to crop biotechnology
  - Understand major ethical issues relating to animal biotechnology
  - Understand major ethical issues relating to environmental biotechnology

  Develop an appreciation of how intrinsic, extrinsic factors/arguments as well as rights etc. affect bioethical decision making.

General Background / recap..

- Humans have used biotech for centuries to enhance production & quality of food and medicine.
- Traditional biotechnologies covered areas of food production / processing & have not always been associated with fears.
- Modern biotech challenges traditional understanding of food production introducing fears related to ethics, health, safety, environment.
- These powerful new techniques have introduced new potential risks & ethical complications that need properly understood and managed.

GMWATCH

Biotech ethics; Intrinsic vs. Extrinsic arguments

Moral or ethical concerns relating to biotech can be quite vast but also fall into two broad classes:

- **Intrinsic** arguments:- will hold that biotech is wrong in itself
- **Extrinsic** arguments:- will hold that it is wrong because of its consequences

Crop Biotech- Intrinsic Concerns

Intrinsic Concerns would hold that

- If biotech is thought to be intrinsically wrong, no further considerations are morally relevant, for nothing can reverse that intrinsic wrongness (consequences and intentions notwithstanding)

Three areas of Intrinsic concern relevant to crop biotechnology explore whether crop biotech is:

- **Blasphemous**
- **Unnatural**
- **Disrespectful**

Intrinsic Concern… Is crop biotech Blasphemous?

Consider two important contrasting positions:

1. Does manipulating the genes (of plants) constitute playing God?
2. In playing around with the genes (of plants) are we contributing to the continuing work of creation similar to the natural (or assisted) evolution that has driven agriculture and food production for thousands of years?

…..is it blasphemous?

Religious views of modern biotech could hold that (modern) biotech is blasphemous on the following premises.

1. God has created a perfect, natural order
2. Attempt to "improve" that order by manipulating DNA, the basic ingredient of life, thereby crossing species boundaries instituted by God is blasphemous and sinful
3. This technology is attempting to displace the Creator

…is it blasphemous? All religions do not agree!

Different religions have different perspectives on the nature of God and creation:

- Hindus- the supreme being, endlessly creates the worlds of matter and withdraws it into his existence time after time as the cycle of seasons endlessly repeats itself
  - humanity has great custodial responsibility
- Judaism- strongly emphasises the responsibilities that humans have towards nature;
  - earth is the Lord's, no one has unconditional land rights.

…is it blasphemous? All religions do not agree!

- Buddhism- strongly emphasises how humans should relate to the natural world;
  - there is a prohibition on the taking of animal life.
  - Humans have responsibility towards the ‘creation’.
  - Although humans, unlike other creatures, have the opportunity to realise enlightenment, humanity is not necessarily superior to the rest of the natural world.
- Christianity- no unanimous condemnation of modern biotechnology.
  - There is scriptural support for the view that God gave humanity privileged position of "dominion" over nature.
  - Some theologians see modern biotech as opportunity to work with God as co-creators.
  - Views of course do vary between Christian groups.

…is it blasphemous? Synthesis

- Species Boundary: Crop biotech moves genes from one species to another,
  - but religious believers do not necessarily hold that the boundaries between species are sacred and immutable.
- Agricultural: Moral concerns about *animal* applications of biotech seem to carry more weight than about plant applications.
  - This is based on the assumption that humans and animals are *sentient* (feeling) beings, whereas plants are not.
    - Most of the concerns about application of modern biotech in crops are related to environment and biodiversity
- Traditional: Does traditional breeding interfere with natural or created order?
  - The moral concerns expressed about *modern* biotech are applicable to *traditional* methods of breeding. E.g., if it is indeed blasphemous to "interfere with the created order", then such blasphemy has been around for millennia before modern biotech. So why now?

It is unlikely that consensus may ever be built for/ against modern biotech on the basis of blasphemy argument!

