ECONOMICS OF BIOLOGICAL CONTROL:

Biological control/biocontrol is a method of controlling pests such as insects, mites, weeds and plant diseases using other organisms. It relies on predation, parasitism, herbivory or other natural mechanisms, but typically also involve an active human management role. It can be an important component of Integrated Pest Management (IPM) programs.

There are 3 basic strategies for biological pest control:

1. Classical (Importation): where a natural enemy of a pest is introduced in the hope of achieving control;
2. Inductive (Augmentation): in which a large population of natural enemies are administered for quick pest control;
3. Inoculative (Conservation): in which measures are taken to maintain natural enemies through regular reestablishment.

Several organisms are used as agents for biological control like:

1. *Bacillus thuringiensis* : it is most applied species of bacteria used for biological control and it can be used against lepidoptera, coleoptera, diptera.
2. *Trichoderma viride* : it is a potent biocontrol agent & used extensively for soil borne diseases. It has been successfully used against pathogenic fungi belonging to various genera, viz, *Fusarium, Phytophthora, Scelerotia* etc.

Biocontrol agents are now considered to be potent replacements of chemical agents like pesticides, insecticides, as they pose several environmental hazards. A farmer's choice of pest management method is influenced by several factors like:

- Direct expense of control (eg. Price of pesticide treatment).
- Indirect expenses (eg. Equipment, fuel).
- Compatibility of pest control method with other farm operations (eg. Weed and disease control).
- Expected efficacy of control treatments.
- Expected development of market value of the commodity (including price elasticity).
- Overall economics of pest management.

The costs of classical biological control project may be calculated easily. One simply sums the cost of the baseline research, the cost of foreign exploration, shipping, quarantine processing, mass rearing, field releases & post release evaluation. The last cost must be evaluated judiciously as pursuing academic interests may push these costs beyond those required by the

practical problem in hand. Harris (1979) proposed that costs be measured in scientist years (SY) with 1SY being administrative and technical support costs for one more scientist for one year. Eg. The US Department of Agriculture estimated that 1SY in biological control cost 80,000 dollars in 1976.

Some classical biological control projects may be very inexpensive, but others may cost more because of the biological and other complexities encountered. Once establishment & dispersal in the new environment is obtained in classical biological control, no further costs for this natural enemy are incurred unless new biotypes are introduced.

Hence cost-benefit analysis is needed. It is the process of measuring & comparing costs and benefits associated with some action. A common type of cost-benefit analysis is to evaluate a technology (such as use of biocontrol agents) to see if adoption will result in higher or lower profits to associated groups such as growers, consumers, the public etc. a cost-benefit analysis can provide a systematic evaluation of a new control technique (such as unilateral chemical control) & indicates whether the new technique has any economic advantage and estimates the magnitude of that advantage.

The importance of the evaluation phase in the biocontrol projects has been emphasized greater and more methodologies will probably be developed in the future. This is needed to address our ability to predict the outcome of introductions & possible non-target impacts.