PRIVATE SECTOR FORESTRY RESEARCH - A SUCCESS STORY FROM INDIA

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Introduction

Almost the entire 76 million ha recorded forest area is owned and managed by the State Governments in India. Unfortunately, the forests are under intense biotic pressures leading to degradation of forest resources and 31 million ha of forest area has less than 40% crown cover density (Anon., 1996). This is a great paradox and tragedy of immense proportions for an overpopulated country. And yet, forest-based industries or corporate sector are denied any role in the reforestation of degraded forest lands.

There are statutory ceilings limiting the agricultural land holdings both for individual farmers and corporate sector to extremely low levels in all States, e.g. upto 54 acres of worst category of land in Andhra Pradesh (Reddy and Reddy, 1995). It is therefore not possible for any wood-based industrial unit or private sector company to own adequate land for raising intensively managed technology-based captive plantations.

The Government funds forestry research by the State Forest Departments and various Forest Research Institutes under the Indian Council of Forestry Research and Education (ICFRE). Legislation for *sui generis* protection for breeder's rights is still pending, and there is no mechanism for certification of seed of forestry species or registration of clones. Research in agroforestry is also carried out by the universities and Indian Council for Agricultural Research (ICAR). There is no wonder, therefore, that there is very little incentive for private sector investments in forestry research.

A very limited number of Non-Governmental Organisations, certain research institutes supported with donations like Tata Energy Research Institute (TERI), New Delhi, are engaged in research in limited areas related to forestry. Some integrated pulp and paper mills, of late have started promoting farm forestry plantations with limited research and extension support. The only major exceptions of significant forestry research and promotion of technology based plantations by the private sector being applied research in case of Poplars by Wimco Seedlings Ltd. and clonal technology research and technology based plantations of *Eucalyptus* and *Casuarina* by ITC Bhadrachalam Paperboards Limited (ITC Bhadrachalam) (Nair *et al.*, 1996).

This paper discusses the success story of development and commercial scale deployment of high yielding, fast growing and disease resistant clones of *Eucalyptus* and *Casuarina*, and the promotion of technology based clonal plantations through

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the pioneering efforts of ITC Bhadrachalam.

Farm Forestry Plantations

An integrated pulp and paper mill with 40,000 tonnes/year capacity was established by ITC Bhadrachalam, at Sarapaka, near the temple town of Bhadrachalam in a remote tribal belt of Khammam District of Andhra Pradesh State during 1979. The mill at present has a capacity of 65,700 tonnes pulp and 210,000 tonnes high quality paperboards and paper annually. For pulp production, 40,000 tonnes bamboo from Government owned forests and 124,000 tonnes hardwoods (bone dry weight) primarily from the farm forestry plantations, are procured annually. Company has been very keen to invest in captive industrial plantations for ensuring future supplies of high quality pulpwood in a cost effective and sustainable basis (Anon., 1997). However, because of statutory ceilings on the agricultural land holdings and retrograde Government policy not to involve industries in reforestation of degraded forest lands owned by the Government, it has not been possible to develop captive industrial plantations.

The visionary management of the company, therefore, opted for the only alternative to promote farm forestry plantations on marginal agricultural lands by providing high quality seedlings, technical extension services and buy-back guarantees at remunerative prices to farmers. 6,185 farmers in 1,138 villages were assisted to promote 7,441 ha of *Eucalyptus* plantations with 17.4 million seedlings during 1987-1995. Unfortunately, genetically improved planting stock of short rotation pulpwood species like *Eucalyptus, Leucaena* and *Casuarina*, popular with the farmers, was not available. Therefore, the productivity and profitability of seed route plantations has been very low ranging between 6-10 m^3/ha/yr (Lal, 1993; 1995).

Clonal Technology : Research & Development

With a view to improving the productivity and profitability of plantations and making farm forestry an attractive land use option, the company has been implementing a major research and development project since 1989 with main thrust on genetic improvement of planting stock and improvement of package of practices. Major gains in productivity of *Eucalyptus* have been achieved in a short time span through applications of vegetative propagation and cloning techniques with gainful exploitation of existing useful variation and development/deployment of locality specific, high yielding, fast growing and disease resistant clones (Lal *et al.*, 1993; 1994).