Intrinsic Concern… Is crop biotech unnatural?

Consider two important contrasting positions:

1. To change that which is natural is to alter the harmony within living beings & harmony in their relationship with the environment
2. The release of organisms into the environment is a natural process which is only increased by human activities such as by modern biotech

Perhaps, those who do not connect with the blasphemy argument, may connect with the argument about the process being unnatural?

What are the arguments for unnaturalness of biotech?

……is crop biotech unnatural?

Opposition to modern biotechnology on the basis of unnaturalness will be premised on such argument as:

1. Nature and all that is natural is valuable and good in itself and as is;
2. All forms of biotech are unnatural in that they go against and interfere with nature, particularly in the crossing of natural species boundaries;
3. All forms of modern biotechnology are therefore intrinsically wrong.

Two important questions may help to interrogate these positions:

- What is natural and what is unnatural?
- Is being natural necessarily good?

What is natural? What is unnatural?

- Depending on context, is natural to be taken to mean any of these:
  - usual, normal, right, fitting, appropriate, uncultivated, innate, spontaneous, etc.?
- Are the unnatural things the opposite of these?
    - What about table eggs? Broiler chicken? And so many modern products that did not necessarily exist in nature (products of human intervention in nature) but have been accepted as part of everyday life for as long as we can remember?
    - Modern civilization has been dependent on man's interference with nature and the natural.

Facts:

- Humanity may have accepted "unnatural" as normal and has been living with it since domestication of plants and animals.
- Substantial crossing of species boundaries (the principal argument for the unnaturalness of biotech) has been around for millennia and may have been occurring naturally also!
  - What biotechnology has done is to increase the pace and make it more obvious by timeline.
  - The natural/unnatural argument may be intrinsically shapeless

Is being natural necessarily good?

- Is whatever is ‘natural’ good and whatever is ‘unnatural’ bad?
  - If natural foods are good, what about natural toxins and toxic components of natural foods?
  - Are all the medicines and vaccines we hold dear natural?
  - Why is it easy to accept biotech medicines but not biotech foods?
- Did Darwin not lament the “clumsy, wasteful, blundering, low and horribly cruel works of nature“?
  - So ethical right and wrong may not be easily assigned on the basis of natural or not; since the fact of something happening in nature does not mean we are morally unjustified in interfering with it.
  - Even if natural species barriers can be identified (difficult), their mere existence provides no clear ethical directives about what *ought* to be done (or not done) about them.

Intrinsic Concern ....Is crop biotech disrespectful?

Consider two important contrasting positions:

1. Something is wrong with accepting the transfer of genes between species, **working to control the shape of nature** and **allowing the control of this process to be placed in private hands** through patents.
2. Genetic engineering is an area of immense complexity & astonishing simplicity, which occasions amazement and its own kind of reverence.

If peoples & religions differ on the blasphemy; are not unanimous on the natural / unnatural argument; perhaps they may agree about the process being disrespectful?

- What kind of disrespect does biotech engender & towards what?

Is (modern) biotech disrespectful? Reductionist vs. Holistic Arguments

The Reductionist Argument: (-Jeremy Rifkin)

"Already researchers in the field of molecular biology are arguing that there is nothing particularly sacred about the concept of a species…they see no ethical problem whatsoever in transferring one, five or even hundred genes from one species into the heredity blueprint of another species. For they truly believe that they are only transferring chemicals coded in the genes and are not anything unique to a specific animal. By this kind of reasoning, all of life becomes desacralized. All of life becomes reduced to a chemical level and becomes available for manipulation"

Is (modern) biotech disrespectful? Reductionist vs. Holistic Arguments

The holistic, ecological or environmental arguments are built on claims and theories about the interdependence of all life-forms in a complex, self-regulating "biotic community“ and the consequent extension of moral rights and moral value to the non-human world.

