REGISTRATION OF CLONES AND CERTIFICATION OF CLONAL PLANTING STOCK

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Introduction

Vegetatively propagated clonal planting stock is uniform and true to type with all the desirable qualities of the genotype i.e. clone/cultivar. However, all good phenotypes are not necessarily good genotypes. Genetically superior clones are selected on the basis of their outstanding performance in multi-location replicated field trials. The best performing clones with superior genetic qualities are selected for large-scale multiplication and supply of improved clonal planting stock for farm forestry plantations and reforestation projects. The entire process needs meticulous planning, long-term scientific research and extremely careful selection of genetically superior and well-adapted clones. All commercial scale clonal plantation programmes must be supported with long term breeding programme and meticulous research on supportive subjects and development strategies.

Genetically superior clones form very small or insignificant percentage of a very large number of clones of each important tree species, which need to be tested in field for many years before release for commercial plantations. It takes many years of dedicated hard work and scientific research for development and deployment of really outstanding and genetically superior clones leading to vast improvement of productivity, quality of produce and profitability of plantations.

As different clones of each particular tree species are based on selections from within the same species, it is not possible to identify any specific clone on visual inspection, unless the identity of each clonal sapling is already known based on meticulous records. Genetic purity of each clone must always be ensured and exact identity needs to be meticulously maintained. The developmental costs for production of clonal planting stock of selected genetically superior clones are very high in comparison to simple vegetative propagation of untested plants of questionable genetic qualities. Likewise cost of clonal planting stock is many times higher than the cost of normal seedlings of the same species. Therefore Government must take requisite steps to safeguard the genuine interest of growers of clonal plantations. Registration of genetically superior commercial clones and certification of clonal planting stock of Poplars and *Eucalyptus* should be the first important positive step in this direction.

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Development of superior clones

Clonal technology primarily envisages taking advantage of the natural variation in tree species for immediate gains in productivity and quality of produce of new plantations. Important steps for tree improvement through vegetative propagation and cloning techniques involve selection of Candidate Plus Trees (CPTs) based on desirable phenotypic features from existing plantations or natural forests; cloning of the CPTs through rooting of juvenile cuttings under controlled environment and field testing of the clones for selection of genetically superior, fast growing and disease resistant clones. The clonal planting stock, based on such selected superior clones, captures desirable natural variation, resulting in substantial improvement in productivity and quality of wood of future plantations. One of the most significant and extremely useful advantages of cloning is to capture genetic superiority of control pollinated hybrid seedlings for development and deployment of hybrid clones. Large-scale usage of high yielding, disease resistant, fast growing and locality specific clonal planting stock can increase productivity of plantations, quality of produce and profitability substantially.

Clonal technology has opened vast possibilities and new vistas for sustainable improvements in land productivity, yields and economic returns from plantations based on genetically superior, disease resistant clonal planting stock. Vegetative propagation techniques are now being used for production of clonal planting stock of many important coniferous and hardwood species, and the pace needs to be accelerated.

Clonal option for species amenable to cost effective vegetative propagation, with due safeguards, offers fastest gains in short time. Combination of cloning and long term breeding strategies provides immediate benefits, requisite genetic diversity and rich long-term gains. Even comparatively high production cost of clonal planting stock, which is often one of the constraints to faster spread of clonal plantations, has been amply justified by tremendous gains in yields and improvement of wood quality in most cases.

Substantial gains in productivity have been achieved through applications of vegetative propagation techniques in number of species like *Eucalyptus*, Poplars, *Gmelina, Acacia mangium, Triplochiton*, etc. Best known example is *Eucalyptus* in Brazil where average productivity of clonal plantations ranges between 45-75 m^3/ha/yr depending upon site qualities. Mean annual increment up to 100 m^3/ha/yr has been achieved with some of the outstanding clones on best sites (Lal, 1992, 1993).

Clones of Poplars

It took many years of dedicated research and development by Uttar Pradesh Forest Department, Forest Research Institute, Dehra Dun and WIMCO Limited before large-scale commercial plantations of poplars (*Populus deltoides*) in U.P., Punjab and Haryana became a unique success story (Jones and Lal, 1989).

