

## Curriculum Vitae

**Professor Rajasekaran R. Lada (RAJ)**  
**Full Professor & Department Head,**  
**Founding Director, Christmas tree Research Centre**  
**Department of Environmental Sciences**



### **I. Contact Information**

Professor R. R. Lada Ph.D., P.Ag., U.M.C.  
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Seed, Plant, Tree, Stress and Eco-Physiologist  
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*An internationally recognized award winning inspirational academic leader and a visionary with an excellent academic, administrative, managerial, research and internationalization experience, with an excellent interpersonal, financial and budgetary management experience, and partnership building skills who turns ideas into action, resolve to provide academic leadership, commitment to excel and serve society at large through science and academic innovation using 21<sup>st</sup> century management and technical skills.*

✓ Demonstrated Academic leadership (teaching, research publications and internationalization)	✓ Superior analytical, organizational, budgetary and management skills	✓ Exceptional integrity and honesty
✓ Demonstrated Administrative and Management capabilities	✓ Values-based, student, staff, faculty success-based management skills	✓ Rationale and with good judgment skills
✓ Excellent Communicator	✓ High energy, enthusiasm, patience, persistence, resolve, creativity and forward looking.	✓ Great listener
✓ Committed to success of students, staff and faculty and the institution	✓ Abilities to convert challenges into opportunities.	✓ Empathetic
✓ Outstanding scholarship	✓ Respects autonomy	✓ Commitment to deliver
✓ Excellent partnership-building abilities	✓ Ability to bring people together for a common purpose.	✓ Experience in a multi-cultural, multi-national, multi-ethnic environment

## II. Education

U.M.C (University Management Certificate)	2011	University of Manitoba, Canada (CHERD)
PhD- Plant Physiology	1989	The University of Adelaide, Australia
M.Sc. Ag. Horticulture	1979	Tamil Nadu Agricultural University, Coimbatore, India
B.Sc. (Hort)	1977	Tamil Nadu Agricultural University, Coimbatore, India

## III. Academic, Administrative, Industrial Experience

From	To	Position held	Organization
2010	Current	Founding Director, Christmas tree Research Centre	Faculty of Agriculture, Dalhousie Univeristy, Dal AC, Truro, Nova Scotia, Canada (NSAC merged with Dalhousie University)
2010	Current	Adjunct Professor, Department of Biology (Supervision of PhD students)	Faculty of Sciences, Dalhousie University
2010	Current	Professor & Head, Department of Environmental Sciences	Faculty of Agriculture, Dalhousie University, (NSAC merged with Dalhousie University) Truro, Nova Scotia, Canada
2008	June 2010	Professor & NSAC Faculty Graduate Coordinator (Academic Administration of Graduate studies )	Nova Scotia Agricultural College, Truro, Nova Scotia, Canada
2006	Current	Adjunct Director, Biologie Vegetal	Laval University, Quebec, Canada.
2007	Current	Professor, Plant Physiology	Department of Plant and Animal Science Nova Scotia Agricultural College, Truro, Nova Scotia, Canada
2002	2007	Associate Professor (Senior most Level) Plant Physiology	Nova Scotia Agricultural College, Truro, Nova Scotia, Canada
2002	2003	Internally Recruited Scientist (IRS) and Head, Crop and Soil Management & Olericulture (on sabbatical) (International Research and Development)	The World Vegetable Centre, Taiwan, ROC
1998	Current	Member, Faculty of Graduate Studies	Dalhousie Univeristy, Halifax, Canada.
1998	2002	Research Professor and Chair, Processing Carrot Research Program	Nova Scotia Agricultural College, Truro, Nova Scotia, Canada
1996	1998	Program Leader & Post Doctoral Research	Earth Sciences Centre, Faculty of Forestry, University of Toronto,

		Associate, Ecochemical Research	Canada
1994	1996	Deputy General Manager, Horticulture & Head, Research and Development	MaxWorth Orchards (India) Ltd, Madras, India.
1991	1994	Full Professor and Head, Department of Horticulture	Annamalai University, India
1989	1991	Reader and Head, Division of Horticulture	Annamalai University, India
1989 Jan	1989 June	Scientist and Head Division of Agronomy and Soil Science	India Cardamom Research Institute, Ministry of Commerce, Govt. of India, India. (Federal Institution)
1984	1989	The University of Adelaide Doctoral Research Fellow	University of Adelaide, Waite Agricultural Research Institute, Glen Osmond, South Australia
1981	1984	Assistant Professor, Department of Horticulture	Agricultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, India
1979	1981	Research Associate, Department of Horticulture	Agricultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, India

#### IV. **Highlights of Academic, Research, Administrative, International and Industrial Experience and Leadership**

2010 Dec- current: **Department Head, Department of Environmental Sciences.**

Providing Academic leadership, academic programme development and management, budget development and management, personnel management, developing strategic planning, promoting academic and scholarly environment, building partnership with industry and establish research partnership, recruitment, training, mentorship to new faculty, performance development, liaison with university administration, industry and faculty; promote a collegial, professional and respectful environment; trigger and sustain academic innovation. Maintaining healthy financial environment.

2010- current: **President, Atlantic Canada Christmas Tree Research and Development Consortium.**

Build industry and institutional partnership, review research and advise producers on their production issues, develop research and development strategies; review and manage the activities of CRC and the consortium.

**2010- current: Founding Director, Christmas Tree Research Center, NSAC.**

Established world-class Research Centre with multi-million \$ research grants. Research on various platforms, recruitment, training research personnel, build infrastructure capacity; liaison with the industry and funding agencies; develop R and D strategies, monitor research progress, financial management, recruitment, professional development, publications, disclosures, IP management, outreach.

**2010- current: Scientific Advisor, Green Agricultural Technologies, Rural Development Administration, Republic of Korea.**

Develop strategies for Republic of Korea on Agricultural Green Technologies; Educate scientists on the strategic opportunity areas.

**2008 – current: Advisor to the Deputy Prime Minister, The Kingdom of Cambodia (University Revitalization).**

Advise on University revitalization, programme development, University structure development, policies and procedures, mentoring Deans, Rectors and Vice-Rectors.

**2008 –2010: Faculty Graduate Studies Coordinator, NSAC.**

Serving Graduate students and faculty supervisors at large; Academic aspect of the graduate programme management.

**2008 –2010: Chair, Steering Committee, Atlantic Canada Christmas Tree Research and Development Consortium. SMART Christmas Trees and Technologies Initiative.** Developed industry partnership; Chair of the Steering Committee; Developed various successful proposal that lead to the establishment of the Christmas tree Research Centre and multi-million \$ Atlantic Innovation Fund.

**2006-current: Project Director – Agricultural Education for Extension. CIDA –ACCC funded project.** Project development, partnership building with RUA, Cambodia, project implementation, project leadership, conflict resolution, communication, review.

**2006–current: Program Director, Agroinformatics** project funded by ACAA. Project development, presentation, implementation, design, management, recruitment, financial management, team building, industry cooperation, report development, out-reach.

**2006- 2010: Project Director, NSERC- CRD** Project on Harvest Decision Modeling. Project conceptualization, fund raising, grant proposal development, project implementation, human resource management, training HQP, financial management, project coordination, implementation, industry liaison, report writing, out-reach.

**2005-current: Research Director, Christmas Tree Research** sponsored by Christmas Tree Research Council, Nova Scotia. Fund raising, grant proposal development, project implementation and management, research supervision, HQP training, advisory to research council, reporting, out-reach.

2003-current: **Advisor, Edible Horticulture Research Program**, Nova Scotia Agricultural College, Truro, Nova Scotia.

Proponent and Founder of the program, Industry liaison, Project proposal development for the EDH Research Chair, Fund raising through Technology Development, IRC and AgriFutures programs, Grant proposal development, Establishing an Advisory committee, Expert advise on research direction, Research Chair recruitment, Developing terms of references, Co-chair of the EDH Advisory Board, Project monitoring, Advisory, Management, Evaluation, Mentorship for the EDH Research Chair, Co-applicant/co-operator for several edible horticulture projects funded to Horticulture Nova Scotia, Potato Marketing Board, Prospect AgriServices, Kentville.

2004 –2009: **Director/Leader. Rhubarb Research Program.**

Industry liaison, Program proponent, Project development and Management, Grant proposal writing, Project management, Project advisory committee, Research management, Chair - steering committee, Out-reach, Researcher recruitment, Graduate student supervision and HQP training, industry liaison, Communication.

2007 (July)- current: **Full Professor, Plant Physiology**, Department of Plant and Animal Sciences, Nova Scotia Agricultural College, Truro, Nova Scotia, Canada.

Director, Processing Carrot Research Program; Rhubarb Research Program; Christmas Tree Research, Project Director - NSERC-CRD Research Program; Proponent and Founder and Advisor -Edible Horticulture Research Program; Chair – Steering Committee Marine Bioproducts Research; Project Director – Agri-Extension for Education in Cambodia -CIDA funded project; Theme Leader – Stress Remediation, Environmental and Precision Agriculture Technologies – AIF- Oxford Frozen Foods funded program; Project Leader – over forty research projects. Grant Proposal development, Infrastructure proposal development, Supervisor and Chair of the Advisory Committee – Graduate and postgraduate students supervision and training; Researcher recruitment, Training HQP and management, Budget Management; Team Building, Capacity Enhancement, Human Resource Development; Communication, Industry Linkage and Partnership development; Infrastructure Development; Outreach – conduct participatory research, field tours, exhibitions, fact sheet development; Communication – scientific and popular articles, fact sheets; Research management, scientist recruitment, training HQP, budget management, human resource development, research strategic planning.

2002 (April) – 2007 (June): **Associate Professor**, Dept. of Plant and Animal Sciences, Nova Scotia Agricultural College, Truro, Nova Scotia, Canada.

Director, Processing Carrot Research Program; Rhubarb Research Program; Christmas Tree Research, NSERC-CRD Research Program; Proponent, Founder, Advisor Edible Horticulture Research Program; Theme Leader – Stress Remediation,

Environmental and Precision Agriculture Technologies – AIF- Oxford Frozen Foods funded program; Project Leader – over forty research projects. Grant Proposal development, Infrastructure proposal development, Supervisor and Chair of the Advisory Committee – Graduate and postgraduate students supervision and training; Researcher recruitment, Training HQP and management, Budget Management; Team Building, Capacity Enhancement, Human Resource Development; Communication, Industry Linkage and Partnership development; Infrastructure Development; Outreach – conduct participatory research, field tours, exhibitions, fact sheet development; Communication – scientific and popular articles, fact sheets; Research management, scientist recruitment, training HQP, budget management, grant proposal development, human resource development, research strategic planning.

2002- 2003: **Head, Crop and Soil Management and Olericulture, AVRDC – The World Vegetable Center, Taiwan ROC.**

Administration, Research management, Strategic plan development, Human resource management, Budget management, International project management, International grant proposal development, Supervision of scientists and research personnel, Implementation of international R and D projects viz. Peri-urban vegetable production systems, Year round vegetable production systems, Off-season vegetable production systems, Tropical and Subtropical vegetable production systems, Safe vegetable production systems. Team building, Training international scientists, extension personnel and students, Conflict resolution, Performance evaluation of researchers, motivation, research environment building, communication enhancement.

1998- current: **Chair/Director, Processing Carrot Research Program**, Department of Plant and Animal Sciences, Nova Scotia Agricultural College, Truro, Nova Scotia, Canada.