Biotechnology’s alleged lack of respect for the biotic environment is captured in the position of the World Council of Churches-

- biotechnology is associated with a world view that does not respect humanity’s dependence on the earth as mother and as source of life and nourishment

Biotech is disrespectful….the reductionist arguments

- Several (and widespread) aspects of modern research may adopt reductionist approach;
- Reductionism does not imply that biotechnologists will view fellow humans as chemicals;
- Epidemiologist or social scientists do not become reductionist because they see humans and diseases as statistics and figure;
- Reductionism is not the same as madness! Will a biotechnologist view his spouse or even pet as chemicals?
- Even within reductionism, do people express comparable level of ethical concerns for genetic manipulation of tomatoes as they would if biotechnologist manipulated the genes of dogs?
- What positions exist in relation to respect for the environment by biotechnology? Perhaps this may be of greater concern?

Biotech is disrespectful….the Holistic arguments

- How do biotechnologist display a lack of respect for the natural world?
- Specialist knowledge often lead to greater respect;
  - physicians do not become disrespectful of humans because they treat people
- In the matter of respect there are ethical distinctions between genetic manipulation of animals and plants.
- Why is traditional biotech which has achieved mainly the same aim as modern one not being accused of disrespect?

Crop Biotech- Extrinsic concerns

Extrinsic concerns relate to what are claimed as the undesirable *consequences* of crop biotech.

Two areas of Extrinsic concern relevant to crop biotech are **Safety** & **Socio-economic** consequences of the process & products of biotech;

Note:

- Statements about safety and socio-economic consequences are predictions.
  - These may or not turn out to be accurate and may or not happen!
- Extrinsic concerns are by their very nature provisional and carry weight only in proportion to the likelihood of the predictions happening

Drivers of Extrinsic Concerns

Ethical questions related to extrinsic arguments are driven by:

1. Difficulty in reaching agreements:
   - It is difficult to reach agreements on the consequences of an action;
   - agreements even if reached do not prove the ethical or moral good or bad/ rightness or wrongness of such consequences
2. Multiplicity of Possible Consequences:
   - Most actions never produce one consequence but rather a set of consequences occurring at different times; so there will often be conflicting advantages and disadvantages
3. Costs and benefits of Consequences:
   - Consequences have to be *weighed* and *compared* against each other, and this cannot be a purely factual assessment. Attempts to estimate likely costs and benefits of an action can be made on straightforward financial basis, but this does not address the moral issues.
   - Ethical judgements have to be made about the *value* or *priority* to be placed upon different possible costs and benefits produced by different possible consequences.

Extrinsic Concern…Is crop Biotech Risky? (Safety)

Two important contrasting positions would be:

1. Based on statistics, introducing GE organisms- bacteria, viruses, plants and animal in massive volumes for commercial purposes will produce unsafe outcomes.
2. The past decade of experiments have placed billions of organisms into the environment without producing any pathogen; traditional breeding has produced novel species without attracting moral (safety) concerns.

Is Crop biotech Risky?.....

- Does being risky make an action morally wrong?
  - Risk and safety become matters of moral concern when they raise questions about *responsibility* and *justifiability.*
- So, what are the risks & fears associated with crop biotechnology?
  - Spread of super weeds?
  - Loss of genetic diversity?
  - ??

…..Is Crop biotech Risky?

Some guidance positions

- The possible harmful effects of crop biotech are entirely speculative; no instances have occurred in practice.
- Many scientists believe this clean record to indicate that modern biotech is in fact peculiarly safe - safer in fact than the relatively indiscriminate genetic exchanges that occur in traditional selective breeding.
- Stringent regulations exist in all countries where biotech developments are taking place.
- Excessive caution may not remove risk but may deny evolution of capacity to deal with future challenges

Extrinsic Concern…Is crop biotech unfair?

