India's national capacity in order to implement the Protocol. It will also address the capacity building needs of the country for implementing the national biosafety framework related to transboundary movement of LMOs. This includes the assessment, management and long term monitoring and documentation of the risks to the sustainable use of biodiversity and to human health potentially posed by the introduction of LMOs.

It is envisaged that at the end of the three-year capacity building project there will be sufficient capacity in the country including in terms of effective co-ordination between the responsible agencies to assess and manage risks associated with transboundary movement of LMOs through strengthening of the legal and regulatory frameworks, enhanced institutional capacity and effective communication strategies. Knowledge and methodologies on biosafety will be shared and transferred to the State agencies across the country through sustained training programmes.

Key Provisions of Cartagena Protocol

- The Protocol provides for establishing an internet-based "Biosafety Clearing-House" to help countries in sharing and exchange of scientific, technical, environmental and legal information about living modified organisms (LMOs) and their products.
- It creates an advance informed agreement (AIA) procedure that in effect requires exporters to seek consent from an importing country before the first shipment of an LMO meant to be introduced into the environment.
- The Protocol establishes a process for considering more detailed identification and documentation of LMO commodities in international trade.
- The protocol contains reference to a precautionary approach and reaffirms what has been stated in Principle 15 of the Rio Declaration on Environment and Development, that is, governments may use the precautionary principle to bar import of a transgenic product even in the absence of conclusive evidence that the product is not safe.
- The Protocol calls on Parties to cooperate with developing countries in building their capacity for managing modern biotechnology.
- The Protocol does not address food safety issues and consumer product labeling. It does not cover non-living products derived from LMOs, such as cooking oil from genetically modified (GM) corn or ketchup from GM tomatoes.

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Evaluation of Imported Transgenic Planting Material: Emerging National Scenario

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Advances in technologies enabling transfer of foreign gene in plants have overcome several barriers to crop improvement. These technologies offer immense benefits in terms of increased yield, better quality and resistance to biotic and abiotic factors. The transgenic crops can minimize crop damage through disease and pest-resistant varieties, reduce the use of chemicals and enhance stress tolerance in crops, thereby permitting economically productive farming on hitherto unproductive lands. Over the last two decades, transgenic plants were widely used in basics and applied studies. The first genetically engineered crop released in 1994 for commercial production was the *FlavrSavr* tomato in United States. Thereafter adoption of GM crops has been at very fast pace. The global area under transgenic crops has continued to grow over the last eight years, reaching 81 million hectares (m ha) in 2004, which represents a 47-fold increase from 1.7 m ha in 1996. Thus potential of this technology for enhancing crop productivity has been accepted worldwide.

Because of the revolutionary nature of this new technology, there are also concerns about the risks and uncertainty associated with it, which too needs to be managed effectively. For example, the "terminator technology" (Oliver, 1998) was the most controversial news in commercial transgenic research in the last decade. The technology offered "Technology Protection System" (TPS) by genetically engineering a suicide mechanism into seeds, disabling farmers from saving seeds and using it in the next generation. In India, out of more than 100 million farmers, 80 percent are dependent on farm-saved seed. The potential threat to small farmers caused widespread outrage and protests during 1998, forcing the authorities to ban the technology in India. India has developed an efficient regulatory mechanism to monitor experiments in plant biotechnology as well as for biosafety assessment of transgenic plants. India is among the few developing countries, which have instituted biosafety regulations and incorporated them in national laws as far back as in 1989 (GOI 1989). The biosafety guidelines to monitor all experiments involving genetically improved plants, both within the laboratory/ greenhouse and outside were first prescribed in 1990 by DBT and were further revised and evolved in 1994 and 1998.

NBPGR is the nodal agency for issuing import permit for transgenic planting material for research purposes, on technical clearance of Review Committee on Genetic Manipulation (RCGM), DBT, Govt. of India. Since 1997, transgenic lines are being imported on regular basis through NBPGR. Eight transgenic crops for different traits were imported through NBPGR (Mangal *et al.*, 2003). Till date 32 imports of different crops namely *Brassica oleracea*, *B. juncea*, *B. napus*, *Oryza sativa*, *Gossypium* sp., *Zea mays*, *Cicer arietinum*, *Glycine max*, *Nicotiana tabacum* and *Triticum aestivum* have been imported in the country for research purposes from countries like Belgium, Philippines, USA, Australia, UK, Scotland, Switzerland, China, Canada and South Africa.

Among the transgenes introduced, transgenic *Brassica* lines have been imported with *Cry9C*, *osmads*, *bar*, *barnase* and *barstar* genes, which impart resistance against lepidopteran insects, photoperiod insensitivity, resistance to gluphosinate ammonium herbicide, male sterility and restoration of male fertility, respectively. The transgenes imported in rice include *Amal* gene from *Amaranthus* for improved nutrition, *Cry1Ac* and *Cry19C* genes for imparting resistance against lepidopteran insects, *Cry1A(b)* for resistance to stem borer, *Xa21* for resistance to bacterial leaf blight, *PR* genes for resistance to sheath borer, *bar* gene, herbicide Basta-resistant gene and the genes for phytoene synthase, phytoene desaturase, and lycopene cyclase involved in the synthesis of ✪carotene in the endosperm of Golden rice. Recently, fungal pathogen resistance genes ScFv fragments from various sources incorporated in rice and wheat were also imported from Germany. In addition, *Cp4EPSPS* gene (for tolerance to glyphosate herbicide) and *aad* gene (coding for 3"-(9)-*o*aminoglycoside adenylyl transferase and conveying resistance to streptomycin and spectinomycin) in soybean and cotton, *CryX* and *Cry1A* genes (for resistance to lepidopteran insects) and *vip3* gene (for resistance to bollworm) in cotton; *Cry1Ab*, *CP4EPSPS* and *pat* genes (synthetic *bar* gene coding for phosphinothricin acetyl transferase and isolated from *Streptomyces viridochromogenes*) in maize, *Bean alpha A1* gene for imparting resistance against *Collasobruchus chinensis*, a serious pest of stored grains in chickpea and *Aox* gene for alternate oxidase in tobacco have also been imported.

In 2000, under DBT project National containment Facility along with transgene testing laboratory for evaluation of imported transgenic planting material was established at NBPGR. Under this project all the imported transgenic planting material is regularly being tested for terminator technology. The terminator cassette consists of three sets of genes namely, *repressor*, *cre-recombinase* and toxic genes. The primers have been designed from the sequence available from the *cre-recombinase* gene and are being used for PCR based detection to check the presence of this cassette in the received transgenic material. Besides this, primers were also designed and successfully employed for detection of transgenes like *Cry1Ab*, *Cry1Ac*, *CryX*, *Xa21*, *Vip-3*, AOX, CP4EPSPS, *barnase*, *barstar*, antifungal peptide genes, *phytoene synthase*, *Phytoene desaturase* and *Lycopene cyclase* etc. In addition, primers have also been designed for scorable/selectable markers such as *hpt*I, *hpt*II and *bar* or promoter fragments such as CaMv 35S and *nos* terminator and employed for detection of their presence in transgenic materials.

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