Establishing research program, Research Management, Research grant proposal development, Infrastructure grant proposal development, Problem diagnosis, Project development, Project implementation, Innovation, Staff recruitment, Training highly qualified personnel, Teaching graduate, undergraduate and technology programs, Establishing collaboration with international scientists, Extension, Establishing industry links, Personnel management and development, Budget management, Outreach, Communication, Industry liaison.

2000-2007: **Project Director, NSERC-CRD – Resource Optimization and Modeling**

Project proposal development, Project management, Chair, Research Management Committee, Project implementation, Publication, Result dissemination, Recruitment, Budget management, Reporting.

1994-96 **Head, Research and Development (Deputy General Manager) – Maxworth Orchards Research and Development Centre, Maxworth Orchards (India) Ltd.**

Established a R&D center, Head of R and D activities, Project development and execution, International liaison, Infrastructure development, establishing hi-tech orchards, hi-tech nurseries, fully automated plant growing structures, policy making, budget management, project planning and implementation, international R&D projects, project execution, recruitment, training, performance appraisals, HR development, Quality control, Team building.

1993-94 **Proponent, Grant Proposal Development and Member Representative of the Annamalai University - World Bank Project.**

1991-1994 **Professor and Head of the Department of Horticulture**

**Teaching-** Graduate program development, Chair – Board of Studies (Horticulture), Curriculum development, Teaching undergraduate and post graduate programs.

**Research** – Grant proposal development, Grant Review, Research management, Recruitment, Training HQP, strategic plan development, Infrastructure development, Project management, out-reach.

**Administration** – Dept. management, Human resource management, Faculty development, Curriculum development, Finance/Budget management, Faculty recruitment and training, Infrastructure development, Research and research management, Grant proposal development, Project execution, Team building, Student selection and admission, Budget management, Graduate student supervision, Chair, Board of studies, Horticulture.

**University Administration** – Dept. Head, Budget committee, Member- Academic council, Member- University Syndicate.

## V MOST SIGNIFICANT CONTRIBUTIONS TO RESEARCH AND/OR TO PRACTICAL APPLICATIONS

***i. Natural and synthetic antistress, antioxidants protect plants against abiotic stresses, promotes growth and yield and benefits transferred to next generation (Technology Development, NSERC-CRD, NSERC – PGS):*** Ambiol, a derivative of 5-hydroxybenzimidazole, protected plants from drought-induced senescence, maintaining membrane integrity and photosynthesis and promoting growth (**Rajasekaran, L.R.** and Blake, T.J. 2002. Can J Plant Sci. 82: 195-202). Ambiol triggers specific proteins and ABA is not required to confer drought acclimation (*MacDonald, M.T., Rajasekaran, L.R., Hoyle, J., Robinson, A.R.* 2009. HortScience 44 (7):1-5.). Ambiol conferred drought tolerance can be carried to even the second generation seedlings (*MacDonald, M.T., Rajasekaran, L.R., Hoyle, J., Robinson, A.R.* 2010. Journal of Plant Growth Regulation – In Press). Natural antioxidants, NA1, NA2, NA3 also inhibited drought induced senescence through triggering specific proteins (*MacDonald, M.T., Rajasekaran, L.R., Robinson, A.R., Hoyle, J.* 2009. HortScience 44:1323-1329). Natural antistress compounds, glycinebetaine and trigonelline were discovered (**Rajasekaran 1989**. PhD Thesis, University of Adelaide; **Rajasekaran et al.** 2001. Can J Plant Sci. 81:487-498; **Rajasekaran et al** 2000. Can J Plant Sci. 80: 151-157). Glycinebetaine protected photosynthesis (**Rajasekaran et al.** 1999. Photosynthetica), enhances membrane stability (*Caldwell 2001*, M.Sc. Thesis, NSAC-Dalhousie; *Caldwell and Rajasekaran* 2002. Proc. Int. Carrot Conf. Bakersfield, CA). Seed preconditioning using BP2 and Ambiol increased seedling emergence and yield and recovery of fancy grades in



oranza by 71 and 146% compared to the untreated control (**Rajasekaran et al. 2005. Scientia Horticulturae 106: 25-37**). ***These compounds have great potential in protecting plants against drought, oxidative stresses and for commercialization.***

**ii. Ecophysiology of photosynthesis uncovered. Micro-environment alters photosynthesis (NSERC-CRD -Lada):** Photosynthesis in carrot model system is significantly influenced by irradiance, carbon dioxide, soil moisture and to a lesser extent, by nutrients. Increasing irradiance increased Pn non-linearly. Increasing Pn however, reduced Gs and TI contributing to an increase in WUE (**Kyei-Bohen et al. 2003. Photosynthetica 41; 301-305**). Increasing CO<sub>2</sub> concentration increased Pn non-linearly. Increasing CO<sub>2</sub> reduced Gs and TI and increased WUE. Pn<sub>max</sub> for was 650 μmole mol<sup>-1</sup> (**Kyei-Bohen et al. 2003. Photosynthetica 41: 597-603**). The benefits of increasing CO<sub>2</sub> concentrations are lost under high temperature and water deficits (**Thiagarajan and Rajasekaran 2007. Photosynthetica. 45: 355-362; Thiagarajan and Rajasekaran 2006. Photosynthetica 45:43-50**). Photosynthesis was not significantly altered by NPK (**Pattipas et al. 2005. Proc.ASHS 2005; Rajasekaran et al. 2005. Proc. ASHS 2005**). Declining soil moisture below -33cbars reduced photosynthesis significantly (**Caldwell and Rajasekaran 2002. Proc. Intl. Carrot Conf. Bakersfield, CA**). We have also discovered that water deficit rather than N deficiency alters PN and yield components and WUE declines when N levels increases (**Pan et al 2011 Photosynthetica 49:316-320; Ibid 49:309-315**). Exposure to LED white, red and blue spectra, delayed postharvest needle abscission (**Veitch and Rajasekaran, 2011 J Applied Agriculture –In Press**). ***These discoveries are of great importance in photosynthesis and environmental research.***

**iii. Plant Growth Regulators (PGRs) inhibit drought-induced senescence (NSERC):** Declining root zone water potential reduced xylem pressure potential and needle extension, and destabilized membranes, promoting ethylene synthesis in jack pine seedlings (**Rajasekaran and Blake, 1999. J Plant Growth Regul. 18:175-181**). ABA, spermine, spermidine and Ambiol protected jack pine seedlings by sustaining photosynthesis, conferring membrane stability by inhibiting ethylene synthesis, and maintaining favorable xylem potential allowing growth to continue (**Rajasekaran and Blake, 1999. J Plant Growth Regul. 18:175-181**). Bioprotect (BP2) also protected jack pine seedlings from dehydration and enhanced growth through inducing root growth, maintaining hydraulic conductivity, protecting photosynthesis and membrane function (**Rajasekaran and Blake, Patent Pending**). ***These PGRs have significant potential in retarding dehydration induced senescence. Nearly 2 million seedlings are currently being treated in private nurseries.***

**iv. Inhibiting ethylene synthesis prevents drought induced senescence (Commonwealth scholarship to Islam):** Ethylene concentration increases under drought, inducing membrane leakage, reducing photofunctions and triggering senescence reactions (**Rajasekaran and Blake, 1999. J Plant Growth Regul. 18:175-181; Islam et al.2003. Trees 17: 278**). Inhibiting ethylene synthesis using AVG and Ambiol, significantly enhanced drought tolerance of white pine seedlings, sustained hydraulic conductivity and maintained elastic modulus preventing senescence reactions (**Islam et al. 2003. Trees 17:278**). ***This technology is of great importance in preventing senescence in conifers.***

**v. Natural antistress compounds discovered in carrots, onions and tomatoes (Technology Development).** A natural antistress compound, glycine betaine was discovered in carrots, onion and tomatoes (**Caldwell,T and Rajasekaran 2002. Proc. Int. Carrot Conf. Bakersfield, CA**) Preconditioning carrot seedlings with glycine betaine enhances membrane stability and protects the seedlings (**Caldwell 2001, M.Sc. Thesis, NSAC-Dalhousie; Caldwell and Rajasekaran 2002. Proc. Int. Carrot Conf. Bakersfield, CA**). ***These compounds have great potential in protecting crops during unanticipated drought and for commercialization.***

**vi. Thermogenic compounds, antistress, antioxidant compounds in promoting seed germination and seedling emergence at low temperature and low moisture status discovered (AgriFocus 2000):** Stand establishment has been a greater challenge in carrot production. Low temperature and low moisture during seeding often results in uneven seed germination resulting in poor crop stand, challenging production, productivity, quality and profitability. A group of compounds, called salicylates such as DHBA, SA, ASA all enhanced germination at a limiting low temperature of 5°C (Rajasekaran et al. 2002- Can. J. Plant Sci., 82: 443-450). Embryoconditioning using various antistress, antioxidant compounds such as Ambiol (5-hydroxybenzimidazole derivative), Bioprotect (a natural antistress, antioxidant) and glycinebetaine (natural antistress compound) all promoted germination under low soil moisture of 25%FC. Field experiments using these compounds showed a significant advantage in promoting uniform emergence under natural conditions (Rajasekaran et al. 2003 - Acta Horticulturae 2003; Rajasekaran et al. 2005 – Scientia Horticulturae). *This technology offers greater promise for synchronizing and promoting seedling emergence under limited low temperature and low moisture conditions and is being commercially tested for adoption by the industry.*

**vii. Endophytes in carrots discovered to enhance seedling growth (AgriFocus 2000):** Endophytic bacteria belonging to 28 genera have been discovered from carrot crown tissues. *Pseudomonas* species were abundant compared to other species. Both *Pseudomonas putida* strain MLSN and *Bacillus* strain MLSN triggered shoot and root growth by nearly 72 per cent (Surette, M.A. et al. 2003. Plant and Soil 253: 1381-390). Their potential in abiotic and biotic stresses is being explored. *This has great potential in naturally enhancing growth, triggering plant defense against fungal diseases and pests and promoting resistance to environmental stresses. This will have a great impact in food safety by reducing pesticide use and will have a positive impact on the environment and ecosystem stability.*

**viii. Carrots can adjust well under nutrient deficient environments (Technology Development; NSERC-CRD).** Carrots were less responsive to both macro and micro nutrients under both sand culture and field conditions. Increasing N, P K or S had no significant yield advantage. However, significant relationships between tissue and soil P, Mg, S, Fe, Zn and B were found at active bulking. Petiole Mg, Fe concentrations and leaf Zn concentration at bulking initiation stage showed a significant correlation with yield. At bulking stage, leaf N, P concentrations had a significant negative correlation. Tissue Ca, Mg, S, Mn concentrations had significant correlations with root weight (Pattipas, F.C., Rajasekaran L.R., Caldwell, C.D., Warman, P. 2008. Communication in Soil Science and Plant Analysis 39:763-788; Pattipas, C., Rajasekaran L.R., Caldwell, C.D., Miller, C. 2005. Communication in Soil Science and Plant Analysis, 37:1597-1609). *Tissue nutrient diagnostics has direct impact on crop yield and quality and on the environment by optimization of required nutrients. This research has eliminated use of P completely and reduced use of N fertilizers by 50% reducing the cost of production while enhancing environmental stewardship.*

**ix. Agriinformatics Research (AgriFutures-ACAAF; NSERC, AIF, Oxford Frozen Foods Limited).** A new discipline of research integrating physiology, agroecology, informatics and computation technology has been established to understand the linkage between yield and agroclimatalogical, agroecological and management factors to predict crop development and make harvest decision. The approach included the collection of data from several seasons which was subjected to integrity checks then was migrated to the Oracle database. The weather data for six different weather stations for the years 2006-2008 were collected from the Environment Canada national weather database. Bar and line graphs based outputs were chosen as the primary visualization mode to represent the data in Oracle database. Neural network software such as, JOONE, NeuralNet and Peltarion Synapse were evaluated for their robustness,

flexibility, data visualization capabilities and ease of use. Peltarion Synapse, a .NET based neural network engine was chosen for constructing neural network models. Data was then subjected to simple correlation analysis to identify the closely related predictors. Following this, a principal component analysis (PCA) was performed using the SAS system. Based on the PCA findings, predictors were chosen for modeling the yield data in Neural Network engine, Synapse. Once the models have attained their minimal root mean square error (RMSE) values the models from the neural network platform will be exported in dynamic link library (DLL) format. These DLL files will serve as the core system of the neural network engine. Each DLL will be able to accept specific inputs and based on the inputs and network coefficients the engine will be able to predict the yield or any chosen response variable. Currently, DLL file for cut and peel carrot type has been developed. A ".NET" based visualization tool has been built using the visual C++ platform. This platform is constructed to be a user-friendly environment where the user can change various input parameters and observe the probable changes in output variables in a visual form such as, text or graphical form. This platform will accept the neural network engines modules developed from the synapse to be embedded in the visualization platform. Individual screens for different carrot types are being constructed. Within each screen, the user controls for adjusting the different input parameters are being developed. Also, a chart utility that will produce dynamic charts to depict the changes in response variables over changing input variables is also been included within each screen.

