Frequently Asked Questions

GM CROPS AND ANIMAL NUTRITION

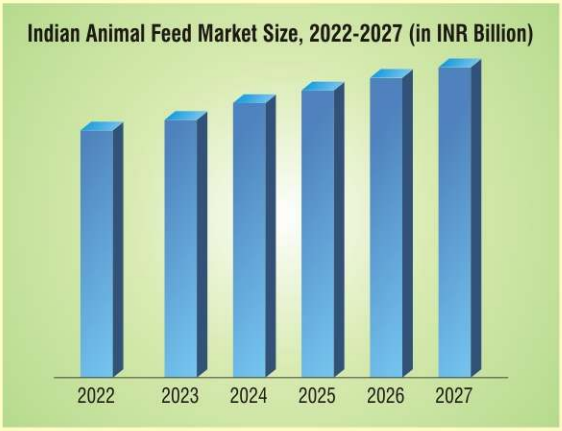
BCIL

Biotech Consortium India Limited

2022

Feed requirements by livestock sector

- The livestock sector plays a significant role in Indian economy. India is the largest producer of milk and buffalo meat in the world. It ranks 3rd in egg production in the world.
- Demand for various livestock-based products is increasing significantly due to increase in per capita income, urbanization, taste and preference and increased awareness about food nutrition.
- Feed is one of the main drivers of livestock production, in addition to good animal breeds and maintaining animal health. It accounts for upto 70% of the total cost of livestock operations. Maize, coarse grains, cereal by-products, oil cakes etc. are important ingredients used for animal feed.
- The Indian animal feed market reached a value of ₹ 874 billion in 2021, and expected to grow at CAGR of 9.6% in next five years with estimated value of ~ ₹ 1500 billion, as per available report.
- Exponential growth of livestock sector is resulting in shortage in supply of feed and feed ingredients and increase in pricing. High volatility in prices of feed is a major concern for livestock sector. In 2021, dramatic price fluctuation for soymeal was observed from ₹ 40 to > ₹ 100 /Kg in the country.
- Genetically modified (GM) crops and their derivatives are extensively used globally for food and feed. Livestock populations constitute the largest consumers of GM crops, as they consume 70-90% of GM crop biomass.
- This brochure provides information on Frequently Asked Questions about GM crops in the context of their use as feed for animal nutrition, to facilitate easy understanding about this technology.

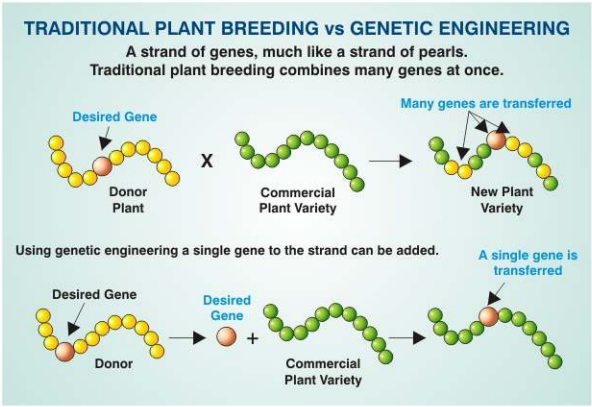


https://www.imarcgroup.com/indian-animal-feed-market

1. What are Genetically Modified (GM) Crops?

- Genetically modified (GM) crops are plants, in which the basic genetic material (DNA) has been altered using genetic engineering techniques. In most cases the aim is to introduce a new trait to the plant.
- GM crops are also referred as genetically engineered (GE) crops, transgenic crops, biotech crops or living modified organisms (LMOs).

2. How do GM crops compare with traditionally bred crops?



- GM crops are similar to those produced using traditional plant breeding in terms of objective of generating more useful and productive crop varieties containing new combination of genes.
- The difference is that GM crops may contain genes from a wide range of organisms as compared to traditionally bred crops that have genes from within plant species or closely related species.
- The development of GM plants with desired traits is done in scientific and precise manner, that is not possible through classical means or may take many years to produce desired characteristics.
- GM technology is not a replacement for traditional breeding, rather it compliments, as one of the promising tools for crop improvement.