Methodology adopted has been selection of candidate plus trees with most desirable qualities and cloning of the Candidate Plus Trees (CPTs) through rooting of juvenile coppice shoots under controlled environment in the green houses. Evaluation of comparative genetic superiority of clones is carried out through replicated field trials. Genotype x environmental interaction studies are taken up to identify a group of superior clones most adaptable to specific sites and soil types. Commercial scale multiplication and field planting of selected genetically superior clones follows this.

Starting with cloning of 64 CPTs of *Eucalyptus tereticornis* and Mysore Gum during 1989, more than 500 CPTs have been cloned so far. Progeny of all clones has

been planted in the gene banks as well as replicated field trials for evaluation. 49 clonal testing areas covering 16 ha, 6 clonal demonstration plots covering 14 ha, 2 clonal seed orchards covering 1 ha and extensive gene banks covering 17 ha have been planted.

Based on the performance of individual clones in the field trials, 72 promising, fast growing and disease resistant clones have been identified. These clones are known as 'Bhadrachalam' clones with productivity ranging between 12-44 m^3/ha/yr under rainfed conditions compared to 6-10 m^3/ha/yr productivity of normal seed route plantations. Further, research work for identification of still better clones is continuing.

Current Research & Development Focus

Vegetative propagation and cloning techniques exploit full productivity potential of superior genotypes. However, no further enhancement of productivity or improvement of genetic qualities of selected clones is possible. In order to develop still better clones than the best available presently and for widening the genetic base of clonal plantations, following research and development priorities have been identified and the same are under implementation:

* Selection of additional candidate plus trees for cloning and field evaluation continues as a regular feature of the strategy for development and deployment of new clones.

* Field testing and selection of highly productive site specific clones for refractory sites including saline and alkaline soils through genotype x environment interaction studies is a high priority research focus. 'Bhadrachalam' clones 1, 71, 130, 272, 404, 405 and 406 have already demonstrated good tolerance to calcareous/alkaline soils with fairly high productivity.

* Development of intra-specific hybrids through control pollination between best 'Bhadrachalam' clones of *E. tereticornis* and inter-specific hybrids of these clones crossed with *E. urophylla* and *E. torelliana*. F1 hybrids showing good heterosis will be cloned.

* Development of clonal seed orchards for production of improved genetically superior seed for future seed route plantations.

* Further improvement of technical package of practices for field plantations and clonal nurseries.

Several intra-specific hybrids have been developed through controlled pollination between selected best 'Bhadrachalam' clones of *E. tereticornis*. Hybrid progeny is under evaluation and many hybrids are showing extremely good promise at one-year age. Development of inter-specific hybrids between *E. tereticornis* and *E. urophylla* / *E. torelliana* is progressing well (Lal *et al.*, 1996; 1997).

Encouraged with the unique success story of 'Bhadrachalam' clones of *Eucalyptus*; similar research work for development and deployment of genetically superior clones of *Casuarina* has been making rapid progress since 1994. 129 CPTs of *Casuarina* have been successfully cloned

and gene banks have been established. Field trials are in progress for evaluation of comparative genetic superiority of these clones, with a view of selecting locality specific, disease resistant clones with high productivity (Lal *et al.*, 1996 a).

Improved Package of Practices

Thrust areas in respect of improvement of package of practices have been thorough preparation of site through deep ploughing, effective preventive and control measures against termites during the critical establishment stage after transplanting, cultural practices including timely weeding and soil working, protection against damage by insect pests and cattle, maintenance of soil fertility through raising leguminous crops in between the 3m wide planting rows for green manuring and application of fertilizers to supplement deficient plant nutrients.

Improvement of Nursery Practices

The entire clonal planting stock of *Eucalyptus* and *Casuarina* is being raised in modern root trainer nurseries using vermiculite as the growing medium. Improved package of practices for ensuring best possible results in respect of rooting of cuttings in the green house under controlled environment and subsequent maintenance and nursing of plants in the shade houses and open nurseries have been standardised through intensive research. Schedules for fertiliser and micronutrients applications have been refined and perfected for large-scale commercial production of clonal planting stock. Prophylactic and control measures against common leaf spot disease of eucalyptus at nursery stage have been identified e.g. Bavistin has been found to be most effective to control *Cylindrocladium* and Dithane M-45 as well as Blitox are quite effective against *Alternaria* leaf blight.