Most of the clones of different species of poplars introduced in the initial trials, during the 1960s in Tarai areas of Nainital District, were found to be unsuccessful. However, one clone - IC of *Populus deltoides* showed good promise for commercial

plantations. Later, four clones were introduced out of selections made in Grafton in Australia. Two of these clones, G3 and G48 of *Populus deltoides* performed substantially better than clone IC. These two clones have been the basis of large scale commercial farm forestry plantations in Punjab, Haryana and Uttar Pradesh. Later, some of the clones introduced from Stoneville, USA, and local selections by State Forest Department at Lalkaun and WIMCO Seedlings Limited, Rudrapur (Uttaranchal), were included in the Poplar plantations programmes (Lal, 1991).

Clones of *Eucalyptus*

Development and large-scale deployment of high yielding and disease resistant 'Bhadrachalam' clones of *Eucalyptus* has been pioneered in India by ITC Bhadrachalam Paperboards Limited (Lal, 1999). Starting with selection and cloning of 64 candidate plus trees during 1989, 514 CPTs of *Eucalyptus* have been cloned and evaluated upto November 1999. Out of these clones, 86 clones have been shortlisted based on their superior growth rates and desirable genetic qualities. The productivity of these shortlisted clones under rainfed conditions in Andhra Pradesh ranges between 12-44 m^3/ha/yr. In certain clonal trials the productivity of best clones has been more than ten times productivity of seedling control treatment or the worst performing clones. Accordingly, only the very best clones are selected for large-scale commercial multiplication for supply of clonal planting stock for farm forestry plantations and reforestation projects. However, with a view to ensuring a wide genetic based for the clonal plantations the number of such commercial clones should be fairly large preferably around twenty but not less than ten (Lal *et al.*, 1997).

Supply of Clonal Planting Stock

During the early stages of commercial Poplar plantations in North India, only Uttar Pradesh Forest Department and WIMCO Seedlings Ltd., supplied most of the clonal planting stock required for Poplar plantations. Later, Haryana and Punjab Forest Departments also supplemented the supplies. Estimated present demand for one year old nursery plants of good Poplar clones may be between 12-15 million Entire Transplants valued at Rs. 180-225 million per year. Currently, apart from WIMCO Seedlings Ltd., Sai Biotech, New Delhi and Nuchem Limited, Chandigarh, are major players in the organized sector for marketing of clonal planting stock of poplars to the farmers. However, there are large number of individuals and farmers who raise Poplar nurseries and supply one year old nursery plants for farm forestry plantations. Many new entrants in this business do not have the requisite technical background and experience for ensuring genetic purity of the clones and raising of true-to-type, healthy and vigorous clonal saplings. In certain cases, branch cuttings are taken, even from mature growing plantations for raising of Poplar nurseries, unmindful of the exact identity of the clone and impact of the adult phase of the branch cuttings on future growth of nursery saplings raised from old branches.

The original and pioneering research work of the development and deployment of field tested, genetically superior 'Bhadrachalam' clones of *Eucalyptus* has been carried out by ITC Bhadrachalam Paperboards Limited. This company and Andhra Pradesh Forest Development Corporation currently produce nearly 6 million saplings of genetically superior 'Bhadrachalam' clones of *Eucalyptus*

annually valued at Rs. 48 million. But some parties are already offering planting stock of so-called super clones of *Eucalyptus*. Because of high cost of clonal planting stock and inherent difficulties in exact identification of specific clones at field level, unscrupulous players may sell spurious planting stock to the unsuspecting farmers/ other clients.

Certification of Clonal Planting Stock

Many farmers, who may buy clonal planting stock of questionable origin and genetic qualities albeit at slightly lower costs, will have to pay heavy price on account of poor growth, low productivity and inferior quality of produce because of spurious clonal planting stock.

Spurious clonal planting stock does not only mean loss of money invested on purchase of clonal planting stock, but farmers and other clients raising clonal plantations will suffer huge financial losses because of poor productivity and quality of produce from the spurious clonal planting stock passed on to the growers by unethical and unscrupulous players. Poor genetic quality of unregistered clones and spurious clonal planting stock will bring this revolutionary technology to disrepute with disastrous financial consequences for the farmers. Such adverse developments will have serious impact on the confidence of the farmers and credibility of suppliers of clonal planting stock. This will hamper the spread of clonal plantations limiting the benefits from this wonderful clonal technology for the country.