Gene and DNA

- A gene is a sequence of DNA that contains information to determine a particular characteristic/trait.
- The genetic code is universal i.e., the DNA of all organisms is made up of the same building blocks and is encoded in exactly the same way.
- Genes are units of inheritance that are passed from one generation to the next.
- All organisms have varying number of genes. The genetic differences among different species as well as organisms within a species lie in the difference in number and sequence of those genes in the DNA/genome.

3. Why do we need GM crops?

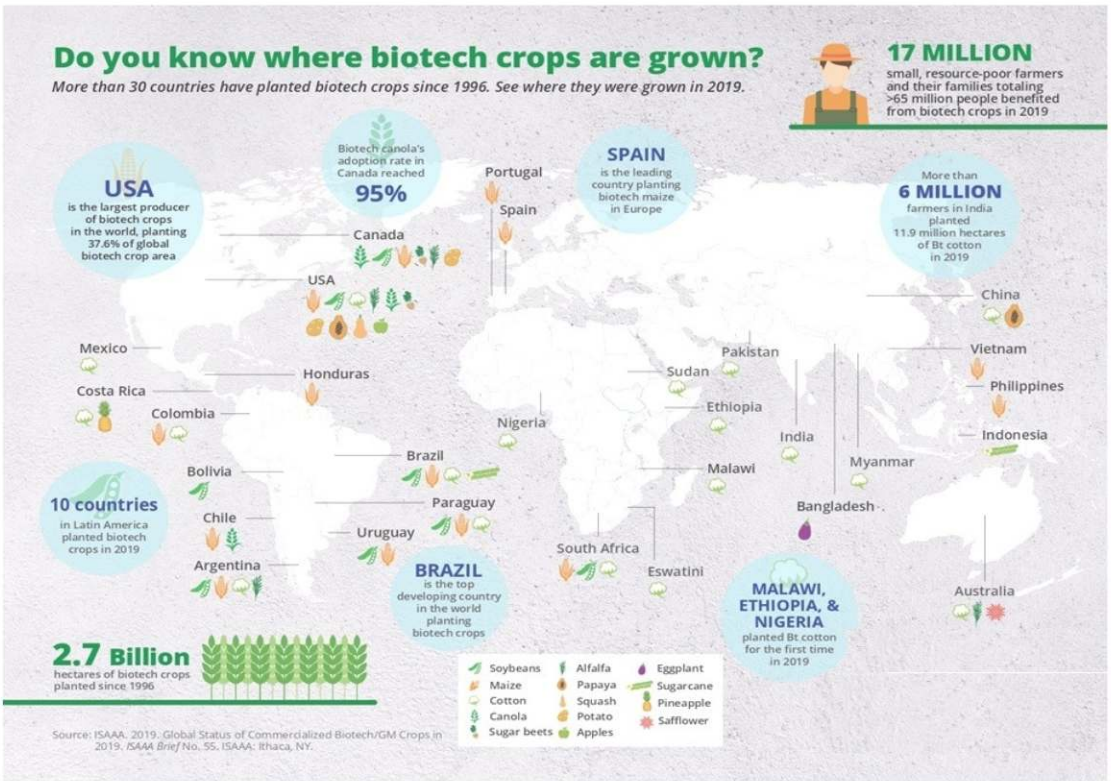
- Growing demand for food and feed requires increase in the production per unit land. Farmers regularly need new technologies to increase productivity and product quality to deal with challenges such as pests, diseases, weeds, climatic conditions etc.
- GM crops are one such option that has been used to incorporate traits in various crops such as insect/pest resistance, herbicide tolerance, disease resistance, altered nutritional profile, enhanced storage life etc.
- These include crops used for animal feed such as maize, soybean, mustard, cotton and alfalfa.