- Database of field operations and yield attributes has been developed in Oracle.
- A database management system to manage and visualize trends and pattern for various field scenarios has been developed.
- A platform to integrate and visualize neural network generated outputs has been generated using .net technology.
- Neural network based models are being developed from data collected from field as well as research projects.
- Visualization models can now predict optimal combinations of agronomic practices to maximize quality of carrot yields.

These models are being tested and available to the carrot industry end of this year. This is the first ever agroinformatics based decision management system developed for carrot yield monitoring and harvest decision system. A protocol has been demonstrated to the industry. This approach has been extended to the wild blueberry industry as well. (This has IP potential hence publication relating to this project has been deferred currently).

***x. Christmas tree research - Needle Abscission and Senescence Physiology and Technologies (AIF, NSERC, ACAAF, Growing Forward, CTCNS, NSDNR)***

Christmas tree industry in the Atlantic Canada is over \$72 million industry. The major challenge that the industry faces is needle drop. Investigations have been ongoing over the past 5 years. Over 190 genotypes from NS showed that some accessions are highly sensitive to needle drop (within 6 days) while some genotypes retained needle for over 60 days. High Needle Abscission Resistance clones have been identified, grafted and planted in Plumdale Balsam fir seed orchard.

We have also uncovered that cold acclimation at 5 degrees C for 6 h reduced needle loss in Balsam fir. There was however no interaction between cold acclimation temperature and duration. The Balsam fir seedlings acclimated to cold with roots retained its needles for long rather than the root-detached ones suggesting that an unknown factor from the roots may be responsible for enhancing the responsivity of the needles to cold enhancing needle retention. Cold acclimation at 5°C reduced water loss, maintained chlorophyll and membrane integrity

better in seedlings with roots than the root-detached ones again strongly suggesting that the roots play a major role in needle retention.

Our research has also provided an understanding that natural cold acclimation benefits needle retention post harvest. Natural cold acclimation however benefited the NAS clones. In NAS clones, cold acclimation enhanced needle retention by 10-15 days while in NAR clones, cold acclimation has a negative effect.

Our research indicates that ethylene may be the key regulator of needle abscission in Balsam fir. Long term exposure to exogenous ethylene induced needle drop in root-detached Balsam fir. Inhibiting ethylene synthesis or blocking its receptors has significantly enhanced needle retention extending needle retention over 90 days.

The products have been named as Stop Drop, and commercialization potential of this compound is significant. This will transform the Christmas tree industry by providing extended needle retention and position NS Christmas tree industry strongly in the global market, stabilizing rural economy and sustaining livelihood. Since these compounds have market potential, publication of results has been differed for the time being until patented.

**Senescence and abscission physiology:** Ethylene concentration increases under drought, inducing membrane leakage, reducing photofunctions and triggering senescence reactions (*Rajasekaran* and Blake, 1999. *J Plant Growth Regul.* 18:175-181; **Islam** et al.2003. *Trees* 17: 278). Inhibiting ethylene synthesis using AVG and Ambiol, significantly enhanced drought tolerance of white pine seedlings, sustained hydraulic conductivity and maintained elastic modulus preventing senescence reactions (**Islam** et al. 2003. *Trees* 17:278). Ethylene is discovered as a signal for postharvest needle drop, inhibiting synthesis or masking its receptor delayed needle abscission. Ethylene is triggered 2d before abscission occurs (*Mason* et al. *Trees* 24, 879-886). Manipulating VPD and temperature can reduce needle abscission in the absence of ethylene. The benefits of low VPD and low temperature disappear in the presence of ethylene. ***This technology is of great importance in preventing senescence and needle abscission in conifers.***

## VI. SCIENTIFIC ACHIEVEMENTS

- Hormonal signal involved in needle abscission identified.
- Root derived signals in balsam fir that regulate needle abscission identified.
- Cold acclimation physiology uncovered in balsam fir.
- Environmental factors that regulate needle abscission discovered.
- Genotypes NAR mechanism uncovered and clones with high NAR identified.
- Signals in rhizome initiation and development in rhubarb identified.
- Technology for propagule production in rhizome developed.
- Canopy regulation technologies developed for rhubarb.
- Maturity, Yield and Quality models developed for carrots.
- Agroinformatics developed for carrots.
- Germination Promotion Agents for low temperature and low moisture conditions discovered and developed.
- Role of antioxidants in promoting drought tolerance in tomatoes discovered.
- Water productivity models developed for carrots.
- Photosynthetic models developed under various environments for carrots and optimal environment for maximal productivity identified.

- Bulking signals in carrots identified.
- Stress protection technologies developed.
- Antistress compounds discovered in carrots.
- An analogue of ABA having antitranspirant potential identified.
- QACs antitranspirant and antioxidant potential discovered.
- Discovered new quaternary ammonium compounds in wheat, carrots, tomatoes, wild *Lycopersicon* species and onions that promote drought and salinity tolerance.
- Developed innovative embryo-conditioning technique using thermogenic compounds, antistress, antioxidant compounds for synchronizing emergence in carrots under limiting moisture and temperature conditions.
- New bacterial endophytes that promote growth in carrots discovered.
- Discovered new natural compounds having antistress, antioxidant, antisenescence properties.
- Developed drought protection technologies for conifer tree seedlings.
- Identified mechanisms of drought acclimation due to antistress compounds in conifer tree seedlings.
- Identified new PGRs promoting growth and enhancing drought tolerance in tree and crop seedlings.
- Developed and demonstrated vertical and horizontal space utilization models for orchard crops that involve Mango, pomegranates, guava, papaya, tamarind, grapes, ber for high return on investment.
- Developed cell lines tolerant to NaCl stress in tomato.
- Developed techniques for promoting growth and conditioning plants against heat, low temperature, drought and salinity.
- Evolved cell lines tolerant to high temperature in geranium.
- Discovered a new quaternary ammonium compound, trigonelline enhancing salt tolerance in tomato species and the physiological adaptation of accumulation of glycinebetaine.
- Identified factors responsible for flower drop and yield reduction in tomato exposed to drought and salt stress.
- Evolved and released three high yielding varieties in bittermelon, chrysanthemum and marigold.
- Established salt tolerance limits of the germplasm of various tropical and temperate vegetables and spice crops.
- Developed high yielding varieties in bitter melon (MDU-1), marigold (MDU-1) and chrysanthemum (MDU-1).
- Advanced lines with high temperature, drought and salinity tolerance in tomato, onion, carrot, okra.
- Mechanism of drought, salinity and high temperature tolerance in tomato, onion, carrots, bhendi identified.
- Mechanism of post-harvest senescence in Jasmines understood. Developed techniques to alleviate post-harvest senescence in Jasmines.

## VII. INNOVATIVE TECHNOLOGIES

- Technology for needle abscission control developed. Needle Abscission Mitigating Agents (NAMA) developed.
- Synthetic Root Sap (SRS) to promote needle retention developed.
- Synthetic Root Derived Factors (SRDF) developed to promote needle retention.
- Environmental technologies for promoting postharvest needle retention developed.
- Developed Artificial Exosperm technology for small seeded vegetable crop.
- Developed “Agroinformatics” for carrots.
- Invented an embryo conditioning technique using new PGRs and natural antistress, antisenescence compounds for enhancing growth and drought, high and low temperature tolerance of cucumber, peas, carrots, onions, tomatoes and conifers.
- Developed techniques for enhancing stand establishment in carrots using PGRs, thermogenic compounds, antistress, antioxidant compounds.
- Developed resource optimization models for carrots.
- Developed growth and maturity models for carrots.
- Water requirement models developed for carrots.
- Isolated, identified, developed biotization techniques using carrot specific endophytes for enhancing growth and emergence.
- Enhanced tolerance of tomato to high temperature by high temperature seed priming.
- Alleviated salt stress-induced responses by hormonal modulations in tomato.
- Developed and advanced high temperature tolerant tomato lines
- Invented a new technique for overcoming nematode problem in crossandra by intergeneric grafting.
- Invented a pinching technique for increasing production of gomphrena.
- Standardized agrotechniques for enhancing high yield and alkaloid content in *Catheranthus roseus*.
- Hastened tuber development through pinching and defoliation techniques in cassava.
- Developed a new softwood grafting technique for advancing bearing in tamarind.
- Increased shelf-life of jasmines through post-harvest manipulations.

## VIII. RESEARCH AND INFRASTRUCTURE GRANTS AWARDED

### ***A. Funding Awarded:***

1. Physiological determinants, Environmental and nutritional regulation of growth, yield and quality and resource optimization modeling Carrots. **NSERC-CRD**, \$450,000. **Applicant and Project Director: R. Lada**



2. Systematic monitoring of environmental, soil, and microbial regulation of plant growth, development, yield, and composition. **CFI**, \$349,871.- **Applicants and Project Leaders:** D.Percival and **R. Lada**
3. Developing, disseminating technology for process carrot production, NSDAM \$1500. **Applicant and Project Leader: R. Lada.**
4. Varietal Evaluation of processing carrots. AgriFocus 2000 \$12,000- Project Leaders: Applicant: C. Caldwell; **Project Leader: R. Lada**
5. Germination and Emergence synchronization using thermogenic compounds in processing carrots. AgriFocus 2000, \$32,000. **Project Leader: R. Lada**, Project Cooperator: C. Caldwell
6. Role(s) of Quaternary ammonium Compounds (QACs) and Tertiary Sulphonium Compounds (TSCs) in enhancing drought tolerance of vegetable crops. AgriFocus 2000, \$31,000. **Project Leader: R. Lada**
7. Establishing a Cropping Systems Research Center. CFI \$800,000. **Applicants:** G. Atlin, **R.Lada**, C. Caldwell, R.Martin, J. Nowak.
8. Studies on Assessing Risk of Heavy Metal contamination in Old Orchard soils in Nova Scotia. AgriFocus 2000. \$24,400. **Project Leader: R. Lada**, Cooperator: C. Caldwell.
9. Endophytic Plant Beneficial Bacteria (EPBB) in Enhancing Yield and Stress Tolerance in Processing Carrots. AgriFocus 2000. \$34,110. **Applicant and Project Leader: R. Lada**, Cooperators: J. Nowak and A.V. Sturz.
10. Bulking Physiology: I. Phytohormones and PGRs in Hastening and Accelerating Bulking in dicer Carrots. \$38,000, AgriFocus 2000. **Applicant and Project Leader: R.Lada**, Cooperator: C. Caldwell.
11. Water Requirement and Irrigation management for Optimizing Crop Stand, Yield and Quality in Processing Carrots. \$39,000. AgriFocus 2000. **Applicant and Project Leader: R.Lada**, Cooperators: C. Caldwell, A. Madani, R. Gordon.
12. Foliar diagnosis of nutrients and nutrient optimization in carrots. \$38,000, AgriFocus 2000. **Applicant and Project Leader: R. Lada**, Cooperators: C. Caldwell, T. Astatkie, K. Sanderson.
13. Soil water management in carrots using various antitranspirants. \$22,000. AWARD 2000. **Applicant and Project Leader: R. Lada**, cooperator: T.J. Blake.
14. Stand Establishment in Carrots: Emergence synchronization. \$38,000 AgriFocus 2000, **Applicant and Project Leader: R. Lada.**

15. Maturity modeling in Processing Carrots. \$37,000. AgriFocus. **Applicant and Project Leader: R. Lada**

16. Emergence synchronization using various seed matriconditioning techniques in processing carrots. Agri Focus, \$37,000, **Applicant and Project Leader: R. Lada**

16. Greenshoulder control technologies in processing carrots. \$38,000, Agri Focus, **Applicant and Project Leader: R. Lada**

17. Pest and disease forecast modeling. \$110,000. **Applicants:** K. Sanderson (Project Leader), G. Burgess, **R. Lada**, Matching Investment Initiatives, Agriculture, Agri-Food Canada.

