Debate regarding genetically modified crops

Science, Agriculture

DEBATE REGARDING GENETICALLY MODIFIED CROPS INTRODUCTION:- For thousands of years, human beings have modified nature's organisms for usage in agriculture. New technology has furthered this trend: recombinant DNA technology allows biotechnology firms to insert DNAs into plant genomes, thereby creating plants that express the desired traits. Use of such genetically modified organisms (GMOs) has prompted controversy, especially for its role in ensuring food security. As such, the use of transgenics merits a serious discussion regarding its relevance to food security. This piece discusses the purported benefits and costs of utilizing GMOs, as well as the benefits they have brought — saving land, reducing pesticide use, and promising to alleviate third world hunger. Then we provide an in-depth analysis of the health, ecological, and socio-economic impact of transgenic organisms. Our ultimate stance on this issue is to wait for greater availability of biotech organisms unassociated with large agricultural corporations, and for additional scientific data. Any reference to genetically modified (GM) organisms in this piece are exclusively pointed at transgenic organisms. We will also be examining in depth the two most widespread types of transgenic organisms: herbicide-tolerant crops and insecticide-producing plants. CONCLUSION:- Other technologies available have fewer scientific unknowns, less possibility of forming cycles of farmer debt, and have led to equally significant reductions in hunger. Integrated pest management, organic farming, and other improved farming practices may increase yields just as effectively as would introducing transgenic organisms. As such, we will not promote their widespread use until more research has been done on long term health effects, GMO seeds are available outside of corporate agriculture

control, the biological effects of gene insertion are better understood, and research confirms that the presence of GMOs will not harm the native species in an ecosystem. QUESTIONS....??? Q1. Will GM food reduce hunger in developing countries like India ? ANS. If hunger could be addressed by techno-logy, green revolution would have done it long ago. The fact is that hunger has grown in India in absolute terms - some 320 million people go to bed hungry every night. Two years back, India had a record foodgrain surplus of 65 million tonnes. If 65 million tonnes surplus could not feed the 320 million hungry, how will GM food remove hunger? In reality, GM food diverts precious financial resources to an irrelevant research, comes with stronger intellectual property rights, and is aimed at strengthening corporate control over agriculture. Q2. But what about malnutrition? Crops like golden rice can help remove blindness.?? ANS: This again is the result of misplaced thinking. There are 12 million people in India who suffer from Vitamin A deficiency. These people primarily live in food deficit areas or are marginalised. These are people who cannot buy their normal requirement of food, including rice. If they were adequately fed, there would be no malnutrition. If the poor in Kalahandi, for instance, can't buy rice that lies rotting in front of their eyes, how will they buy golden rice? Q3: Then why is the Indian government experimenting with GM crops and foods? ANS: For two reasons: First, India is under tremendous pressure from the biotechnology industry to allow GM crops. These companies have the financial resources to mobilise scientific opinion as well as political support. Second, agricultural scientists are using biotechnology as a Trojan horse. With nothing to show by way of scientific breakthrough in the past three

decades, GM research will ensure livelihood security for the scientists. Q4: What GM crops and food items is India experimenting with? ANS: Besides cotton, genetic engineering experiments are being conducted on maize, mustard, sugarcane, sorghum, pigeonpea, chickpea, rice, tomato, brinjal, potato, banana, papaya, cauliflower, oilseeds, castor, soyabean and medicinal plants. Experiments are also underway on several species of fish. In fact, such is the desperation that scientists are trying to insert Bt gene into any crop they can lay their hands on, not knowing whether this is desirable or not. Q5: Does GM technology threaten our genetic resources and traditional knowledge? ANS: We have already lost control over our plant, animal and microbial genetic resources. A copy of roughly 1, 50, 000 plant accessions that have been collected in India, are with the US department of agriculture. India has no control over these resources. At the same time, India is now busy documenting traditional knowledge, so as to help the American companies know the uses of the plant species they have got from us. Further, Trade-related Intellectual Property Rights (TRIPs) allows patents on genes and cell lines, which will block India's agricultural research leading to what I have always termed as a scientific apartheid against the developing countries. ADVANTAGES 1. More informed customers, because they need to make more informed decisions in regard to nutrition, agriculture and science. 2. Less pesticide is needed to be used due to insect pest resistant plants. 3. More economically friendly as pesticides do not go into the air, soil, and water (especially freshwater supplies). Their production hazards to the environment also decreases. 4. Decrease in costs of growing and farming, due to the reduced use of pesticides. 5. Higher crop yields. 6. Farmers have