4. Which are the important GM crops and their derivatives used for animal feed?

- Livestock producers in many parts of the world prefer corn grain and soybean meal for energy and/or protein source in feed for poultry, dairy, aqua, swine etc. In addition to the whole grains, the products derived from GM crops are also used for feeding Animals.
- Soybean meal is by-product of the extraction of soybean oil. Globally, about 98% of soybean meal is used in animal feed. Significant quantities of canola seed meal and cotton seed meal are also fed to animals.
- By-products from processing of maize are also being used for animal feed. These include Dried Distillers Grains with Solubles (DDGS) and Corn Gluten Meal (CGM).
  - ❖ DDGS is a major co-product from production of ethanol from grains. It is high in energy and mid protein. It has high levels of phosphorous. Its nutritional profile falls between soybean meal and corn (maize). It is widely used as a feed ingredient of poultry, dairy and aqua as an inexpensive feed material.
  - ❖ CGM is a by-product of the manufacture of maize starch, containing about 65% crude protein. It is used as source of protein and energy for livestock species.

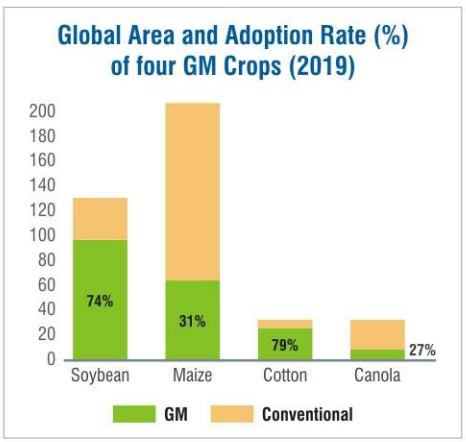
5. How long have GM crops been cultivated and are in the market?

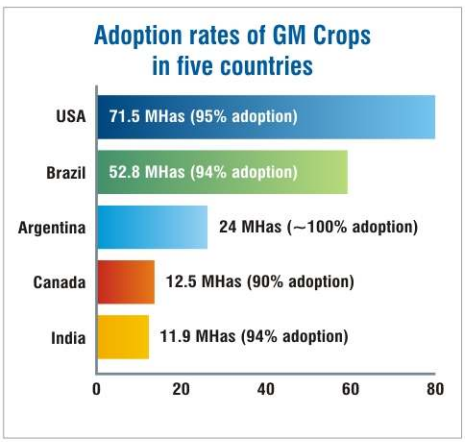
- The development of GM crops started in the 90s.
- The first GM crop FlavrSavrTM tomato, was approved in the United States in 1994.
- Subsequently, several commercially important GM crops viz. maize, cotton, soybean and canola were approved for cultivation by 1996.
- As per the available reports in 2019, 16 GM crops have been planted in more than 30 countries since 1996. The area under cultivation of GM crops has increased from 1.7 million hectares (MHa) in 1996 to 190.4 MHa in 2019.
- A total of 71 countries have issued regulatory approvals for GM crops for consumption as food and/or feed.
- In 2019, 29 countries planted GM crops and additional 43 countries have granted regulatory approvals for GM crops for import as food and feed use.



6. What is the share of GM vs. non-GM crops used as animal feed?

- The adoption rates for four GM crops important for animal feed have been very high. In the countries, where these are approved for cultivation, more than 90% area is under that particular crop. For example, in USA, average rate of adoption of soybean, maize and canola is 95%.
- In 2019, 74% of soybean, 31% of maize, 79% of cotton and 27% of canola were GM crops.





Source: ISAAA, 2019

7. Why is GM technology being adopted by only few countries and its non- acceptance by developed countries like European Union (EU) raises doubts about the efficacy of the technology?

- Maximum adoption of GM crops occurred in six countries (USA, Brazil, Argentina, India, Canada, China). This is because these countries have agriculture as a dominant economic activity. USA, Brazil, India and China are among the top 10 producers of various agricultural commodities in the world.
- EU countries, Russia, Japan, Korea etc. are mostly importers of agricultural products. These countries have approved GM crops for food and feed use and are importing large quantities of products derived from GM crops.
- About 70% of soybean meal consumed in the EU is imported and 80% of this meal is produced from GM soybean.