Plantations Department - Organisation

The Plantations Department of the Company headed by the Vice President - Plantations has complete freedom to decide research priorities, technical issues and implement research and clonal production/ marketing plans subject to the approval of financial expenses by the Managing Director. Vice President (Plantations) is assisted by Deputy Chief Manager (Plantations Research & Clonal Plant Production), supported by eight managers. Likewise, Deputy Chief Manager (Plantations) supported by eleven managers assist the Vice President (Plantations) in respect of farm forestry extension, promotion of technology based plantations and marketing of clonal planting stock. Four junior managers provide secretarial and office support services.

Extremely well defined research objectives, competent and committed scientific personnel, continuity of research plans and personnel, adequate delegation with accountability and wholehearted support at the topmost level of the Company have been key factors leading to emergence of ITC Bhadrachalam as respected pioneers in the field of clonal technology and technology based plantations in India. The Company's efforts have been recognised with technical consultancy assignment of World Bank aided Forestry Development Project in Maharashtra State and three prestigious awards :

* Rajiv Gandhi Parti Bhoomi Mitra Award - 1994-96, by Minister of Rural Areas & Employment, Government of India.

* The Vantech Industry Rolling Trophy for R&D - 1995, Award by CII, Southern Region.

* FAPCCI Award for "The Best Technological Development in R&D for 1991-92".

Application and Transfer of Research Findings

Planting stock of selected 'Bhadrachalam' clones has been supplied to Forest Development Corporations/Forest Departments of various States and Forest Research Institutes to enable them plant clonal seed orchards and maintain their own gene banks for future multiplication of these clones. Andhra Pradesh Forest Development Corporation (APFDC) is implementing a World Bank funded Industrial Plantations Project to plant 17,500 ha degraded forest lands with 'Bhadrachalam' clones of *Eucalyptus*.

Clonal planting stock of 'Bhadrachalam' clones of *Eucalyptus* has been supplied to Forest Departments/Forest Development Corporations of Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Madhya Pradesh, Orissa, West Bengal and Haryana. Likewise, 'Bhadrachalam' clones have been supplied to Institute of Forest Genetics and Tree Breeding, Coimbatore, Kerala Forest Research Institute, Peechi and many wood based industrial units.

Clonal saplings of 11 best clones with productivity of 20-44 m^3/ha/yr under rainfed conditions are being supplied to farmers for raising clonal farm forestry plantations with technical extension services and buy-back guarantees provided by the Company. Two Clonal Demonstration Plantations (CDPs) were established during August 1991 based on five short listed clones with outstanding performance in CTA I at two years age. Additional CDPs have been established in three districts of Andhra Pradesh covering 15 ha area.

Clonal planting stock of the most promising 'Bhadrachalam' clones was released to farmers on selective basis from 1992 onwards. As seeing is believing for the farmers, these demonstration plantations and successful extension campaigns by the field staff of ITC Bhadrachalam have been instrumental in large-scale acceptance and vast popularity of 'Bhadrachalam' clones (Lal *et al.*, 1997).

Between 1992-95, 0.78 million clonal saplings were supplied. Supply of clonal plants exceeded one million saplings during 1996. 1.3 million clonal saplings were supplied during 1997 and supplies during the current year 1998-99 will be around 2 million saplings. A uniform selling price has been charged from all clients including the farmers, Forest Departments and Forest Development Corporations for supply of clonal planting stock. Selling price was Rs. 7/- per sapling ex Clonal Plant Production Centre at Bhadrachalam for the years 1996 to 1998. Total area planted with 'Bhadrachalam' clones of *Eucalyptus* upto 1998 will be more than 3,000 ha involving nearly 2,000 farmers.

Findings of the clonal technology research and experiences gained in the promotion of technology based plantations have been published by the company's scientists in the form of research papers in the *Indian Forester*, and papers presented in various national level and international seminars/conferences. (Lal, 1991; 1992; 1993; 1994; 1995; 1996; Lal *et al.*, 1992;

1993; 1993a; 1994; 1996; 1997). Printed copies of the improved package of practices for clonal plantations have also been supplied to the Forest Departments and farmers raising clonal plantations.