18. Genotype screening for drought tolerance in processing carrots (2002-2005), \$39,000, AgriFocus Tech Development, **Applicant and Project Leader: R. Lada**

19. Developing an integrated gel seeding technique for processing carrots (2002-2005) \$39500, AgriFocus 2000 Tech Development, **Applicant and Project Leader: R. Lada**

20. UV stress monitoring and protection technologies. (2003-2005) NT\$ 450,000. Council of Agriculture, Taiwan. (concept note approved) **Applicant and Project Leader: R. Lada**

21. Role of Quaternary ammonium compounds in enhancing multiple stress tolerance in vegetable crops. (2003-2005). Council of Agriculture, Taiwan. NT\$1,300,000 (Concept note approved). **Applicant and Project Leader: R. Lada.**

22. Technologies for hot-wet season production of tomato and sweet pepper in Taiwan lowlands. Council of Agriculture, Taiwan. NT\$ 1,623,000 (Concept note approved). **Applicant and Project Leader: R. Lada**

23. Design, Development and Demonstration of integrated, innovative, Precision Tunnel Horticulture Production (PTHP) technologies for Taiwan. Council of Agriculture, Taiwan. NT\$3,140,000. (Concept note approved). **Applicant and Project Leader: R. Lada**

24. N monitoring in leafy vegetables. Council of Agriculture, Taiwan. NT\$450,000. **Applicant and Project Manager: R. Lada.**

25. Compost development protocol development in vegetable systems. NT\$450,000. Council of Agriculture, Taiwan. Applicant: Ma. **Project Manager: R. Lada.**

26. Screening high temperature tolerant broccoli cultivars. NT\$500,000. Council of Agriculture, Taiwan, **Applicants: Mr. Chang and R. Lada; Project Manager: R. Lada**



27. Starter solution application technologies for vegetable crops. NT\$500,000. Council of Agriculture, Taiwan. Applicant: Ma; **Project Manager: R. Lada.**

28. Sulphur Nutrition in Carrots (2002-2005). \$36,900, Technology Development. Applicant: Dr. Kyei-Bohen; **Project Leaders: R. Lada and C. Caldwell.**

29. Controlling crack development during freezing (CDF) in cut and peel carrots. (2004-2006). \$39,900. **Applicant and Project Leader: R. Lada.**

30. Resource optimization for processing carrots: II. Nutrient and moisture relations on maturity, yield and quality. (2004-2006). \$38,980. Technology Development. **Applicant and Project Leader: R. Lada**

31. Good Agricultural Practices (GAP) for processing carrots: I. Photo-physical-mechanical (PPM) technologies to trigger plant defense against key pests and diseases. (2004-2006). \$40,000. **Applicant and Project Leader: R. Lada.**

32. Maturity, quality and yield modeling for processing carrots II. Predicting growth, physiological maturity and quality using microclimate models for production and processing planning. (2004-2006). \$33,000. **Applicant and Project Leader: R. Lada.**

33. Growth and Stress Product (GASP) Research Program. Atlantic Innovation Fund. \$2.25 million. (2003-2008). **Proponent, Steering Committee Chair: R. Lada Applicant: Acadian Seaplants.**

34. Environmental and Precision Agricultural Technologies for blueberries and carrots. (2003-2008). \$1.566 million. Applicant: Oxford Frozen Foods Ltd. Co-proposal developer, Member of the Research Steering Committee and **Theme Leader: R. Lada.**

35. Establishing Edible Horticulture Research Program and Edible Horticulture Research Chair at NSAC. (2004-2009). \$300,000. Technology Development and AgriFutures. **Proponent and Proposal Development: R. Lada; Applicant: Horticulture Nova Scotia.**

36. Crown Management Technologies (CMT) for Enhancing Propagule Production in Rhubarb. Technology Development (2005-2007). **Applicant and Project Leader: R. Lada; \$39,800.**

37. Canopy Management Technologies (CAMT) for Enhancing Harvest Efficiency in Rhubarb. Technology Development (2005-2007). **Applicant and Project Leader: R. Lada. \$40,000.**

38. Bulking Physiology, Dynamics, Yield and Quality Modeling in Processing Carrots. NSERC-CRD \$218,500; In-kind – \$272,000. **Applicant and Project Director: R. Lada.**

39. Agriinformatics for Processing Carrots. ACAAF. \$ 441,000 (total project cost). **Applicant: Oxford Frozen Foods Limited. Project Development & Project Director: R. Lada.**

40. Ecophysiology, dynamics and bulking modeling of cut and peel carrots. \$40,000 (total project cost). Technology Development- NSDA. **Applicant: R. Lada.**

41. Cold Acclimation Physiology and Technologies - \$1.1 million (Project Cost). ACAAF and CTCNS. **Proponent & Project Leader: R. Lada.**

42. Physiology of Needle Abscission Resistance in Root Detached Balsam Fir. NSERC – CRD \$710,000. **Proponent & Project Director: R. Lada.**

43. Smart Christmas Trees and Technologies Initiative. AIF (Atlantic Innovation Fund) \$4.984 Million (Total Project Cost). **Proponent & Project Director: R. Lada**

***B. Projects Completed:***

1. Evolving cell lines tolerant to various environmental stresses in forest tree seedlings-300,000(INR), Ministry of Forestry, Govt of Tamil Nadu, India. **Applicant and Project Leader: R. Lada**

2. Screening and high temperature adaptation in geranium and patchouli and evolving cell lines tolerant to high temperature-580,000 (INR)- Indian Council of Agricultural Research, New Delhi, India. **Applicant and Project Leader: R. Lada**

3. Reclamation and revegetation of back filled mine spoils of Neyveli Lignite Corporation" 5,500,000(INR)-Ministry of Coal, Govt. of India. **Applicants: N.N.Prasad, R. Lada, B. Ragupathy; Project Leader (Horticulture): R. Lada**

4. "Standardization of agrotechniques for obtaining high yield and alkaloid content in *Catheranthus roseus*" 300,000(INR)- Indian Council of Agriculture Research, New Delhi, India. **Project Leader: R. Lada**

5. "Introduction, selection, hybridization and mutation breeding in bittergourd (*Memordica charantia*, L)"-50000 (INR), University Research Grants, TNAU, India. **Project Leader: R. Lada**

6. Assessing heavy metals in soil of Nova Scotia. AgriFocus 2000. **Project Leader: R. Lada**

7. Germination synchronization in processing carrots. AgriFocus 2000. **Project Leader: R. Lada**

8. Characterization, isolation and role of endopytes in processing carrots, Agri Focus 2000, **Project Leader: R. Lada**
9. The role of quaternary ammonium compounds in enhancing drought tolerance in vegetable crops. Agri Focus 2000. **Project Leader: R. Lada**
10. Germination synchronisation in processing carrots. AgriFocus 2000. **Project Leader: R. Lada**
11. Maturity, yield and Quality modelling, Agrifocus 2000. **Project Leader: R. Lada.**
12. Genotype screening for drought tolerance in processing carrots AgriFocus Tech Development, **Applicant and Project Leader: R. Lada**
13. Developing an integrated gel seeding technique for processing carrots. AgriFocus 2000 Tech Development, **Applicant and Project Leader: R. Lada**
14. Sulphur Nutrition in Carrots. Technology Development. Applicant: Dr. Kyei-Bohen; **Project Leaders: R. Lada and C. Caldwell.**
15. Maturity modeling in Processing Carrots. AgriFocus. **Applicant and Project Leader: R. Lada**
16. Emergence synchronization using various seed matriconditioning techniques in processing carrots. Agri Focus, **Applicant and Project Leader: R. Lada**
17. Greenshoulder control technologies in processing carrots. Agri Focus, **Applicant and Project Leader: R. Lada**
18. Pest and disease forecast modeling. \$110,000. **Applicants:** K. Sanderson (Project Leader), G. Burgess, **R. Lada**, Matching Investment Initiatives, Agriculture, Agri-Food Canada.
19. Genotype screening for drought tolerance in processing carrots (2002-2005), \$39,000, AgriFocus Tech Development, **Applicant and Project Leader: R. Lada**
20. Sulphur Nutrition in Carrots (2002-2005). \$36,900, Technology Development. Applicant: Dr. Kyei-Bohen; **Project Leaders: R. Lada and C. Caldwell.**
21. Controlling crack development during freezing (CDF) in cut and peel carrots. (2004-2006). \$39,900. **Applicant and Project Leader: R. Lada.**
22. Resource optimization for processing carrots: II. Nutrient and moisture relations on maturity, yield and quality. (2004-2006). \$38,980. Technology Development. **Applicant and Project Leader: R. Lada**

23. Good Agricultural Practices (GAP) for processing carrots: I. Photo-physical-mechanical (PPM) technologies to trigger plant defense against key pests and diseases. (2004-2006). \$40,000. **Applicant and Project Leader: R. Lada.**

24. Maturity, quality and yield modeling for processing carrots II. Predicting growth, physiological maturity and quality using microclimate models for production and processing planning. (2004-2006). \$33,000. **Applicant and Project Leader: R. Lada.**

25. Crown Management Technologies (CMT) for Enhancing Propagule Production in Rhubarb. Technology Development (2005-2007). **Applicant and Project Leader: R. Lada;** \$39, 800.

26. Canopy Management Technologies (CAMT) for Enhancing Harvest Efficiency in Rhubarb. Technology Development (2005-2007). **Applicant and Project Leader: R. Lada.** \$40,000.