Two important contrasting positions would be:

1. Technological advance puts farmers on a treadmill
2. Every technological revolution brings about social changes with problems which governments have to face and societies have to adapt to.
   - It is not the technology itself which can solve the problems.
   - Nor is their existence an argument for stopping the clock.
   - The challenge is to evolve **appropriate regulations in open transparent and inclusive manner**

Is crop Biotech unfair?....

The main worries related to unfairness of crop biotech concern economic v*ulnerability of poorer farmers* and poorer countries and the *disadvantages* they may suffer.

- Large scale agriculture;
- inability to reuse seeds;
- restriction on exchange of genetic resources;
- matters related to patents and control;
- loss of niche capacity and products;
- loss of independence;
- misappropriation of genetic resources of less developed countries.

….Is crop Biotech unfair?

Some Guidance positions

- All new technologies inevitably have far-searching socio-economic effects;
  - it is not restricted to crop biotechnology.
- All new technologies have initially benefited those countries that invented it or have capacity to grow it.
- Patenting is accepted as a means of encouraging inventions & innovation by guaranteeing benefits.
  - International actions already exist to show sensitivity to and prevent / minimise the socio-economic burden of poor and vulnerable individuals and communities.

Animal Ethics vs. Animal Welfare

Why do animals matter ethically?

- The issue which has increasingly come to be seen as ethically significant is not the use of animals but their **welfare**.

- Sentiency: The capacity of animals to experience pain and pleasure
  - Speciesism: This refers to refusal to accord all sentient beings equal consideration. The result is preferential consideration for human beings over other animals.

In considering sentiency as an ethical principle two approaches may be adopted

- Utilitarianism: to maximize pleasure and minimize pain; how do we weigh different levels of human benefit against different levels of animal suffering?
- Inherent Value: focuses not upon calculations of pain and pleasure felt by sentient creatures, but upon their inherent value as individuals, which gives them the right to be treated with respect.

Complications here relate to the diversity in the animal kingdom

Animal Biotech- Intrinsic Concerns

Intrinsic Concerns would hold that:

- If biotech is thought to be intrinsically wrong, no further considerations are morally relevant, for nothing can reverse that intrinsic wrongness (consequences & intentions notwithstanding)

Three areas of Intrinsic concern relevant to animal biotech explore whether animal biotech is:

- **Blasphemous (transgenic animals/ moral status of animals)**
- **Unnatural**
- **Disrespectful**

In these respects the arguments are similar in animal and plant biotech. However, in animal biotech concerns vary between animal biotech related to medicine & for food use

- Patenting in animal Biotech

Some questions peculiar to animal biotech

Transgenic animals can create particular problems for some religious groups:

Halal / unclean / forbidden etc.

- Would you be prepared to eat genetically modified turkey? What ethical concerns would you associate with that?
- Should genes from non-halal animal be used to improve halal ones?
- Etc.?

Animal Biotech- Extrinsic Concerns

Extrinsic Concerns relate to what are claimed as the undesirable *consequences* of animal biotech.

Two areas of Extrinsic concern relevant to animal biotech are **Safety (risk)** & **Socio-economic** consequences of the process & products.

- Statements about safety and socio-economic consequences are predictions. These may turn out to be accurate or not and may or not happen!
- Extrinsic concerns are by their very nature provisional and carry weight only in proportion to the likelihood of the predictions happening

Extrinsic arguments related to animal biotech are comparable to those related to crop biotech.

Risk concerns in Animal Biotech

- The speed with which biotech can effect changes in animals, make it difficult for the changes to be observed over many generations (relative to traditional breeding).
- This method of breeding might produce unexpected and harmful results for those who eat foods derived from such animals
- Animal biotech might reduce genetic diversity, producing monocultures which could be vulnerable to new diseases or environmental threats.
- Animals models engineered in biomedical research might escape and infect the human (and animal) populations, or generate new and more resistant strains of the disease.
- Organs from GM animals might transmit viral diseases if used in human medicine
- That GM animals might be accidentally or deliberately released into the environment, causing various forms of ecological disaster

In spite of some of these concerns being unlikely to occur, regulatory bodies exist to ensure that no one turns a blind eye to such risks.