Even growing demand for planting stock of 'Bhadrachalam' clones is a testimony of their popularity and genetic superiority. Visionary approach and pioneering achievements of the company in clonal technology research and promotion of large-scale clonal plantations have been well recognised.

Funding of Research and Extension Costs

The entire clonal technology research and farm forestry extension programmes are funded internally by the Company. The sale proceeds of clonal planting stock at the current level meet only part of the production, research and development, staff and administration, depreciation and the interest costs. Yet, the company continues to support this activity which is vital for securing future pulpwood supplies.

During the period 1986-87 to 1997-98, ITC Bhadrachalam spent Rs. 3.19 crores, on promotion of farm forestry plantations and providing technical extension services. Likewise, during the period 1989-90 to 1997-98 the company spent Rs. 2.88 crores towards operating expenses and administration costs in respect of clonal technology research/development and production of clonal planting stock. Capital expenditure incurred during the period 1989-90 to 1997-98, mainly for establishment of green houses, shade houses, modern root trainer nurseries, lab equipment and vehicles, etc., has been Rs. 1.50 crores. A sum of Rs. 2.36 crores has been recovered towards sale proceeds of seedlings and clonal planting stock upto 1997-98.

However, the company now wants the Plantation Department to be self-reliant and self-supporting for funding future expenses. As the demand for clonal planting stock is growing very fast and production capacity has been expanded to 2.3 million clonal saplings per year during 1997-98, Research & Development expenses and fixed overhead costs will be spread over larger volumes. Plantations Department hopes to be self-sufficient in funds through sale proceeds of clonal planting stock within 1-2 years and simultaneously achieving the primary objective of securing future pulpwood supplies through clonal farm forestry plantations.

Co-ordination of Research and Linkages

After the visit of top executives of ITC Bhadrachalam to Aracruz in Brazil during 1987, the company solicited transfer of technology and consultancy services from Aracruz Florestal, S.A. and some renowned international consultants. However, the arrangements could not be finalised because of the exorbitant price tag, which ITC Bhadrachalam just could not afford. Therefore, it was resolved to be self-reliant and make earnest efforts to succeed through in-house efforts. A separate Plantations Department was created and Vice President (Plantations) with supporting research and extension managers were recruited during 1989.

Collaborative arrangements initially for two years were finalised with Tata Energy Research Institute (TERI), which were extended for another four years term.

It was a learning process for both the organisations. The vast experience of Shri A.N. Chaturvedi, a retired and well-known forester and Shri Sujan Singh, Plant Pathologist of TERI, were of immense help. Initial selection of candidate plus trees was carried out jointly by ITC Bhadrachalam scientists and Shri A.N. Chaturvedi. Shri Sujan Singh provided very useful help in identification of fungal pathogens and finding appropriate preventive and control measures against the same at the green house and open nursery stages, as well as field plantations. A lump sum consultation fee of Rs. 10.5 lacs was paid to TERI for the first two years period and thereafter, annual payment @ Rs. 2 lacs plus actual travel, boarding and lodging costs for the field visits. Even now, need based assistance in the areas like plant pathology, entomology and soil science, etc. is sought from scientists of Agricultural Universities and Forest Research Institutes. Mutually beneficial collaboration for research with other institutes/organisations is most welcome.

The pioneering and pain-staking efforts of ITC Bhadrachalam for the development and deployment of genetically superior clones of *Eucalyptus* would not have been successful, but for the generous help provided by APFDC and the farmers of Andhra Pradesh who permitted the company scientists to select CPTs for cloning from their seed route *Eucalyptus* plantations. As ITC Bhadrachalam did not have any breeding populations or extensive seed route *Eucalyptus* plantations, CPTs selected from APFDC and farmer's plantations contributed to the vital foundations of company's clonal technology research and development programme. Later some clones were also received on exchange basis from Institute of Forest Genetics & Tree Breeding and from Wimco Seedlings Limited, Rudrapur, Uttar Pradesh for trials in Andhra Pradesh. Unfortunately, none of the clones received from these two sources performed well to qualify to be short listed as promising clones suitable for large-scale commercial multiplication.