## IX. CURRENT RESEARCH

- **Senescence and abscission control:** Understanding the fundamental processes leading to senescence, signals involved in senescence trigger, biophysical processes triggering senescence, volatiles in senescence promotion, antioxidants and antisenesescence agents discovery.
- **Harvest Decision Modeling:** Bulking Physiology, dynamics, agronomical, agroclimatological interaction on yield and quality and harvest decision modeling.
- **Resource optimization and modeling for processing carrots:** Optimizing photosynthesis, photosynthesis modeling, environmental and resource interactions, nutrient and yield modeling, water modeling, maturity and yield modeling.
- **Agroinformatics:** Knowledge management tools, Decision making tools, Crop growth and maturity models, Crop Production Systematics, Harvest Decision Models.
- **Needle Retention in Christmas Trees:** Understanding the physiological mechanisms of needle loss, signals involved in cold acclimation, senescence mechanisms, antisenesescence compounds in controlling senescence.
- **Ecophysiology** – Modelling photosynthesis in crops exposed to various environmental, agroclimatological and agronomical factors; Root bulking and maturity modeling.
- **Edible horticulture** – Principally carrots, rhubarb, grapes, blueberries
- **Abiotic stresses and stress acclimation and mitigation:** Plant to plant communication, Stress physiology and metabolism, Stress Defense Molecules, stress acclimation and remediation, photo-physical-mechanical means of stress alleviation.
- **Plant stress defense mechanisms and Biocompounds Research:** Plant defense mechanisms, physiology of stress acclimation, adaptation, Natural antistress, antioxidants, bioregulators, biopesticides and fungicides, Plant defense molecules.
- **Seed and seedling physiology:** Seed priming using various natural antistress, antioxidants for enhancing growth, yield and quality of processing carrots under

natural drought. Synchronization of seed germination and emergence and Stand Establishment.

#### X. PUBLICATION AND ORAL AND WRITTEN COMMUNICATION ABILITIES

##### *Original papers in Peer-reviewed journals:*

75. MacDonald, M.T., **Rajasekaran, L.R.**, Martinenko, A., Dorais, M., Pepin, S., Desjardins, Y. 2012. Is there a link between ethylene evolution, ethylene sensitivity and needle abscission in root detached balsam fir. *Acta Hort.* 932: 405-412.

74. *Thiagarajan, A., Rajasekaran L.R.* 2012. Cold acclimation influence postharvest needle retention in root detached Balsam fir. *Acta Horticulture* 932: 371-378.

73. *MacDonald, M.T., Rajasekaran, L.R., Doris, M., Pepin, S.* 2012. Influence of humidity and temperature on postharvest needle abscission in Balsam fir in the presence and absence of exogenous ethylene. *Hort Sci* 47: 1332-1332.

72. MacDonald M.T., **Rajasekaran L.R.**, Dorais M, Pepin S. 2011. Endogenous and exogenous ethylene induces needle abscission and cellulase activity in postharvest balsam fir (*Abies balsamea* L.). *Trees* 25: 947-952

71. Thiagarajan, A., **Rajasekaran, L.R.**, Adams, A. 2012. Ecophysiological characteristics of two carrot cultivars in response to agro-ecological factors and nitrogen application. *Photosynthetica* 50 (xxx-xxx).

70. Thiagarajan, A., **Rajasekaran L.R.**, Peppin, S., Forney, C., Desjardins, Y. Dorais, M., 2012. Characterization of phytohormonal and postharvest senescence responses of balsam fir (*Abies balsamea* (L) Mill.) exposed to short-term low temperature. *Trees - Structure and Function* DOI 10.1007/s00468-012-0728-1

69. Veitch, R., **Rajasekaran L.R.**, Mason M.T. 2011. The influence of Light Emitting Diodes (LED) on post-harvest needle abscission in balsam fir. *International Journal of Applied Agriculture* 14 (1).

68. *Rayirath, U., Rajasekaran, L.R., Caldwell, C.D., Sibley, K., Asiedu, K.* 2011. Role of ethylene and jasmonic acid on rhizome induction and growth of rhubarb. *Plant Cell Tiss Organ Cult.* 105:253–263.

67. Pan, X., **Rajasekaran L.R.**, Caldwell, C.D., Falk, K.C. 2011. Water-stress and N-nutrition effects on photosynthesis and growth of *Brassica carinata*. *Photosynthetica* 49:309-315.
66. Pan, X., **Rajasekaran L.R.**, Caldwell, C.D., Falk, K.C. 2011. Photosynthetic and growth responses of *Camelina sativa* (L) Crantz to varying nitrogen and soil water status. *Photosynthetica* 49:316-320.
65. MacDonald, M.T., **Rajasekaran, L.R.**, Dorais, M, Pepin, S., Desjardins, Y. 2010. Ethylene triggers needle abscission in root-detached balsam fir. *Trees* 24, 879-886.
64. MacDonald, M.T., **Rajasekaran, L.R.**, Robinson, A.R., Hoyle, J. 2010. Ambiol-induced benefits begin at germination, persist through development and passed on to its next generation in tomato seedlings. *J. Plant Growth Regulation* 29:357-365.
63. MacDonald, M.T., **Rajasekaran, L.R.**, Hoyle, J., Robinson, A.R. 2009. Ambiol preconditioning can induce drought tolerance in abscisic acid-deficient tomato seedlings. *HortScience* 44 (7):1-5.
62. MacDonald, M.T., **Rajasekaran, L.R.**, Robinson, A.R., Hoyle, J. 2009. Seed preconditioning with natural and synthetic antioxidants induces drought tolerance in tomato seedlings. *HortScience* 44:1323-1329.
61. Rayirath, U.P., **Rajasekaran, L.R.**, Caldwell, C.D., Asiedu, S.K., Sibley, K.J., Adams, A. 2009. CCC and Prohexadione –Ca enhance rhizome growth and lateral bud production in rhubarb (*Rheum rhabarbarum* L) *J Plant Growth Regul* 28:137-146.
60. Palanisamy, R., **Rajasekaran, L.R.**, Asiedu, S.K., Caldwell, C.D., Adams, A. 2008. Canopy volume and root length influence greenshoulder and internal greening in carrot genotypes. *International Journal of Vegetable Science* 15 (2):116.
59. Urbanick, S.D., Caldwell, C.D., Zheljzkov, V.D., **Rajasekaran, L.R.**, Luan, L. 2008. The effect of cultivar and applied nitrogen on the performance of *Camelina sativa* L in the Maritime Provinces of Canada. *Can. J. Plant. Sci* 88:111-119.
58. Urbaniak, S. D., Caldwell, C.D., Zheljzkov, V.D., **Rajasekaran, L.R.**, Luan, L. 2008. The effect of seeding rate, seeding date and seeder type on the performance of *Camelina sativa* L. in the Maritime provinces of Canada. *Can J. Plant Sci.* 88:501-08.
57. Wright, H., DeLong, J., **Rajasekaran, L.R.**, Prange, R. 2008. A new minimum fluorescence parameter, as generated using pulse frequency modulation, compared with pulse amplitude modulation: Fx versus Fo. *Photosynth Res.* 97: 205-214.

56. *Wright, H., DeLong, J., Prange, R., Rajasekaran, L.R.* 2008. The relationship between water status and chlorophyll a fluorescence in grapes (*Vitis* sp). Post harvest Biology and Technology 51: 193-199.
55. *Pattipas, F.C., Rajasekaran L.R., Caldwell, C.D., Warman, P.* 2008. Critical tissue identification and soil plant nutrient relationships in the dicer carrot variety Red Core Chanteney. Communication in Soil Science and Plant Analysis 39:763-788.
54. *MacDonald, M., Rajasekaran, L.R., Hoyle, J., Robinson, A.R.* 2008. Ambiol, a derivative of 5-hydroxybenzimidazole seed preconditioning acclimates tomato seedlings to drought. Acta Hort.(ISHS) 774: 355-362.
53. *Rajasekaran, L.R., Thiagarajan, A., Gordon, R., Astatkie, T., Adams, A.* 2007. Optimizing photosynthetically active radiation and moisture regimes can enhance water use efficiency in carrots. Acta Hort. (ISHS) 767:53-58.
52. *Rajasekaran L.R., and Adams, A.* 2007. Sustainable carrot production technologies: The interactive effects of soil moisture and nitrogen fertilization on the yield and recovery of slicer carrots. Acta Hort. (ISHS) 767: 211-216.
51. *Rajasekaran, L.R., Joy, P., Fullerton, C, Williams, B., Ells, A.* 2007. Dehydration reduces crack development in IQF “Baby carrots”. Acta Hort.(ISHS) 768: 559-563.
50. *Thiagarajan, A., Rajasekaran, L.R., Joy, P.* 2007. Compensatory effects of elevated CO<sub>2</sub> on the inhibitory effects of high temperature and irradiance on photosynthetic gas exchange in carrots. Photosynthetica. 45: 355-362.
49. *Leclerc, M., Caldwell, C.D., Norrie, J., Rajasekaran L.R.* 2006 Effect of plant growth regulators on propagule formation of *Astilbe x arendsii*, *Hemerocallis* spp and *Hosta* spp. Hort Science 41: 651-653.
48. *Palanisamy, R., Rajasekaran L.R., Asiedu,S., Caldwell, C.D., Adams, A.* 2006. The Effects of Light and Re-hilling on Greenshoulder and Internal Greening in Carrots. Crop Science 47: 1151-1158.
46. *Thiagarajan, A., Rajasekaran, L.R.* 2006. Intrinsic Changes in Photosynthetic parameters of carrot leaves exposed to elevated CO<sub>2</sub> concentrations under varying moisture deficit regimes. Photosynthetica. 45(1):43-50
45. *Joy, P., Rajasekaran, L.R.* 2006. Post-harvest crack development and freezer enhancement of cut and peel carrots. Journal of Food Science 71: 392-397.
44. *Pattipas, C., Rajasekaran L.R., Caldwell, C.D., Miller, C.* 2005. Leaf tissue testing and soil and plant tissue relationships for nitrogen management in carrots. Communication in Soil Science and Plant Analysis, 37:1597-1609.

43. *Leclerc, M., Caldwell, C.D., Norrie, J., Rajasekaran L.R.* 2006 Effect of plant growth regulators on propagule formation of *Astilbe x arendsii*, *Hemerocallis* spp and *Hosta* spp. Hort Science 41: 651-653.
42. *Briscoe, R.D., Rajasekaran, L.R., Caldwell, C.D., Sibley, K.* 2006. Suitability of Different Gels as Seed Carriers and Germination and Emergence Promoters (GEPs) in Processing Carrots. Hort Science 41: 613-617.
41. **Rajasekaran, L.R.**, T. Astatkie, Caldwell, C.D. 2005. Seeding rate and seed spacing modulates yield and recovery of slicer and dicer carrots differently. Scientia Horticulturae 197: 319-324.
40. **Rajasekaran, L.R.** Stiles, A., Blake, T.J. 2005. The effects of natural and synthetic seed preconditioning agents (SPA) in hastening seedling emergence and enhancing yield and quality of processing carrots. Scientia Horticulturae 106: 25-37.
39. *Leclerc, M., Caldwell, C.D., Rajasekaran L.R., Norrie, J.* 2005. Effect of inflorescence removal on propagule formation of *Astilbe x arendsii*, *Hemerocallis* spp and *Hosta* spp. Hort Science 40 (3): 756-759.
38. *Kyei-Bohen, S., Rajasekaran L.R., Astatkie, T., Gordon, R. and Caldwell, C.D.* 2003. Leaf gas exchange of carrots in response to elevated CO<sub>2</sub> concentrations. Photosynthetica.41: 597-603.
37. **Rajasekaran, L.R.**, Stiles, A., *Surette, M.A., Nowak, J., Sturz, A.V., Blake, T.J.* 2003. Stand Establishment Technologies for Processing Carrots. Acta Hort. 631: 105-116.
36. *Caldwell, T. and Rajasekaran, L.R. and Hooper, D.* 2003. Physiological Responses of Onion Seedlings Exposed to Drought. Acta Hort. 618:321-327.
35. *Kyei-Bohen, S., Rajasekaran, L.R., Astatkie, T., Gordon, R., and Caldwell, C.D.* 2003. Photosynthetic response of carrots to varying irradiances. Photosynthetica 41 (2): 301-305.
34. *Islam M.A., Blake T.J., Kocacinar, F., Rajasekaran L.R.* 2003. Ambiol, spermine and aminoethoxyvinylglycine prevent water stress and protect membranes in *Pinus strobes* L under drought. Trees-Structure and Function 17:278-284.
33. *Surette M.A., Sturz, A.V., Rajasekaran L.R., Nowak, J.* 2003. Characterization of endophytic plant growth promoting (PGP) bacteria, their location, population density, and biodiversity in processing carrots (*Daucus carota* L. var. sativus). Plant and Soil. 253: 381-390.
32. **Rajasekaran, L.R.**, Stiles, A., Blake, T.J., *Surette, M.A. Caldwell, C. and Nowak, J.* 2002. Stand establishment technologies in processing carrots. Acta Horticulturae 631: 105-116.