8. How many GM crops are approved and cultivated in India?

- To date, Bt cotton is the only GM crop approved in 2002 for commercial cultivation in India.
- The total area under Bt cotton has increased from 0.05 MHa in 2002 to >11.9 MHa in 2019, that accounts for >95% area under cotton.
- Adoption of Bt cotton has tripled cotton production (13 million bales in 2003 to 37.1 million bales in 2021 with a yield gain of 31%). In addition, insecticide sprays have been reduced by approx. 39%.
- The production of cotton seed and its byproducts - oil and meal has also tripled.
- Livestock sector in India has been using domestically produced GM cottonseed meal for feed. It is also exported to other countries.

9. Are any products derived from GM crops approved for import in India?

- Soybean oil and canola oil derived from GM crops are approved for import in India
- India imports significant quantities of these oils from Argentina, Brazil, Canada etc.
- In 2021, Government of India permitted import of limited quantities of GM soybean meal for use in animal feed, in view of urgent requirements and increase in prices.
- All these products have been permitted, as they either do not contain transgenic proteins and/or are not living modified organisms (LMOs).

10. Are GM crops and the food/feed derived from them are safe?

- Different GM crops include different genes inserted in different ways. Accordingly, GM crops containing specific genes and their safety is assessed on a case-by-case basis, GM crops are permitted to be grown only after they have passed safety assessments and are not likely to pose risks for human health and environment.
- Numerous evaluations by regulatory authorities globally are available that confirm the safety and nutritional equivalence of approved GM crops with their conventional counterparts.
- Reviews by major scientific bodies and regulatory agencies have confirmed that GM crops and the food derived from them are safe.

11. If livestock consume GM crops, are there chances of presence of transgenes in food product derived from them?

- Genes are part of all living organisms including traditionally bred plants and animals. Human or animals eat genes whenever they eat any kind of food.
- Transgenic genes or expressed novel proteins present in GM crops are broken down during the digestion process in the same way as other genes or proteins and so the chances of presence of transgenes in animal products such as meat, milk and eggs are virtually zero.

12. Do the foods from GM crops contain fewer nutrients than comparable foods?

- Detailed compositional analysis is an essential part of the safety evaluation process. Prior to approval, it is necessary to demonstrate that GM crops presently being cultivated are as nutritious as foods from comparable traditionally bred plants.

13. Are there long-term health effects of GM crops?

- The only difference between the GM crops and their non-GM counterparts is the proteins expressed by inserted genes. The safety of the consumption of these proteins is established based on biological properties and tests of digestibility, acute toxicity, and allergenicity.
- Once this is done and safety established then the compositional equivalence confirms that the GM crop/ food is similar to corresponding non-GM which has been used / consumed traditionally for generations and hence no long term effects are expected to be seen based on this history of safe human use.

14. How can GM crops be used by consumers in a country?

- The cultivation and use of GM crops is subjected to national regulations in various countries.
- GM crops can be cultivated, imported and marketed only after authorizations by competent national authorities.

15. How are the imports of derivatives of GM crops regulated?

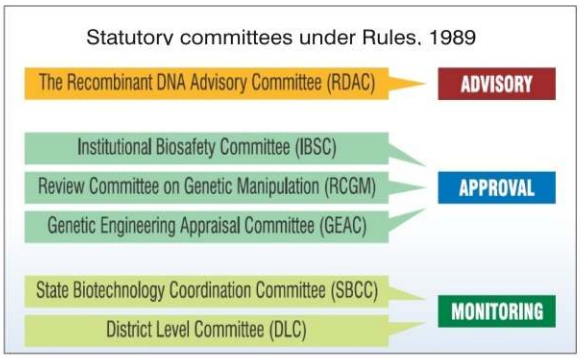
- Whereas import of seeds or propagable material and grains requires prior authorization, import of processed products derived from GM crops to be used as feed is exempted by several countries.
- In South Africa, products such as soybean meal and DDGS are excluded from GMO legislation as these products not being viable.
- The LMO Act in Republic of South Korea excludes processed products for feed, therefore no import approval necessary.
- In Vietnam, grant of certificates for GM plants for food and/or feed use is given if the same have been approved in 5 developed countries.