Environmental Concerns in Biotech

Ethical concerns related to environmental impact of biotech centre around "GMOs are novel and can reduce or change biodiversity or upset the balance of nature in unintended ways":

- Transgene escape to wild-type /horizontal transfer /new disease agents
- GM Plants having selective advantage /generation of super-weeds
- Mixing of genes from unrelated species- 'crossing of species boundaries'
- Development of tolerance to pesticides; increased use of pesticides; damage or depletion to dependent wildlife
  - Resistance to insect pest
  - Harm to non-target organisms
  - Loss of biodiversity (crop and wildlife)
  - Loss of genetic diversity within crops
  - Unpredictable gene expression and flow ('genetic pollution')
  - Alteration in evolutionary pattern
  - Loss of ecosystem in marginal lands/ conversion of such lands to agriculture
  - Agricultural intensification
  - Contamination of soil and water

Environmental Ethics in Biotech

Environmental ethics draw from human understanding of *Nature* and *Creation* and is usually either *Human Centred* or *Eco-Centred*

- **Human centred Environmental ethics**: the environment is valued for what it can provide for humans;
  - it is protected so that the resources it provides will be available for current and future generations.
- **Eco centred Environmental ethics**: The environment is valued because it has intrinsic value;
  - it was so created;
  - natural order;
  - God made it so, and humans are only custodians

Both approaches recognise that humans are part of the biosphere & need to protect the environment to be able to continue to exist sustainably

Human Centred Environmental Ethics

- Humans depend on the environment for life and quality living
- Quality living depend on biodiversity
  - Humans derive pleasure from living alongside elements of the natural world or knowing that they exist
- The delicate balance of the ecosystem may be upset by the introduction of new organisms
- The environment should be preserved to provide for the sustenance of this and future generation

Eco-centred Environmental Ethics

- Eco-centred environmental ethics arguments are more intrinsic than the human centred one and often are driven by religious beliefs
  - Nature has value for itself because it is there
  - We should not damage other species unless it is absolutely necessary for human survival (not luxury)
  - Nature has life so has some value
  - God created the world and so has value as created
    - (humans are stewards not owners of the planet)
  - Living organisms that comprise the environment have rights (*this is less convincing*)
  - Intrinsic arguments raise issues of unnaturalness of biotechnological interference with the biosphere

Potential benefits to the Environment

- Reduction of inputs; increased yield due to herbicide tolerant and insect resistant crops
  - Reduction in the water use
  - Reduction in pesticide and herbicide use
- Improved agronomic practice; direct sowing in unploughed land (herbicide tolerance and efficient weed control)
  - Reduction in moisture loss
  - Marginal increases in length of growing season
  - Control of erosion in erosion prone soils
  - Climate improvement
- Potential for reclaiming marginal land for wildlife as a consequence of improved yield from GM crop use

Decision

- Environmental impacts of biotech can be complex as are the ethical considerations that can bear on decision
- Balancing benefits and risks associated with biotech should guide decision making

Unit 3

Ethical issues in the uptake of Biotechnology (6h).

Lecture 3;

Framework for analysing ethical issues (2h).

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Unit 3: Lecture 3; Framework for analysing ethical issues (2h).

Students & Lecturer are expected use the standards derived from the ethical theories explored in 1c (Consequentialism; Deontology; Virtue & African Moral Theory) to analyse the

- Ethical issues raised in crop biotechnology
- Ethical issues raised in animal biotechnology
- Ethical issues raised in environmental biotechnology

In the process the student will be able to develop their own points of view in ethical matters relating to biotech through structured reasoning.

What ethical issues are at stake?