31. **Rajasekaran L. R.** 2002. Plant growth regulators in enhancing abiotic stress tolerance in plants. Plant Growth Regulator Society of America, 30.
30. *Neuteboom, C.E., Rajasekaran L.R., Caldwell, C. D., Eaton, L., Havard, P.* 2002. Ethephon and spermidine enhance bulking in dicer carrots (*Daucus carota* var. *sativus*). Plant Growth Regulator Society of America, 30.
29. *Caldwell, T. and Rajasekaran L.R.* 2002. The role and potential of quaternary ammonium compounds in enhancing drought tolerance. Plant Growth Regulator Society of America, 30.
28. **Rajasekaran, L.R., A.Stiles, Caldwell, C. D.** 2002. Stand Establishment in Processing Carrots: Effect of various temperature regimes on germination and the role of salicylates in promoting germination at a low temperature. Can J Plant Sci 82:443-450.
27. **Rajasekaran, L.R.** and Blake, T. J. 2002. A derivative of 5-hydroxybenzimidazole (Ambiol) promotes growth and acclimates carrot seedlings exposed to drought. Can J Plant Sci. 82: 195-202.
26. **Rajasekaran, L. R.** G.P. Jones, D. Aspinall, Paleg, L.G. 2001. Stress Metabolism: IX. Effect of salt stress on trigonelline accumulation in tomato. Can. J. Plant Sci. 81:487-498.
25. **Rajasekaran, L.R.** Aspinall, D. and Paleg, L. G. 2000. Mechanism of salt tolerance in *Lycopersicon* spp. Can. J. Plant Sci. 80: 151-157.
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23. **Rajasekaran, L.R.** and Blake, T. J. 1998. Early growth invigoration of jack pine seedlings by natural plant growth regulators. Trees 12: 420-423.
22. **Rajasekaran, L.R.** Aspinall, D., Kriedemann, T. J. and Paleg, L.G. 1997. Adaptive significance of accumulation of proline and glycinebetaine in wheat exposed to salt stress. Photosynthetica 34(3): 357-366.
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20. *Rajan,G.B., Shakila, A., and Rajasekaran, L.R.* 1997. Mass propagation of Pogostemon patchouli Hook through somatic organogenesis. South Indian Hort. 45: 45-49.

19. Vijayalalitha, S.J. and **Rajasekaran, L.R.** 1997. Influence of naphthalene acetic acid on fruit size in sapota (*Manilkara achrus* Mill. Fosberg) cv. Oval. Ad. Plant Sci., 10(2): 127-129.
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5. **Rajasekaran, L.R.**, Nambisan, K.M.P. and Shanmugavelu, K.G. 1981. Studies on spacing -cum- fertilizer requirement in *Catheranthus roseus* G.Don. In Proc. of the IV All India Workshop on Medicinal and Aromatic Plants. Agricultural College and Research Instt., Tamil Nadu Agricultural University, Madurai, India.
4. **Rajasekaran, L.R.**, Nambisan, K.M.P., Shanmugavelu, K.G., and Selvarajan, M. 1981. Studies on floral biology of *Catheranthus roseus* G. Don. In Proc. of IV All India Workshop on Medicinal and Aromatic Plants. Agricultural College and Research Instt., Tamil Nadu Agricultural University, Madurai, India.
3. **Rajasekaran, L.R.**, Nambisan, K.M.P., Shanmugavelu, K.G.,and Selvarajan, M. 1981. Studies on frequency of irrigation on the yield and alkaloid content of *Catheranthus roseus* G.Don. In Proc. of IV All India Workshop on Medicinal and Aromatic Plants. Agricultural College and Research Instt., Tamil Nadu Agricultural University, Madurai, India.
2. **Rajasekaran, L.R.**, Nambisan, K.M.P., Shanmugavelu, K.G., and Selvarajan, M. 1981. Studies on seed storage and germination in *Catheranthus roseus* G. Don. In Proc. of IV All India Workshop on Medicinal and Aromatic Plants. Agricultural College and Research Instt., Tamil Nadu Agricultural University, Madurai, India.
1. Nambisan, K.M.P., Krishanan, B.M., Selvarajan,M., and **Rajasekaran, L.R.** 1981. Some random thoughts on manuring bananas. In Proc. of National Seminar on Banana Production Technology. Tamil Nadu Agricultural University, Coimbatore, India.

\* Names in italics represent my students or research associates.

***Please note in some journals Rajasekaran L.R is shown as Lada R.R. (as the last name).***

***Scientific Reports (non peer-reviewed)***

39. Rajasekaran, L.R. 2012. Third Annual Research Report – CRC. NSAC. June, 2012.
38. Rajasekaran, L.R. 2011. Second Annual Research Report –CRC. NSAC. March 2011.
37. Rajasekaran, L.R. 2011. First Annual Research Report – CRC. NSAC. March 2011.
36. Rajasekaran L.R. 2011. 13th PCRPs Research Report NSAC. April 2011.
35. Rajasekaran, L.R. 2010 12<sup>th</sup> PCRPs Research Report. NSAC. April 2010.
34. Rajasekaran, L.R. 2009. Screening Balsam fir genotypes for needle abscission resistance. Technical Report -6. Christmas Tree Research, NSAC.
33. Rajasekaran, L.R. 2009. The role of LED lights on needle abscission in Balsam fir. Technical Report-5. Christmas Tree Research, NSAC.
32. Rajasekaran, L.R. 2009. The effects of certain fire retardants on needle retention in Balsam fir. Technical Report -4. Christmas Tree Research, NSAC.
31. Rajasekaran, L.R. 2008. Crown Management Technologies in Rhubarb. Rhubarb Research Program Annual Report. NSAC.
30. Rajasekaran, L.R. 2008. Canopy management technologies for Rhubarb. Rhubarb Research Program Annual Report. NSAC.
29. Rajasekaran, L.R. 2008. PCRPs Annual Report. Vol. 10. Processing Carrot Research Program. NSAC.
28. Rajasekaran, L.R. 2007. Good Agricultural Practices (GAP) for processing carrots: I. Photo-physical-mechanical (PPM) technologies to trigger plant defense against key pests and diseases. Final Report. Technology Development.
27. Rajasekaran, L.R. 2007. PCRPs Annual Report Vol. 9. Processing Carrot Research Program, NSAC.
26. Thiagarajan, A. and **Rajasekaran, L.R.** 2006. Factors affecting needle retention in Balsam fir – A review. Technical Report -3. Christmas Tree Research, NSAC.
25. **Rajasekaran, L.R.** and Thiagarajan, A. 2006. The influence of cold acclimation and role of roots in needle retention in balsam fir. Technical Report -2. Christmas Tree Research, NSAC.
24. **Rajasekaran, L.R.** and Thiagarajan, A. 2005. The physiology of needle retention as influenced by certain chemical agents in balsam fir, *Abies balsamea*. Technical Report -1. Christmas Tree Research, NSAC.

23. Rajasekaran, L.R. 2006. Annual report relating to carrot research activities for ACOA.
22. Rajasekaran, L.R. 2006. Carrot stand establishment technologies. III. An integrated gel seeding techniques for stand establishment in processing carrots. NSAC, Truro, NS.
21. Rajasekaran, L.R. 2006. Genotypic screening and developing drought protection technologies for carrots. NSAC, Truro.
20. Rajasekaran, L.R. 2006. NSERC Project Interim Report.
19. Rajasekaran, L.R. 2006. Rhubarb research program report, NSAC, Truro, NS
18. Rajasekaran, L.R. 2006. PCRP Annual Report 8, NSAC, Truro, NS
17. Rajasekaran, L. R. 2005. Physiology of drought tolerance in carrots: Role of glycinebetaine in enhancing drought tolerance in carrots. NSAC, Truro, NS.
16. Rajasekaran, L.R. 2005. PCRP Annual Report 7, NSAC, Truro, NS.
15. Rajasekaran, L.R.2005. PCRP Final Report, NSAC, Truro, NS.
14. Rajasekaran, L.R. 2005. Sulphur nutrition in Carrot. Final Report, NSAC, Truro, NS.
13. Rajasekaran, L.R. 2004. Maturity modeling in carrots. Final Report, NSAC, Truro, NS.
12. Rajasekaran, L.R.2004. Stand establishment in Carrots, Final Report, NSAC, Truro, NS.
11. Rajasekaran, L.R.2005. Physiology of Greenshoulder occurrence in carrots. NSAC, Truro, NS.
10. Rajasekaran L.R. 2003. AVRDC Report 2002. AVRDC- The World Vegetable Center, Taiwan.
9. Rajasekaran L.R. 2003. Processing Carrot Research Program Report. 2002. Department of Plant and Animal Sciences, NSAC, Truro, Nova Scotia, Canada
8. Rajasekaran L.R. 2002. Processing Carrot Research Program Report. 2001. Department of Plant and Animal Sciences, NSAC, Truro, Nova Scotia, Canada
7. Rajasekaran L.R. 2001. Processing Carrot Research Program Report. 2000. Department of Plant and Animal Sciences, NSAC, Truro, Nova Scotia, Canada
6. Rajasekaran L. R. 2000. Processing Carrot Research Program Report 1999. Department of Plant Science, Nova Scotia Agricultural College, Truro, Nova Scotia, Canada.

5. Rajasekaran L.R. 2000. A Study on the Effect of Foliar Nutrient Application on Yield and Quality of Processing Carrots. Processing Carrot Research Program, Nova Scotia Agricultural College, Truro, Canada, January 2000.
4. Rajasekaran, L.R. 1999. A mega-plot evaluation of promising processing carrot varieties. Processing Carrot Research Program, Dept. of Plant Science, Nova Scotia Agricultural College, Truro, Canada, December 1999.
3. Rajasekaran, L.R. 1999. A study on the performance of various slicer and dicer varieties in Nova Scotia, Processing carrot research program, Dept. of Plant Science, Nova Scotia Agricultural College, Truro, Nova Scotia, Canada, December 1999.
2. Rajasekaran, L.R. 1999. Processing Carrot Research Program Research Report 1998. Dept. of Plant Science, Nova Scotia Agricultural College, Truro, Nova Scotia, Canada, March 1999.
1. Rajasekaran L.R. 1998. Calibrating a model of competition for soil moisture for jack pine seedlings. Faculty of Forestry, University of Toronto, Canada.