16. Does growing and trade of GM crops prevent exports of livestock products?

- Growing and trade (import/export) of GM crops does not stop a country from exporting agricultural products to other countries.
- Several countries including U.S, Canada, Brazil, Argentina, Australia and South Africa that grow GM crops continue to export products derived from GM crops to countries around the world.
- The export of GM crops and products thereof requires approval for use in importing countries. From the scientific perspective, food safety data is assessed by the importing countries prior to grant of approval

17. Who regulates development and use of GM crops in India?

- In India, genetically modified organisms are regulated as per "Rules for the manufacture, use, import, export & storage of hazardous microorga-nisms, genetically engineered organisms or cells, 1989" notified under the Environment (Protection) Act, 1986 (EPA) by the Ministry of Environment, Forests and Climate Change (MoEFCC).



- These rules are implemented by MoEFCC jointly with Department of Biotechnology (DBT), Ministry of Science & Technology. State governments have a role in monitoring of activities involving GM crops.
- There are six statutory committees. Genetic Engineering Appraisal Committee (GEAC) in the MoEFCC, is the apex committee for granting approval. GM food is also regulated by FSSAI and the regulations are under discussion.

18. What is the Cartagena Protocol on Biosafety (CPB) and how does it impact the use of GM crops and products for use as animal feed?

- The Cartagena Protocol on Biosafety (CPB) to Convention on Biological Diversity is an internatio-nal agreement governing the movement of living modified organisms (LMOs) resulting from modern biotechnology from one country to another.
- Products derived from GM crops are processed and do not contain LMOs. Thus, they are not covered under the CPB.
- Transboundary movement of agriculture commodi-ties falls in the category of LMOs for food, feed and processing (FFP) and is subjected to the provisions under the CPB.

LMOs covered under the CPB

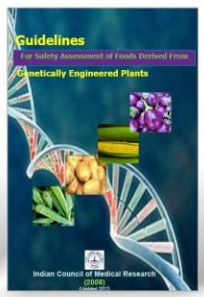
- LMOs for intentional introduction into the environment (e.g., seeds, live fish)
- LMOs intended for direct use as food or feed, or for processing (e.g., agricultural commodities- corn, canola, cotton)
- LMOs for contained use (e.g., bacteria for laboratory scientific experiment)

Exemptions

- LMOs that are pharmaceutical for humans if they are covered by other international agreements or arrangements
- Products derived from LMOs such as processed food (e.g., soybean oil, corn flour)

19. Do we have proper guidelines and protocols for assessing the biosafety of GM crops in India?

- Guidelines and protocols prepared through consultations with stakeholders, have been put in place regularly since the notification of the Rules, 1989 to ensure safety from the use of GM crops and products thereof in research and application.
- The data requirements for safety assessment are extremely rigorous for GM crops and are defined by regulatory authorities.
- The safety tests such as allergenicity, toxicity, nutritional equivalence, composition, effect on non-target organisms, etc. are conducted in accredited facilities or research institutions and the scientific data is scrutinized by the regulatory authorities at each step.



20. What are the potential benefits of using GM crops to livestock sector in India?

- The growing market at both global and national level has propelled the growth of livestock sector in India resulting in increased demand for animal feed.
- It is imperative to make available sufficient low cost and good quality feed for sustainable growth of poultry, dairy, aqua and other livestock sectors.
- Permitting the use of GM crops and its derivatives would help in increasing the availability of feed and feed ingredients in India, and contribute to harness the potential of this sector.

Genetically modified (GM) crops and their derivatives are extensively used for animal feed globally. Bt cotton, is the only approved GM crop in India and Bt cotton derived seed meal is extensively used by livestock sector. The demand for animal feed in India is increasing and various options including the use of GM crops and their derivatives is being explored.

This brochure provides information on frequently asked questions about GM crops and their use for animal nutrition.

For further information, please contact

BCIL

Dr. Vibha Ahuja, Chief General Manager,
Biotech Consortium India Limited
Anuvrat Bhawan, 5th Floor, 210, Deen Dayal Upadhyay Marg,
New Delhi-110 002, Email: vibhaahuja@biotech.co.in