In respect **plant** biotech the issues relate to the technology being:

- **Blasphemous**
- **Unnatural**
- **Disrespectful**
- **Unsafe** and
- Has Negative **Socio-economic** consequences (in particular for rural farmers; this relates to fairness/ unfairness in benefit distribution)

What ethical issues are at stake?

Similarly, in respect **animal** biotech the issues relate to the technology being:

- **Blasphemous**
- **Unnatural**
- **Disrespectful**
- **Unsafe** and having
- Negative **Socio-economic** consequences (in particular for rural farmers; this relates to fairness/ unfairness in benefit distribution)

What ethical issues are at stake?

In respect of the **environment** the issues relate to:

- Escape of transgene to Wild-type plants/ horizontal gene transfer/ new diseases
- GM Plants with selective advantage: super-weeds
- Crossing of species boundaries
- Herbicide /pesticide damage to dependent wildlife and non-target organisms
- Development of resistance in insect pests
- Increased used of herbicides and pesticides
- Loss of biodiversity (crop and wildlife) and genetic diversity
- Unpredictable gene expression and flow ('genetic pollution')
- Alteration in evolutionary pattern
- Loss of ecosystem in marginal lands/ conversion of such lands to agriculture
- Agricultural intensification
- Contamination of soil and water

Response/ approaches to handling ethical issues raised by biotech

Effective discussion of the issues raised above can be best achieved by keeping eye on predominant concern:

- Uncertainty/ precautionary principles
- Consent, labels and choices

These may be discussed on the bases of methods in ethics as developed in unit 1c

Guide to analysing ethical issues related to crop biotech

Ethical Issues	Ethical Framework			
	Consequentialism (Mill's Utilitarianism)	Deontology (Kantian ethics)	Virtue ethics (Aristotle's moral theory)	African moral theory
Blasphemous				
Unnatural				
Disrespectful				
Unsafe				
Unfair				

Guide to analysing ethical issues related to animal biotech

Ethical Issues	Ethical Framework			
	Consequentialism (Mill's Utilitarianism)	Deontology (Kantian ethics)	Virtue ethics (Aristotle's moral theory)	African moral theory
Blasphemous				
Unnatural				
Disrespectful				
Unsafe				
Unfair				

Guide to analysing ethical issues related to environmental biotech

Ethical Issues	Ethical Framework			
	Consequentialism (Mill's Utilitarianism)	Deontology (Kantian ethics)	Virtue ethics (Aristotle's moral theory)	African moral theory
Escape of gene to wild type				
Super-weed				
Super-pests				
Greater use of chemicals				
Loss of biodiversity				
Loss of gene diversity				
Genetic pollution				
Other consequences				

Unit 3

Ethical issues in the uptake of Biotechnology (6h).

Lecture 4;

Elements of Strong and Elements of Weak Justification (1h).

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Unit 3: Lecture 4; Elements of Strong and Elements of Weak Justification (1h).

The aim of this lecture is to guide the student to understand that sound justification in bioethics entails paying attention to the key questions and core ethical considerations embedded in the framework deployed in ‘c’ above.

……Recap on Ethics and Bioethics

- Ethics is concerned with the activity of deciding what one should do, as an individual and a member of a community. It is also concerned with the activity of offering reasons to support a decision about what one should do.

- Bioethics is a subfield of ethics that explores ethical questions related to the life sciences.

  – Bioethical analysis helps people make decisions about their behaviour and about questions that governments, organizations, and communities must face when they consider how best to use new biological knowledge and innovations.

Why teach bioethics & bioethical analysis?