**Fact sheets**

Fourteen

**Booklets**

2. Shanmugavelu, K.G., Rajasekaran, L. R. and S. Natarajan. 1983. Vegetable Crop Production, Home Vegetable Gardens and Terrace Vegetable Gardens. TNAU Publication 13: Department of Agricultural Extension, TNAU, Madurai.
1. Shanmugavelu, K.G., Rajasekaran, L.R. and S. Natarajan. 1983. Vegetable Production. TNAU Publication 13A. Department of Agricultural Extension, TNAU., Madurai.

**XI. FELLOWSHIPS, AWARDS AND HONORS**

- Recipient NSAC Research Excellence Award, May 2010.
- Honored by the appointment as Scientific Advisor, Agricultural Green Technologies, Rural Development Authority, Republic of Korea.
- Honored by the Royal Appointment as Advisor to the Deputy Prime Minister of the Kingdom of Cambodia.
- Honored by Government of Republic of Korea by appointing Honorary Research Scientist, Rural Development Authority (RDA), Republic of Korea. (2004-2009)
- Recipient of NSAC President's Research Excellence 2004 recognition for spearheading and providing leadership to a successful multi million \$ ACOA's AIF initiative of Acadian Seaplants Limited.

- Honored by Nomination for Best Supervisor award by NSAC Graduate Students union 2004.
- Honored by Nomination for NSAC Research Excellence Award, Nova Scotia Agricultural College 2003, 2002, 2001.
- Recipient of Canada Foundation for Innovation Research and Development Award. 2001.
- Received prestigious University of Adelaide Research Grant Fellowship, 1984.
- Through competitive national competition by Indian Council of Agriculture Research (ICAR) awarded Junior Research Fellowship, Indian Council for Agricultural Research, 1977.

## **XII. RESEARCH INFRASTRUCTURE**

- Three World Class Tree Physiology, Tree Molecular Breeding, Tissue, Cell and Organ Culture Laboratories established.
- State of the art instrumentation facility with UPLC system, GC and physiological equipment obtained.
- Established a suite of Controlled Environmental Growth Chambers (five) at CRC.
- Six whole tree laboratories established at CRC.
- GC (NSERC funds)
- HPLC (AAFC Donation)
- Established a fully automated Plant Environmental control facility (CFI Funding).
- Image Analysis system (NSERC funding)
- Leaf area meter, Porometer (NSERC funding)
- Constructed mini-rhizotrons, computer controlled lysimeters (CFI funding).
- Set up a World-class Plant physiology and Ecophysiology lab and acquired LCA 4 Photosynthetic system, Multi-environment control chamber, dendrometers, Theta probes, TDR probes, image analysis system, CNS analyzer (CFI Funding).
- Acquired a 28 channel automated water potential system, Nitrate and K analyzer, water mark sensors (NSERC funding).
- Weather stations (NSERC, CFI and Technology Development funding).
- Carrot Harvester and carrot seeder (CFI – Cropping Systems Funding).

## **XIII. EDITORIAL AND REVIEWING ACTIVITIES**

### ***Editorial Review***

- a. American Society of Horticultural Science (Hort Science, Journal of American Society of Horticulture Science).
- b. Canadian Journal of Plant Science.
- c. The Netherlands Journal of Agriculture.
- d. Australian Journal of Plant Physiology (Australian Journal of Plant Biology)
- e. Chief Editor, Beta (PCRP Publication)
- f. Journal of microbial ecology



**Grant proposal Review activities**

- a. NSERC – Research Partnership Program review committee member
- b. BARD - USA-Israel Binational Agricultural Research and Development fund – Reviewer.
- c. NSAC – Internal Reviewer.

**XIV. ESTABLISHING UNIVERSITY-INDUSTRY LINKAGES**

- Established linkages with Agriculture and Agrifood industries including, Oxford Frozen Foods Limited,
- Bragg Lumber Company Limited,
- Knol Farms Limited,
- Acadian Seaplants Limited;
- Grower organizations – Horticulture Nova Scotia;
- Christmas Tree Council of Nova Scotia.
- NB Christmas Tree Coop
- PEI Christmas Tree Industry
- NFL Christmas Tree industry
- Infor Inc, NB
- Smart Christmas tree Research Cooperative.
- Established Atlantic Canada Christmas Tree Research and Development Consortium.
- TruLeaf Inc. Sustainable, Clean Agriculture Technologies.
- Maple Producers Association for Maple Research Programme.

**XV. ESTABLISHING UNIVERSITY-AAFC LINKAGE AND INTERNATIONAL LINKAGE**

- Collaborative research with Agriculture and Agrifood Canada researchers in Kentville and Charlettetown (Drs. Forney, Prange, Delong; Sanderson).
- Collaborative research with University of Toronto (Dr. Terry Blake), Dalhousie researchers (Dr. Hooper and Drs. Stone, Arunika)
- Established collaborations with Drs. Martine Dorais, Steeve Pepin, Yves Desjardins (Laval University), Dan Quiring (UNB).
- Research linkage and MOU with National Chayei University, Taiwan; King Munghat University of Thailand; Royal University of Agriculture, Cambodia, Tamil Nadu Agricultural University, India.
- Established institution linkage and MOU with the World Vegetable Center, Taiwan.

**XVI. PROMOTING RESEARCH**

- Established a world-class Christmas tree Research Centre with 12 researchers and graduate students.

- As Dept. Head, facilitated establishment of a Canada Research Chair in Entomology. Leads promoting research within NSAC and outside of NSAC.
- Established an Industry Research Chair in Edible Horticulture
- Established an AIF funded Research Chair in Stress Physiology through Acadian Seaplants Industry partnership.
- NSERC- REP for NSAC: Promote NSERC Programs on campus, Promote science to community, consultations with students and researchers, mentor research chairs, promotes science to science teachers, innovative ideas to promote science and innovation. (until 2010).
- Established a position – Science Journalism Intern through NSERC Rep funds to promote NSERC Research (faculty and students) out-reach.
- Club for Science and Innovation (CSI), NSAC
- Participates NSERC Regional Rep meetings and Promotes Science and Research success during NSERC workshops.
- Periodical TV interviews, CBC Radio interviews, Discovery Channel
- Presentation in national and international conferences and congresses
- Presentation in Atlantic Regional conferences
- Organize and present at Annual Carrot grower conferences
- Research presentation and training DNR staff.
- Research presentation to the CTCNS Research Committee
- Frequently invited speaker in national and international conferences and congresses.
- Publish Beta
- Annual Research Reports prepared and circulated to all stakeholders.
- Train high school and junior high school students for science competitions and several won national and regional gold.
- Work collaboratively with NSAC researchers, AAFC researchers and researchers in other universities and with International research organization.
- Constantly publish research in peer-reviewed journals.
- Actively participate in Research Days, Open houses, Agri Fest, University day, Scotia Hort congress.
- Honorary Research Scientist - Rural Development Authority, Republic of Korea.
- Promotes science and innovation to the industries and develop collaborative projects.
- Graduate Program advisor for the Department of Plant and Animal Science since 1999 until 2002 and worked with graduate students and mentored.

## XVII. TEACHING

Over **twenty five years** of teaching experience at the University level, at technology, undergraduate, graduate and doctoral level students of Plant Sciences, Agriculture, Horticulture and Forestry programs in various national and International Universities.

### **Current teaching assignments:**

PLSC 4002: Plant Ecophysiology Fall.

PLSC 4001: Crop Adaptation, Fall (until 2006)

PLSC 4010: Special Topics in Plant Science – Tree and Ecophysiology, Nutriphysiology, Fall

AGRI5440: Special Topics in Crop Physiology

– Advances in Plant Growth and Development. Winter or

– Advances in Stress Physiology and Metabolism Winter

AGRI5710: Graduate Modules (Maximum of Three a year)

AGRI1000: Agroecosystems (Multi-instructor's course) – Vegetable production systems, Fall

**B.Sc. Ag. (1989-1994)**

1. Fundamentals of Horticulture, 2. Plant Propagation, 3. Vegetable crops and Pomology, 4. Spices and Plantation crops.

**B.Sc. Ag. Honours (1986-1988) Plant Physiology**

**M.Sc. Ag. & PhD: (1989-1998)**

1. Growth and Development, 2. Environmental Horticulture, 3. Advances in Vegetable Production, 4. Advances in Pomology, 5. Medicinal and Aromatic Plants, 6. Research Methodology, 7. Tree physiology - Stress Physiology, Metabolism, Acclimation (co-instructor), 8. Tree physiology - Plant growth regulators (co-instructor).

**Graduate Modules: (1998-Till date)**

1. Dormancy, 2. Tuber and bulb Formation, 3. New Plant Growth Regulators, 4. Responses of Plants to Environmental Stresses, 5. Stress Adaptation and Acclimation, 6. Methods in Stress Physiology, 7. Plant growth regulators and Environmental stresses, 8. Mechanism of nutrient uptake, 9. Bulking Physiology, 10. International Vegetable Production Systems; 11. Seed physiology, 12. Protein and Lipid Metabolism. 13. Seed storage physiology and technology, 14. Plant defense against abiotic stresses, 15. Developmental physiology of *Vitis vinifera* grapes.

**Sessional Lectures: (1998-Till date)**

1. Diagnosis and Diagnostic criteria in plants, 2. Plant growth regulators and stress adaptation, 3. Indian Gardens, 4. Vegetable production – Carrot production, 5. Environmental stresses in plants, 6. Breeding of horticultural crops, 7. Carrots in cropping system: Dollars or Soil., 8. Grafting procedures, 9. Adaptation of plants to drought- Carrots-A case study, 10. Carrot cropping systems, 10. Agroecosystems – Vegetable production systems (Tropical and temperate); 11. International Agriculture.

**Academic Programs Development:**

1. Developed a concept note for Post-Bacc Diploma in International Agriculture.  
2. Developed a concept note for one year non-thesis M.Sc in Agriculture

3. Developed a concept note for Masters in International Agriculture.
4. Directed development of two year Diploma in Agri Extension, Cambodia (CIDA)
5. Chair, Plant Science Degree program revitalization working group.
- 6.. Lead, Plant Science Program Outcomes Development Group.
- 7.. Member, Biology Program development committee.
8. Lead International Agriculture Program Development, NSAC.
9. Lead Post-bachelorette in International Agriculture, NSAC
10. Chair, Board of Studies Horticulture – Developed Graduate and Post graduate program in Horticulture, Annamalai University, India. 1998-1999.

***Curriculum Development:***

1. Fifteen new graduate modules developed and offered, NSAC (list above)
2. Three graduate courses developed, NSAC. (Advances in Plant Growth and Development; Advances in Plant Stress Physiology; Advances in Plant Growth Regulators). - NSAC
3. One new course for B.Sc. Agr. on Introduction to Plant Science developed, NSAC
4. One new course for Final year B.Sc. Agr. Students – Plant Ecophysiology developed and offered. – NSAC.
5. One new course on Root Physiology- Secrets from underground developed (with curriculum committee) - NSAC.
5. Eight graduate courses developed for M.Sc. Hort. Program and implemented, Annamalai University, India.

**XV. TRAINING HIGHLY QUALIFIED PERSONNEL**

More than **one hundred and twenty HQPs** have been trained including, twenty seven graduate students, eight undergraduate honours students, eighteen research assistants, four research technicians, four research associates, thirty nine research scientist/specialists, ten faculty and six post-doctoral fellow/research associates, seventy horticulture professionals in various national and international R and D organizations and universities.

**Principal Supervisor**

**Ph.D. Students**

3. Gay MacDonald 2011. Antioxidative stress physiology in postharvest balsam fir (Dr. Lada, Dalhousie University). Current.
2. Aru Thiagarajan 2009. Root signals in controlling senescence. Ph.D. (Drs. R. Lada; S.Peppin, University of Laval)- Graduated.

