# Appendix 3

## Advantages and Disadvantages of Different Genetic Resource Conservation Methods

| Method | Advantages | Disadvantages |
|---|---|---|
| **Evolutionary conservation** | | |
| | Allows evolution to take its course, ie, species to adapt to prevailing environmental conditions and other selection pressures and their change with time.<br>Applicable to species with orthodox and recalcitrant seeds, and to vegetatively propogated material. | Usually requires much space and resource demanding regulation and protection enforcement.<br>Reconcliation with immediate and basic human needs, eg, for agricultural land, often difficult. |
| *In situ* : Protected areas | Conserves genetic resources in their natural habitat, maintains interactions with other species and organisms;<br>Conservation of intra-specific variation can be combined with some degree of conservation of inter-specific variation | Large areas required;<br>Costs of conserving inter-specific variation in general prohibitive;<br>Resources prone to loss by accident, pests, diseases;<br>Potential conflicts between different conservation objectives |
| *In situ* : Managed stands | Conserves genetic resources in their natural habitat, maintains to some degree interactions with other species and organisms;<br>Conservation of intra-specific variation can be combined with conservation of inter-specific variation through a network of spatially separated areas, which also provide insurance against loss by accident, pests and diseases | Many small areas required;<br>Knowledge on management interventions needed to meet specified objectives |
| *Ex situ* : Living conservation stands | Conserves genetic resources in habitats of expected use, maintains to some degree interactions with other species and organisms;<br>Conservation of intra-population variation can be combined with conservation of inter-population variation through a network of spatially separated areas, which also provide insurance against loss by accident, pests and diseases | Many small areas required;<br>Spatial isolation to conserve population identity required;<br>Does not (necessarily) conserve associated species in the ecosystem;<br>Knowledge of management interventions (including establishment) needed to meet specified objectives;<br>Relatively expensive (generally not a preferred alternative for species without actual socio-economic value) |
| **Static Conservation** *(ex situ)* | | |
| | Maintain specific genetic combinations, generally requires less space and is relatively easy to control (less dependent on other land uses) | Often require special facilities and trained personnel and often involve risk of disease transmission;<br>Does not allow continuous adaptation to changes in the environment;<br>Does not conserve associated species in the ecosystem |

| | | |
|---|---|---|
| Seed banks | Propagules ready for use;<br>Relatively inexpensive; little space required (small seeds);<br>Intra- and inter-population can be conserved provided species range adequately sampled | Not applicable to species with recalcitrant seeds not to vegetatively propogated species;<br>Space required (large seeds);<br>Regular regeneration of seedlots may pose problems |
| Pollen banks | Minimum space required;<br>Applicable to species with orthodox and recalcitrant seeds and to vegetatively propogated material;<br>Intra- and inter-population variation can be conserved provided species range adequately sampled | Only half the genome conserved;<br>Tri-cellular pollen storage extremely difficult;<br>Needs female flowers for conventional propogation;<br>Propagules not readily available |
| Tissue culture banks | Minimum space required;<br>Genetic erosion reduced if methods such as cryopreservation are used;<br>Applicable to species with orthodox and recalcitrant seeds, and to vegetatively propogated material;<br>Intra- and inter-population variation can be conserved provided species range adequately sampled;<br>Aseptic conservation (minimises disease risk);<br>Time required to produce propagules for use is short | Sampling problems (representative individuals and within individual);<br>Protocols are species and at times geotype-specific;<br>Problems of somaclonal variation and early maturation |
| Clonal archives | Applicable to species with orthodox and recalcitrant seeds, and to vegetatively propogated material;<br>Intra- and inter-population variation can be conserved provided species range adequately sampled;<br>Useful method for unique phenotypes/genotypes (eg mutants, variants, sterile types);<br>Time required to produce propagules for use is short | Space required;<br>Resources prone to loss by accident, pests, diseases;<br>Relatively expensive (generally not a preferred alternative for genotypes without actual socio-economic value) |
| Botanical gardens and arboreta | Applicable to species with orthodox and recalcitrant seeds, and to vegetatively propogated material;<br>Useful method for unique phenotypes/genotypes (eg mutants, variants, sterile types); | Space required;<br>Resources prone to loss by accident, pests, diseases;<br>Not apt for conservation of inter- and intra-population variation (requires a larger number of individuals than needed to conserve inter-species variation, which is usually the purpose of botanical gardens/arboreta) |

Source : Graudal, L, *et al*, 1997