- **Advance students' science understanding.** Teaching bioethics can serve as a way to teach science to students who otherwise might not be engaged with the subject:- science society interface and reasoned consideration for real world situation.
- **Prepare students to make informed, thoughtful choices.** Studying bioethics deepens students' understanding of biotech and its impact on society.
- **Promote respectful dialogue among people with diverse views.** Engaging in bioethics discussions helps develop students' ability for reasoned dialogue, especially among people with different perspectives/ backgrounds. It encourages deep thinking about choices from a variety of viewpoints and interests, & facilitates respectful discussions of contentious issues.
- **Cultivate critical-reasoning skills.** Bioethics activities emphasize the importance of justification, a process of giving reasons for views

Basic concepts in Bioethical analysis

Ethical analysis requires clarity which can be gained through critical consideration of four key questions:

- **What is the ethical question?**
- **What are the relevant facts?**
- **Who or what could be affected by the way the question gets resolved?**
- **What are the relevant ethical considerations?**

  - Providing comprehensive answers to these questions enable ethical decision making which may not be the consensus but can recognise all relevant considerations and take account of different view points based on careful reasoning.
    - The bottom-line is to encourage provision of justifications for individual decisions.
  - These questions need not be sequential.

Guide to considering the key questions

In considering ethical questions it is important to consider widely recognised key considerations that will guide choices. These are:

- Respect for persons
- Minimizing harms while maximizing benefits
- Fairness

These form the bases of the framework for ethical analysis (see: module 1 C; Utilitarianism, Deontology and Virtue) and ethical decision making.

What is the ethical question?

Identifying ethical questions is central to ethical enquiry and requires;

- **The ability to see the ethical dimensions of a given situation.**
  - Ethicists often refer to this skill as *moral imagination* or *moral sensitivity*, which is the ability to detect that there are ethical issues at stake.
- **The ability to *distinguish* an ethical question from other kinds of questions, such as legal, scientific, or personal-preference or even religious ones.**
  - People often confuse these different kinds of questions, because they are related

What are the relevant facts?

Ethical analysis of a given question can only be achieved on the basis of available facts necessary to consider it.

- Which scientific facts are important?
  - These will provide the link between the science and the ethics
  - They are needed to be able to answer questions related to benefit and harm

- Which social science facts are important/ relevant?
  - Are there psychological, sociological, anthropological, historical, economic or even religious facts and concepts needed to understand or appreciate the available choices?
    - Often, decisions may have to be made in the face of incomplete facts but research is key to exhausting the options. Being open minded means that certain decision may be revisited in the face of new facts.

Who or What could be affected by the way (ethical) question gets resolved?

- A whole range of individuals, groups, institutions etc. may be affected by the way an ethical question is resolved. There may be non-human stakeholders – animals, plants, other organisms & environment.

- Stakeholder analysis also enables understanding of how ethical decisions affect other stakeholders.

- It provides the basis for prioritization when it is not possible to equally protect all interests (and provide justification for the prioritization)

What are the relevant ethical considerations?

Which considerations will be best for decision making?

- Respect for persons,
  - Not treating someone as a mean to an end or goal; not interfering in a person's ability to make a decision; enabling and assisting others to make choices etc.
- Minimizing harms while maximizing benefits,
  - Promoting positive consequences by balancing harm and benefits; which actions will do the least harm and provide the most benefit (utilitarianism).
- Fairness,
  - Concepts of justice, distributive justice and social justice are central to the consideration of fairness
- others
  - Issues of authenticity, responsibility to community and environment can weigh in on ethical decision making

Building and assessing Justifications

Ethical decisions are made following a process of

- Ethical questions having been asked,
- All relevant facts having been collected,
- All the possible stakeholders having been identified or anticipated,
- All options in terms of relevant ethical consideration having been thought about.

Sound ethical reasoning requires that explanation be provided for a recommendation- why is the decision or recommendation the best? The reason should

  - Describe the most relevant ethical considerations
  - Show how the recommended course of action takes those considerations into account
  - Describe alternative decisions that may have been considered and why they are rejected.

This is called JUSTIFICATION

Building Strong Justifications

Elements of a strong justification include:

- High degree of relevance to the ethical question;
- Reference to the most important science and social science facts;
- Description of the potential effects of a decision on others;
- Identifying and applying the relevant core ethical considerations;
- Analysis of the ways the recommended course of action satisfies those considerations and of the strengths and weaknesses of other solutions; and
- Logical reasoning (conclusion follows from the reasons given).

