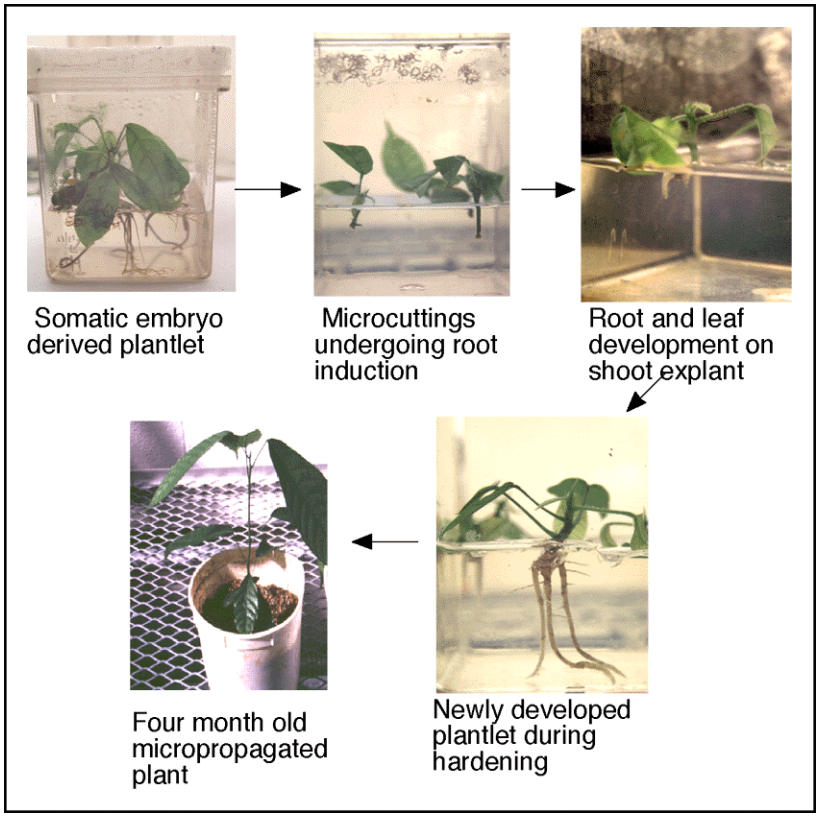
Propagation Systems Developed at PSU

We have developed four vegetative propagation methods that can be used in combination to achieve a large and rapid multiplication of cacao plants from single elite trees. These systems combine the advantages of *in vitro* tissue culture methods, with the simplicity and low costs associated with more traditional rooted cutting propagation. The systems include:

Somatic embryogenesis: A tissue culture based system starting from floral parts in which genetically identical embryos are formed. These embryos have the advantage of growing with the normal orthotropic-plagiotropic morphology of a seed grown cacao plant, unlike those made from cuttings or grafting of plagiotropic shoots. This growth form may have important advantageous over the plagiotropic plants in terms of normal tap root structure/function and lower pruning costs due to natural jourquette formation. We have begun field-testing of such plants in Saint Lucia and in Brazil.

Secondary embryogenesis: A process by which single somatic embryos can form multiple secondary embryos, each identical to the first. This was achieved by re-culturing explants from primary somatic embryos on induction media and secondary embryos are formed (Maximova et al., 2000). This procedure has an import scale up potential and provides a continuous source of embryos without the need to return to floral explants. It was estimated (using Scavina 6 genotype) that it is theoretically possible to produce over 4,000 secondary embryo derived plants from a single flower in approximately one year



Micropropagation: As somatic embryos are converted into plants, the small plantlets, still in tissue culture can be cut into portions each of which can form trees with normal growth morphology. This is a low cost and rapid scale up step.

Macropropagation: In the field, perhaps even in farmers hands, small plants can be induced to form orthotropic shoots, which can be excised and rooted, forming genetically identical plants. This is a very low cost method with a

potential very high multiplication rate. We have developed a low cost misting system, which will make this method easily transferable to the field.

Integrated propagation system

Together, these methods can provide a mean for rapid propagation of elite trees vegetatively from a limited starting material, and in a manner which produces trees with normal architecture. We believe that this system can have an important impact on farmers, providing inexpensive planting materials of high genetic potential. The tissue culture part of the system could be implemented in a University or government lab, and the macropropagation system can be distributed throughout the growing regions in small nurseries. Currently we have started the transfer of this technology to growing regions, and the development of such nursery facilities and demonstration plots. Field testing of such plants is essential to completely validate the growth vigor and yield potential of plants produced by these methods. This will be done in side by side plots, with plants produced by other methods of propagation.

In November of 2000 small field test was established in St Lucia. Additionally, some of the first somatic embryo-derived plants transferred to Saint Lucia are now approaching 3 years of age, and appear to be quite healthy, have branched, flowered and have set fruit. Shown above is one such plant in St. Lucia at 1 1/2 years of age.