more income, which they could spend on such things as, for example, the education of their children. 7. Less deforestation needed to feed the worlds growing population (UN projections say that the world population will reach 8. 15 billion compared to 6. 18 billion in year 2000). This decreases carbon dioxide in the atmosphere, which in turn slows global warming. 8. Decrease in food prices due to lower costs and higher yield. As people in poor countries spend over half of their income on food alone, lower food prices mean an automatic reduction of poverty. 9. Less starvation in the world due to decreased food prices. 10. More nutritious. This has been proven and tested many times. 11. Rigorous testing of ALL GMO crops and products. This makes GMOs much safer than organic (the traditional) crops. 12. ALL GMOs that are sold in the market, due to the strict tests. If the slightest chance of health hazard, a GMO is NOT allowed to enter the markets. 13. Strict and very complex standards that GMOs have to fully meet. 14. More thoroughly understood crops due to the rigorous testing. 15. Scientific development of agriculture, health and related sciences due to the better understanding of the products. For example, the development of new medicines. 16. Creation of “ super foods" due to better knowledge. Super foods are types of food that are cheap to produce, grow fast in large quantities, highly nutritious. 17. Reduction of world starvation due to increased production. 18. Enhancement of the taste of food. 19. Enhancement of the quality of food. 20. Decrease of maturation time of the plants, so they can be harvested sooner and more often during the year. DISADVANTAGES: 1. Harm to other organisms. For example genes and their effect included in a crop may turn out to be poisonous to insects (monarch butterfly poisoned by GMO corns). 2. Taste of

GMOs are not as good or " natural". 3. Cross-pollination with traditional, organic plants. Cross pollination can occur at quite large distances. New genes may also be included in the offspring of the traditional, organic crops miles away. This makes it difficult to distinguish which crop field is organic, and which is not, posing a problem to the proper labeling of non-GMO food products. 4. Spread of new, more resistant " super weeds. 5. Spread of new, more resistant " super pests". 6. Major trading countries that obtain most of the benefit from the production and trade of genetically modified crops. This might cause more geopolitical conflicts. 7. New trade, tariff and quota issues may arise between countries, regions. 8. Critics say GMOs may cause health problems. 9. As the USA is the biggest producer of GMO crops, their exports may rouse more anti-American feeling, due to “ Americanization" worldwide. 10. Possible damages to the environment. 11. Possible greed of GMO manufacturing firms. 12. Unharmonized test-, and safety standards around the world. 13. GMOs are made because it is possible to make them, not because consumers feel their need. 14. Possible creation of new kinds of weapons; genetic food and beverage weapons. 15. Widening corporate size gaps between food producing giants and smaller ones. This might cause a consolidation in the market: fewer competitors increase the risk of oligopolies, which might increase food prices. 16. Larger companies might have more political power. They might be able to influence safety and health standards (example: less stringent regulations, standards and requirements). 17. Unforeseen risks and dangers due to the complexity of nature. EXAMPLES:- 1. Pesticide resistant rape plants Scientists have transferred a gene to the rape plant which enables the plant to resist a certain pesticide.

When the farmer sprays his genetically modified rape crop with pesticides, he or she can destroy most of the pests without killing the rape plants. Advantages: The farmer can grow a larger crop because it is easier to fight pests. In some cases the farmer can use a more environmentally friendly crop spray. The farmer can also protect the environment by using less crop spray. Disadvantages: 1. Genes from the genetically modified rape crop could be transferred to the pests. The pests then become resistant to the crop spray and the crop spraying becomes useless. 2. Rape plants can pollinate weeds - for example navew which is found in rape fields. When rape plants pollinate the navew their genes are transferred. The navew then acquires pesticide resistance. Corn, soya beans and sugar cane have also been genetically modified by scientists so they are able to tolerate crop spray. 2. Insecticide sweet corn Scientists have genetically modified sweet corn so that it produces a poison which kills harmful insects. This means the farmer no longer needs to fight insects with insecticides. The genetically modified corn is called Bt-corn, because the insect-killing gene in the plant comes from the bacteria Bacillus thuringiensis. Advantages: 1. The farmer no longer has to use insecticide to kill insects, so the surrounding environment is no longer exposed to large amounts of harmful insecticide. 2. The farmer no longer needs to walk around with a drum of toxic spray wearing a mask and protective clothing. Disadvantages: 1. This type of genetically modified corn will poison the insects over a longer period than the farmer who would spray the crops once or twice. In this way the insects can become accustomed (or resistant) to the poison. If that happens both crop spraying and the use of genetically modified Bt-corn become ineffective. 2. A variety