The strongest justifications are those that give the best possible reasons for a particular conclusion and responses to counter-arguments.

  - Bear in mind that there may be no one right answer and disagreements should only be bases for deeper thinking.

Building Strong Justifications

Elements of a weak justification include

- Errors in the facts of the situation or the history surrounding a case (errors in the science or social science content);
- Errors in understanding or applying a core ethical consideration (mistakes of interpretation of core ethical considerations); and
- Errors in logic (the conclusion does not follow from the reasons given).

Guideline Assessment of Justification

Element	Exemplary	Proficient	Partially Proficient	Developing
Relevance to the ethical question	The justification strongly relates to resolving the ethical question	The justification relates clearly to resolving the ethical question	The justification references ethical Q but may not directly address it or attempt to resolve it	The justification either does not reference the ethical Q or does so inaccurately
Ref to the important science & social science facts	Factual info relevant to the case thoroughly described. Additional important info clearly defined. Demonstrates solid understanding of context of case & can distinguish b/w irrelevant & relevant facts	Factual information relevant to the case is described. Additional important information is clearly identified	Factual information relevant to the case is described, but some key facts may be missing. Additional important information is identified but may be partially incomplete	Factual information relevant to the case is incompletely described or is missing. Additional important information is missing
Ref to the potential effects of a decision on others	Thoughtful & insightful description of major stakeholders & their interests/ concerns/ priorities. Effects on stakeholders and ways to resolution are deeply considered	Description of major stakeholders/ their interests/ concerns/ priorities presented. Possible effects on stakeholders & ways to resolve those are deeply considered	Description of major stakeholders/ their interests/ concerns/ priorities presented. Few major ones may be missing. Possible effects on stakeholders & ways to resolve those are considered for most	Stakeholders are either not identified or are mis-represented. Interests/ concerns/ priorities of S-Hs incomplete or missing for most S-Hs. Possible effects on S-Hs of manners of resolution incomplete or missing

Guideline Assessment of Justification contd.

Element	Exemplary	Proficient	Partially Proficient	Developing
Relevance to the relevant ethical considera-tion	Justification connects to all relevant ethical considerations. Justification makes insightful connections to selected ethical considerations, demonstrating deep understanding.	Justification makes connections to some relevant ethical considerations. Makes connections to ethical considerations / demonstrate understanding/ use appropriate terms	Connection to relevant ethical considns not clearly stated. Connections mentioned demonstrate some misunderstanding of particular ethical considerations. Terms may occasionally be used inaccurately.	Connection to relevant ethical considns incomplete /inaccurate connectns mentioned demonstrate mis-understanding of ethical considns. Terms used inaccurately.
Generating solutions and justification	1 or more possible solutions generated. For each, a strong justification for & against developed. Justifications skilfully & insightfully draw on facts of case & all relevant eth, considns.	1 or more possible Solutions generated. For each, a justification for and against are developed. Justificatns draw on facts of the case & all or most of the relevant ethical considerations.	1 or more possible solutions generatd, but justifications incomplete. Facts of case may not be referenced, and ethical considerations may be missing in the discussion.	Solutions are either incomplete or missing. Facts of the case not referenced & ethical considerations not discussed.
Thoughtful and logical reasoning	ption is strongly justified, conclusion flows logically from the premises presented. Justification demonstrates deep/ thoughtful considn & exceptionally organized	Selected option clearly justified; conclusion flows from the premises presented. Justification demonstrates consideration of the topic.	Option justified, but the conclusion may not flow logically from premises presented. Justification demonstrates awareness of topic but little Reflection. Thinking is somewhat	Option not clearly identified, in-completely justified, or not at all. Conclusion may be missing or not flow logically from justificatn. Justificatn demonstrates little /