There are great merits in collaborative research because of tremendous savings in costs through minimising duplication of equipment, manpower and expenses on repetitive research. Likewise, there is great benefit from saving of valuable time and developmental costs by arranging transfer of technology already developed, which may suit the requirements of other interested clients. For example, ITC Bhadrachalam is keen to collaborate with any reputed research laboratory for collaborative research in respect of molecular marker techniques and DNA finger printing of 'Bhadrachalam' clones, with a view to developing suitable techniques for early identification of future promising and genetically superior clones. Company is in touch with Centre for Cellular & Molecular Biology, Secunderabad, Andhra Pradesh, for developing DNA finger printing protocols for *Eucalyptus*.

ITC Bhadrachalam has also recently finalised arrangements with Mysore Paper Mills Limited for collaboration regarding domestication of CPTs from extensive *E. camaldulensis* plantations of the latter for cloning and field evaluation. It will be extremely useful if all State Forest Departments having large scale *Eucalyptus* and *Casuarina* plantations could join hands to select CPTs for cloning and planting of multi-locational trials in all the States for simultaneous field evaluation of clones. Simultaneously, short listed 'Bhadrachalam' clones and all new clones to

be developed as above, can be planted on problematic sites like saline/alkaline and other refractory sites to study genotype x environmental interaction for selecting promising future clones most adapted to each specific site in various States promoting *Eucalyptus* plantations.

ITC Bhadrachalam has also announced a policy decision about their willingness to supply genetically improved clonal planting stock of all 'Bhadrachalam' clones to any wood-based industrial unit in the country, all State Forest Departments and research institutes.

The company is also willing to provide technical consultancy services for transfer of clonal technology to any organisation in the public or private sector on mutually agreed basis. In fact, ITC Bhadrachalam is already providing technical support as local consultants to Forest Development Corporation of Maharashtra in respect of upgrading of root trainer nurseries and clonal technology under World Bank aided Forestry Development Project.

ITC Bhadrachalam has also submitted a proposal to Indian Paper Makers Association (IPMA) regarding setting up of a National-level Clonal Technology Research Institute for genetic improvement of pulpwood species. The Federation of Indian Plywood & Panel Industry and Associations of other wood-based industries may join IPMA for establishing, funding and managing the proposed National-level Research Institute. Such a research institute shall focus research and development thrust on major issues of highest priority to the member industries. Pooling of financial and human resources as well as equipment through the proposed institute will make the research cost effective, and results will be available for commercial use by all member industries. Association Foret Cellulose (AFOCEL) in France is a very successful example worth emulation by forest based industries in India.

ITC Bhadrachalam is keen to develop linkages for mutual co-operation with other research institutes and the company is a member of APAFRI and IUFRO. Unfortunately, there is reluctance and also administrative and procedural hindrances for developing meaningful collaborative research programmes between the private sector and public funded research institutes of ICFRE and ICAR. These constraints must be removed in the best national interests. Forestry research in government sector institutions suffers from lack of focus, thrust, absence of prioritisation, too frequent changes in the personnel and research priorities, lack of accountability and procedural/bureaucratic delays. Private sector has been successfully able to address most of these negative bottlenecks and achieve extremely successful results in a short time span with minimum costs. However, lack of availability of sophisticated equipment, inadequate genetic resources, absence of breeding populations, non-availability of land for field trials, limited staff and shoe-string budgets for research and development and publicity for promoting sale of clonal planting stock are some of the major constraints under which ITC Bhadrachalam had to operate. But for these constraints, the achievements would have been far more commendable and faster.

Contribution of Clonal Technology Research

Extremely fast growing, high yielding

and disease resistant clones of *Eucalyptus* have been developed for the first time in India by ITC-Bhadrachalam. Productivity of 'Bhadrachalam' clones of *Eucalyptus* is 2-3 times higher compared to normal seed route plantations. Clonal *Eucalyptus* plantations in India promoted by ITC Bhadrachalam are the first successful example of commercial scale clonal plantations of any forestry species traditionally propagated through seedlings. More than 2,000 farmers and a large number of Forest Departments/Forest Development Corporations in many states have already planted these clones.