of insects are at risk of being killed. It might be predatory insects that eat the harmful ones or, perhaps attractive insects such as butterflies. In the USA, where Bt-corn is used a great deal there is much debate over the harmful effects of Bt-corn on the beautiful Monarch butterfly. IMP: Cotton and potatoes are other examples of plants that scientists have , genetically modified to produce insecticide. 3. Golden rice Golden rice is genetically modified rice that now contains a large amount of A-vitamins. Or more correctly, the rice contains the element beta-carotene which is converted in the body into Vitamin-A. So when you eat golden rice, you get more vitamin A. Beta-carotene gives carrots their orange colour and is the reason why genetically modified rice is golden. For the golden rice to make beta-carotene three new genes are implanted: two from daffodils and the third from a bacterium. Advantages: 1. The rice can be considered a particular advantage to poor people in underdeveloped countries. They eat only an extremely limited diet lacking in the essential bodily vitamins. The consequences of this restricted diet causes many people to die or become blind. This is particularly true in areas of Asia, where most of the population live on rice from morning to evening. Disadvantages: 1. Critics fear that poor people in underdeveloped countries are becoming too dependent on the rich western world. Usually, it is the large private companies in the West that have the means to develop genetically modified plants. By making the plants sterile these large companies can prevent farmers from growing plant-seed for the following year - forcing them to buy new rice from the companies. 2. Some opposers of genetic modification see the " golden rice" as a method of making genetic engineering more widely accepted. Opponents fear that

companies will go on to develop other genetically modified plants from which they can make a profit. A situation could develop where the large companies own the rights to all the good crops. 4. Long-lasting tomatoes Long-lasting, genetically modified tomatoes came on to the market in 1994 and were the first genetically modified food available to consumers. The genetically modified tomato produces less of the substance that causes tomatoes to rot, so remains firm and fresh for a long time. Advantages: 1. Because the GM tomatoes can remain fresh longer they can be allowed to ripen in the sun before picking - resulting in a better tasting tomato. 2. GM tomatoes can tolerate a lengthier transport time. This means that market gardens can avoid picking tomatoes while they are green in order that they will tolerate the transport. 3. The producers also have the advantage that all the tomatoes can be harvested simultaneously. Disadvantages: 1. Scientists today can genetically modify tomatoes without inserting genes for antibiotic resistance. However the first genetically modified tomatoes contained genes that made them resistant to antibiotics. Doctors and vets use antibiotics to fight infections. These genes spread to animals and people, doctors would have difficulties fighting infectious diseases. 2. Strawberries, pineapples, sweet peppers and bananas have all been genetically modified by scientists to remain fresh for longer. OBJECTIVES:- Agriculture faces serious problems in feeding 9 billion people by 2050: production must be increased and ecosystem services maintained under conditions for growing crops that are predicted to worsen in many parts of the world. A proposed solution is sustainable intensification of agriculture, whereby yields are increased on land that is currently cultivated, so sparing land to deliver other ecosystem

services. Genetically modified (GM) crops are already contributing to sustainable intensification through higher yields and lower environmental impacts, and have potential to deliver further significant improvements. Despite their widespread successful use elsewhere, the European Union (EU) has been slow to introduce GM crops: decisions on applications to import GM commodities are lengthy, and decision-making on applications to cultivate GM crops has virtually ceased. Delayed import approvals result in economic losses, particularly in the EU itself as a result of higher commodity prices. Failure to grant cultivation approvals costs EU farmers opportunities to reduce inputs, and results in loss of agricultural research and development from the EU to countries such as the United States and China. Delayed decision-making in the EU ostensibly results from scientific uncertainty about the effects of using GM crops; however, scientific uncertainty may be a means to justify a political decision to restrict cultivation of GM crops in the EU. The problems associated with delayed decision-making will not improve until there is clarity about the EU’s agricultural policy objectives, and whether the use of GM crops will be permitted to contribute to achieving those objectives. HISTORY: For several thousand years, farmers have been altering the genetic makeup of the crops they grow. Human selection for features such as faster growth, larger seeds or sweeter fruits has dramatically changed domesticated plant species compared to their wild relatives. Remarkably, many of our modern crops were developed by people who lacked an understanding of the scientific basis of plant breeding. This is known as Plant Breeding. Corn breeders, particularly, tried numerous strategies to capitalize on the insights into heredity. Corn plants that had

traditionally been allowed to cross-pollinate freely were artificially self-pollinated for generations and crossed to other self-pollinated lines in an effort to achieve a favorable combination of alleles. The corn we eat today is the result of decades of this strategy of self-pollination followed by cross-pollination to produce vigorous hybrid plants. In the Nineties, biotechnology moved out of the laboratory into farms and shops, and became a boom industry. In 1990 the first GM food, a yeast, was approved in the UK; in 1992 the first food to be made from a GM ingredient — a vegetarian cheese — went on sale in the UK; and three years ago supermarkets started selling GM tomato purée. The first commercially grown genetically modified food crop was a tomato created by California company in the early 1990s called the FlavrSavr, it was genetically altered so that it took longer to decompose after being picked. A variety of the tomato was used to make tomato puree that was sold in Europe in the mid-1990s, before controversy erupted over GM crops. Then in 1998, Dr Arpad Pusztai, then of the Rowett Research Institute, Aberdeen, published research suggesting that GM potatoes, modified with an insecticide gene taken from the snowdrop, were toxic to rats in feeding trails.