Because of these most important reasons amongst others, it is absolutely necessary that Government of India must take immediate measures for registration of genetically superior clones developed by Forest Departments, Forest Research Institutes and the Private Sector Companies. Likewise, it is extremely important and absolutely necessary that appropriate legal mechanism for registration of nurseries, certification of gene banks and clonal planting stock by independent, competent and approved certifying agencies is established soonest possible. Ministry of Environment and Forests, Government of India, should take immediate steps for getting suitable legislation enacted by the Parliament. Later, that can be adopted by concerned State Governments for mandatory registration of genetically superior clones and certification of clonal planting stock of registered clones. Government should also fund a project for DNA fingerprinting of all registered commercial clones of poplars and *Eucalyptus*. These steps are also necessary to safeguard against the serious possibilities of admixture of various clones in the absence of scientific approach, which will lead to degeneration of clonal planting stock.

Registration of genetically superior clones and certification of clonal planting stock are in best interests of entire country including farmers, researchers, Forest Development Corporations/Forest Departments and user wood based industries. Unless these urgent measures are taken without loss of further time, unscrupulous players can dupe the farmers and even the State Forest Departments/ Forest Development Corporations by supplying spurious planting stock in the garb of well-known genetically superior clones developed through years of painstaking research. Therefore, Ministry of Environment and Forests should act fast for ensuring mandatory registration of clones and certification of clonal planting stock produced by registered nurseries.

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SUMMARY

Genetically improved, true-to-type and uniform clonal planting stock, of field tested clones adaptable to specific sites, has revolutionized productivity of plantations of Poplars and *Eucalyptus* with major improvements in quality of produce and profitability. Current demand for clonal planting stock of poplars in Punjab, Haryana and Uttar Pradesh is around 15 million plants per year. Demand for 'Bhadrachalam, clones of *Eucalyptus* is growing rapidly in Andhra Pradesh and current demand for farm forestry plantations is 2.5 million saplings annually. Maintenance of genetic purity, health and vigour of clones and matching of adaptable clones to specific planting sites require high technical skills and experience. Therefore, it is absolutely essential that Central and State governments should take appropriate steps immediately for registration of genetically improved clones, clonal nurseries and certification of genuine clonal planting stock so that interests of the growers can be safeguarded against possible supplies of spurious plants in lieu of improved clones. This paper covers these and related issues.

कृन्तकों का पंजीयन तथा कृन्तकीय रोपण-सामग्री का प्रमाणीकरण

प्यारे लाल

साराशं

आनुवंशिकत: परिष्कृत, प्ररूपत: सही और एक समान कृन्तकीय रोपण-सामग्री, विशिष्ट स्थलों के लिए अनुकूलनसम क्षेत्र परीक्षित कृन्तकों ने, जिनमें उत्पाद की गुणवत्ता और लाभप्रदता में मुख्य सुधार लाए जा चुके हों, पोपलर और युकेलिप्टसों के रोपवनों की उत्पादकता में क्रान्ति लादी है । पंजाब, हरियाणा और उत्तर प्रदेश में कृन्तकीय रोपण-सामग्री की वर्तमान मांग 150 लाख पौधे वार्षिक के आस-पास है । युकेलिप्टस के भद्राचलम कृन्तकों की मांग भी आन्ध्र प्रदेश में तेजी से बढ़ती जा रही है और प्रक्षेत्र वानिकी रोपवनों के लिए इसकी मांग 25 लाख पौधे वार्षिक है । कृन्तकों की आनुवंशिक शुद्धता, स्वस्थता और ओजस्विता बनाए रखने और विशिष्ट स्थलों के लिए ठीक रहने वाले कृन्तकों का मिलान करने के लिए उच्च प्राविधिक कौशल और अनुभव की जरूरत होती है । अत: यह परम अनिवार्य है कि केन्द्रीय और राज्य सरकारें आनुवंशिकत: परिष्कृत कृन्तकों, कृन्तकीय रोपणियों के पंजीयन और सही-सही कृन्तकीय रोपण-सामग्री के प्रमाणीकरण के लिए तुरन्त उपयुक्त कदम उठाएं ताकि परिष्कृत कृन्तकों के बदले घटिया किस्म के संभावित पौधे सप्लाई कर दिए जाने के प्रति उत्पादनकर्ताओं के हितों को सुरक्षित किया जा सके । प्रस्तुत अभिपत्र में इन्हीं और इनसे संबन्धित समस्याओं को विचारार्थ लिया गया है ।

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