Clonal Plantations covering 1.25 million ha or 33% of the degraded forest areas in Andhra Pradesh alone can yield 25 million tonnes of pulpwood annually, sufficient for meeting our country's entire pulp and paper requirements projected at 8.5 million tonnes by 2010-11, based on 70% wood fibres furnish. Likewise, high yielding short rotation clonal plantations can meet country's firewood requirements thereby minimising biotic pressures on remaining natural forests and conserve their rich bio-diversity.

ITC-Bhadrachalam will be able to release genetically improved clones of *Casuarina* for commercial scale farm forestry and reforestation projects in the near future. Immense gains in productivity and improvement of quality of produce in a short time span are possible through applications of similar cloning techniques for many important indigenous species amenable to vegetative propagation e.g. *Tectona grandis, Gmelina arborea, Pinus roxburghii, Dalbergia sissoo, Anthocephalus chinensis* and *Dipterocarpus*, etc. (Lal, 1995; Pal, 1993). Unfortunately, forestry research organisations of the State Forest Departments and ICFRE institutions have not accorded richly deserved high research priority for development and large scale deployment of genetically improved clones of important indigenous species. No wonder, the country pays very high price for continuing large-scale use of un-improved seed for most tree species in the farm forestry and reforestation programmes.

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SUMMARY

Almost the entire 76 million ha recorded forest area is owned and managed by the State Governments in India. The Government funds forestry research by the State Forest Departments and various Forest Research Institutes under the Indian Council of Forestry Research and Education. Legislation for *sui generis* protection for breeder's rights is still pending, and there is no mechanism for certification of seed of forestry species or registration of clones. There is no wonder, therefore, that there is little incentive for private sector investments in forestry research. Despite many

constraints, ITC Bhadrachalam has been implementing a major research and development project since 1989 with a view to improving the productivity and profitability of plantations and making farm forestry an attractive land use option. Main R&D thrust has been on genetic improvement of planting stock and improvement of package of practices. Major gains in productivity of *Eucalyptus* have been achieved in a short time span through applications of vegetative propagation and cloning techniques with gainful exploitation of existing useful variation and development/deployment of locality specific, high yielding, fast growing and disease resistant clones. Starting with cloning of 64 CPTs of *Eucalyptus tereticornis* and Mysore Gum during 1989, more than 500 CPTs have been cloned so far. Based on the performance of individual clones in the field trials, 72 promising, fast growing and disease resistant clones have been identified. These clones are now well-known as 'Bhadrachalam' clones with productivity ranging between 12-44 m^3/ha/yr under rainfed conditions compared to 6-10 m^3/ha/yr productivity of normal seed route plantations. Further, research work for identification of still better clones is continuing. Several intra-specific hybrids have been developed through controlled pollination between selected best 'Bhadrachalam' clones of *E. tereticornis*. Hybrid progeny is under evaluation and many hybrids are showing extremely good promise at one-year age. Development of inter-specific hybrids between *E. tereticornis* and *E. urophylla/E. torelliana* is progressing well. Extremely well defined research objectives, competent and committed scientific personnel, continuity of research plans and personnel, adequate delegation with accountability and wholehearted support at the topmost level of the Company have been key factors leading to emergence of ITC Bhadrachalam as respected pioneers in the field of clonal technology and technology based plantations in India. The Company's efforts have been recognised with three prestigious awards and technical consultancy assignment for World Bank aided Forestry Development Project in Maharashtra State. The entire nation is now benefiting from these unique 'Bhadrachalam' clones.

निजी क्षेत्र में हो रहा वानिकी अनुसंधान - भारत में प्राप्त हुई सफलता की एक कथा

प्यारे लाल

सारांश

वन अभिलिखित किया लगभग समूचा 7 करोड़ 60 लाख हे० क्षेत्र भारत की राज्य सरकारों के आधिपत्य और प्रबन्ध में आता है। राज्य वन विभागों और विभिन्न वन अनुसंधान संस्थानों द्वारा किए जा रहे अनुसंधन के लिए धनराशि भी भारतीय वानिकी अनुसंधान व शिक्षा परिषद की अधीनता में सरकार द्वारा ही दी जाती है। प्रजननकर्ता के अधिकारों की सुरक्षा का विधि निर्माण भी अनन्यतः अभी लम्बित है और वानिकी जातियों के बीजों के प्रमाणीकरण अथवा कृन्तकों के पंजीकरण का अभी कोई कानून नहीं बना है। अतः इसमें आश्चर्य भी क्या कि अभी वानिकी अनुसंधान में निजी क्षेत्र द्वारा धन निवैंश का कोई उत्साह नहीं है। अनेक बाधाओं के होते हुए भी आईटीसी, भद्राचलम रोपवनों की उत्पादकता और लाभप्रदता सुधारने और कृषि वानिकी तथा भूमि उपयोग का आकर्षक विकल्प बनाने के लिए 1989 से एक बडी अनुसंधान और विकास परियोजना कियान्वित करता आ रहा है। इस अनुसंधान और विकास का प्रधान बल रोपण सामग्री के जाननिक सुधार और व्यवहार क्रियाओं में परिष्कार लाने पर रहा है। युकेलिप्टस की उत्पादकता बढ़ाने में मुख्य लाभ थोड़े समय के अन्दर ही वर्धी प्रवर्धन और कृन्तन प्रविधियाँ अपनाकर और उनके साथ उपलब्ध उपयोगी विभिन्नता को लाभप्रद ढंग से उपयोग में लाते हुए तथा स्थान विशिष्ट, उच्च प्राप्तिप्रद शीध्रवर्धी और रोगरोधी कृन्तक विकसित/उपयोजित करते हुए प्राप्त किया गया है। *युकेलिप्टस टेरेटिकार्निस* और मैसूर गम (*यु० ग्लोबुलुस*) के 64 सीपीटीओं से 1989 में आरम्भ करके अब तक 500 से अधिक सीपीटीओं के कृन्तक तैयार किए जा चूके हैं। क्षेत्र परीक्षणों में अलग–अलग कृन्तकों की क्रियाशीलता के आधार पर 72 उत्साहप्रद शीध्रवर्धी और रोगरोधी कृन्तक पहचाने गए हैं। अब ये कृन्तक "भद्राचलम कृन्तक" नाम से भलीभांति ज्ञात हैं जिनकी उत्पादकता वर्षा होने वाली दशाओं में 12-44 धमी०/हे०/वर्ष तक है जबकि इसकी तुलना में बीजों द्वारा उगाए सामान्य रोपवनों की उत्पादकता 6-10

धमी०/हे०/वर्ष ही है । इनसे भी श्रेष्ठतर कृन्तकों को पहचानने का अनुसंधान कार्य अभी चल रहा है। *यु० टेरेटिकार्निस* के चुने हुए सर्वोत्तम भद्राचलम कृन्तकों में नियन्त्रित परागण द्वारा इनसे भी श्रेष्ठतर कई अन्तरजाति संकर विकसित किए गए हैं। संकर संतति का मूल्यांकन चल रहा है और बहुत से संकर एक वर्ष की उम्र पर अत्यधिक उत्साही दिखाई पड़ रहे हैं। *यु० टेरेटिकार्निस* और *यु० उरोफायला/यु० टोरेल्लियाना* से अन्तरजातीय संकर विकसित करने का कार्य भी प्रगति पर है। अत्यधिक सुपरिभाषित अनुसंधान लक्ष्य, सुयोग्य और समर्पित वैज्ञानिक कर्मचारी, अनुसंधान योजनाओं और कर्मियों की निरन्तरता, उत्तरदायित्व के साथ समुचित अधिकार मिलना तथा कम्पनी के सर्वोच्च स्तरों की पूरे मन से सहायता, वे महत्वपूर्ण कारक रहे है जिनसे आईटीसी भद्राचलम भारत में कृन्तकीय प्रौद्यैगिकी और प्रौद्यैगिकी आधारित रापवनों के क्षेत्र में सम्मानित अग्रगामियों के रूप में उदित हुई है । इस कम्पनी द्वारा किए गए प्रयत्नों को तीन सम्मान्य पुरस्कारों तथा महाराष्ट्र राज्य में विश्व बैंक सहायित वानिकी विकास परियोजना में प्राविधिक परामर्श कार्य सौंपे जाने की मान्यता मिल चुकी है । इन विलक्षण भद्राचलम कृन्तकों का लाभ अब पूरा राष्ट्र उठा रहा है।

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