1. M. MacDonald 2007 - Physiology of Senescence – PhD (Drs. R. Lada – NSAC; Dr. Martine Dorais, University of Laval) – Graduated.

### **Master's Students**

33. Melissa Georgeson (2011 -). Nutrition physiology and needle retention in balsam fir. NSAC/Dalhousie University.

32. Krishanthi Vithanage (2010-). Ecophysiology seedling emergence in processing carrots. NSAC/Dalhousie University.

31. Robin MacInnes (2010- ). Hydraulic linkage with postharvest needle abscission in balsam fir. NSAC/Dalhousie University.

30. Ernest Korengye (2010- ). Physiology of volatile terpenes in postharvest needle abscission in balsam fir. NSAC/Dalhousie University.

29. Maya Subedi (2010- ). Role of proline and quaternary ammonium compounds in mitigating postharvest needle abscission in balsam fir. NSAC/Dalhousie University.

28. Mark Schooten, (2009- ) Polyols metabolism in cold-acclimated balsam fir. NSAC/Dalhousie.

27. Samantha Feltmate (2005-). Canopy regulation in Rhubarb. NSAC/Dalhousie University. (Part-time)

26. Usha Menon (2005-2008). Crown management in Rhubarb. NSAC/Dalhousie university.

25. Mason MacDonald. (2004-2006). Seed protein and endogenous signals due to embryoconditioning using various antioxidant compounds. NSAC/Dalhousie University.

24. Kathy Pickle M.Sc. (2006-2010). Plant defense enhancement through photo, physical and mechanical means. NSAC/Dalhousie University.

23. Rowen Briscoe M.Sc. 2003-2005. Seedling physiology of carrots. NSAC/Dalhousie

22. Ravishanker, P. M.Sc. 2002-2004: Physiological mechanisms of Greenshoulder (GS) in carrots. NSAC/Dalhousie.

21. F.C. Pattipas. M.Sc. 2001-2003. Carrot Nutrition. NSAC/Dalhousie University.

20. C. E. Neuteboom. M.Sc. 2000-2002. Bulking Physiology and Signals in carrots, NSAC/Dalhousie.

19. M. Surette. M.Sc. 2001. Role of EPBB's in Enhancing Yield, Quality and Stress Tolerance in Processing Carrots, NSAC/Dalhousie.
18. T. Caldwell, M.Sc. 2001. Role of Quaternary Ammonium Compounds and Tertiary Sulphonium compounds in Enhancing Drought Tolerance of Vegetable Crops, NSAC/Dalhousie.
17. Ashok. M.Sc. (Hort). 1994. Salt tolerance of onions (*Allium cepa* var. *aggregatum*). Annamalai University, India.
16. Baskarajan. M.Sc. (Hort). 1994. Enhancing high temperature tolerance in geranium and patchouli through tissue and cell culture techniques. Annamalai University, India.
15. Jeeva Rani M.Sc. (Hort). 1994. Physiological mechanisms of flooding tolerance in egg plant. Annamalai University, India.
14. Baskar. M.Sc. (Hort.). 1994. Salt tolerance of chillies. Annamalai University, India.
13. M. Shanmuganathan M.Sc.(Hort.) 1994. Hastening tuberization in cassava. Annamalai University, India.
12. Ramesh, M.Sc.(Hort.) 1995. Physiological manipulation to initiate curd formation in cauliflower in warmer climate, Annamalai University, India.
11. Rajkumar, S. M.Sc. (Hort.) 1994. Screening and elucidation of mechanism of tolerance in tomato exposed to high temperature. Annamalai University, India.
10. Usha Subramanian, M.Sc.(Hort.) 1994. Physiological and biochemical basis of senescence and means to extend post-harvest shelf life of jasmies. Annamalai University, India.
9. Prabha, D. M.Sc. (Hort.) 1994. Mechanism of salt tolerance in bhendi. Annamalai University, India.
8. Sakthivel, T. M.Sc. (Hort.). 1994. Studies on the physiological, biochemical and molecular basis of high temperature seed conditioning in enhancing high temperature tolerance in tomato. Annamalai University, India.
7. Karupiah M.Sc. (Hort.) 1993. Standardization of tissue culture methods and *in-vitro* manipulation to evolve cell lines tolerant to NaCl stress in tomato. Annamalai University, India.
6. Shanmuganathan, V. M.Sc. (Hort.) 1993. Studies on hormonal alleviation of NaCl-induced responses in tomato cv. Naveen. Annamalai University, India.

5. Vijayalalitha, S.J. M.Sc. (Hort.) 1993. Mechanism of flower drop in NaCl stressed tomato. Annamalai University, India.

4. Anburani, A. M.Sc. (Hort.) 1993. Mechanism of flower drop in water stressed tomato. Annamalai University, India.

3. Haripriya Ph.D 1994 Breeding for quality enhancement in paparikas, Annamalai University, India

2. Shakila Ph.D. 1994 Physiology and molecular basis of tolerance to salt stress in the cell lines of tomato. Annamalai University, India.

1. David Davadass Ph.D. 1994 Brassinolides and stress tolerance in plants. Annamalai University, India.

***Co-supervisor:***

5. G. Kakkar. 2007. Soil plant nutrition of Broccoli – M.Sc. (Co-supervisors: Drs. R. Lada and Li).

4. H. Wright. 2005-2007. Chlorophyll fluorescence and water relations in berry development in wine grapes. NSAC/Dalhousie University. (Co-supervisors: Dr. R. Lada and Dr. Robert Prange).

3. D.L. Wu. M.Sc. 2003-2004. Screening tomato and egg plant germplasm for selecting suitable rootstocks for enhancing flooding tolerance in tomato and egg plants. National Chayi University, Chayi, Taiwan. (Co-supervisors – Dr. Lada and Dr. Yen).

2. M.A. Islam. M.Sc.F. 1997-1999. The effects of chemical preconditioning on physiological changes in drought stressed plants. M.Sc.F. Thesis, University of Toronto, Canada. (Co-supervisors: Dr. T.J. Blake and Dr. R. Lada).

1. Bob Ocran. PhD. 1998- 2004: Natural compounds in enhancing stress tolerance in plants. PhD Thesis. University of Toronto. – In progress (Co-supervisors: - Dr.T. J. Blake and Dr. R. Lada).

***Graduate Student Advisory Committee membership:***

10. Margaret E. M. Sc. Weed control in blueberries. (Supervisor: Dr. N. Boyd)

9. Mullivanan M. M.Sc. Dollar disease control using seaweed extracts in turf grass. (Supervisor: Dr. Prithviraj)

8. Yungfei, Yu. M.Sc. Bioproducts from oil seed crop. (Supervisor: Dr. Claude D. Caldwell)



7. Pan Xue. M.Sc. Ecophysiology of oil seed crops. (Supervisor: Dr. Claude D. Caldwell)
6. Lara Gibbson. M.Sc. Climate modeling growth, yield and quality of wild blueberries. (Supervisor: Dr. Lenord Eaton)
5. Shannon Urbanik. M.Sc. Fatty acid profile changes in various seed crops and their utilization. (Supervisor: Dr. C. Caldwell).
4. Limin Lu. M.Sc. Genotype and environment interaction on fatty acid composition of sunflower and sunola. (Supervisor: Dr. C. Caldwell).
3. Scot Vitth. M.Sc. Genetic and environmental regulation of yield in Triticale cultivars. (Supervisor: Dr. C. Caldwell).
2. Melanie Le Clerk. M.Sc. Seaplant extracts and growth regulators in enhancing propagule production in certain ornamental plants. (Supervisor: Dr. C. Caldwell).
1. Salah Bensalim PhD. (Until 2000). Endophytic biotization in enhancing high temperature tolerance in plants. Dalhousie University/NSAC. (Co-Supervisor: Dr. J. Nowak).

***Undergraduate Honours Research Project Supervision:***

11. Jonathan Sampson 2011. Drought effects on postharvest needle retention in balsam fir.
10. Andrew Smith 2010. Carbon sequestration trends in crops.
9. Lauren Monroe 2005. Enhancing plant defense through rhubarb leaf extracts.
8. Sarah Reddy 2004. Enhancing salinity tolerance in tomato.
7. Geff Shinkles, 2003. Triggering plant defense through physical manipulation of plants
6. Tommy Dixon 2001. May Weed control in a cropping system-an in vivo approach.
5. Gordon Murray 2000. Effect of swathing time on canola seed quality.
4. Christine Pattipas 2000. Emergence synchronization using plant growth regulators in carrots.
3. Sarah MacNally 2000. Postharvest storage changes in beta-carotene as influenced by different storage techniques.

2. Jennifer Roach 1999. Role of ethylene and JA in enhancing bulbing in tulips
1. Carol Stykes 1999. Allelopathic compounds from rotational crops and their effects in weed control in carrots.

#### **XVIII. EXTENSION, OUTREACH AND COMMUNICATION SKILLS**

- Developed and strengthened industry collaboration for establishing processing Carrot Research Program, Knol Farms Research Program, Edible Horticulture Research Program, Growth and Stress Products Research Program, Christmas Tree Council of Nova Scotia, INFOR Inc, NB, DA (NB) & DNR (NS,NFL)
- Implemented "Participatory Research" and "Lab to Land" Programs
- Chief Editor of a Newsletter "Beta" circulated to growers "free of cost"
- Developed Web-based discussion forum
- Conducted twilight tours, exhibitions, grower meetings
- Organized and chaired grower conferences
- Field demonstrations of technologies in grower fields
- Day-to-day involvement with the industry
- Participated in NSAC Open house
- Fact sheets developed and circulated
- Annual report written and circulated
- Television interviews
- Public exhibitions
- Open house
- Editor – Annual Research Report (Indian Cardamom Research Institute -1989)

#### **XVIII. INTERNATIONAL CAPACITY BUILDING, RESEARCH AND DEVELOPMENT ACTIVITIES**

- **Scientific Advisor, Agricultural Green Technologies, Rural Development Authority, Republic of Korea.**
- **Advisor, Deputy Prime Minister of Kingdom of Cambodia.**
- **Volunteer, Executive Advisor** – Canadian Executive Services Organization (CESO), Canada.
- **Expert consultant** - International Center for Biosaline Agriculture, Dubai
- **Honorary Scientist, Rural Development Authority, Government of Republic of Korea.**
- **Project Director – Agriculture Education for Extension in Cambodia.** CIDA funded project.
- **International project development:** Project Development Team – Agriculture Education in Cambodia submitted to **ACCC (CIDA)**. Co-lead for a Tier II CIDA project (\$1.5m) on Poverty Eradication Agricultural Systems (PEAS) in western China. Co-lead in a Tier I (\$5 million) project on Nutritional and Economic Security Transition

(NEST) project in collaboration with University of Philippines, Visayas for submission to CIDA. Project Development: **ADB** (Poverty Reduction, rural economic sustainability and human capacity building through vegetable based post-harvest technologies in Cambodia, LaoPDR, Vietnam), **USAID** Providing sustainable livelihood through enhanced vegetable production in peri-urban and poppy cultivation areas in Afghanistan. **Council of Agriculture Taiwan** – Concept notes and detailed proposal were prepared for several projects and some of them were successfully funded.

- **Developed and participated in international funding proposals** for GTZ/BMZ, MOFA, ADB, USAID, COA funding while at the World Vegetable Center – AVRDC.
- **Chair, International Agriculture Programs Development** – B.Sc. Int Agr. And M.Sc. Int. Agr.
- **Innovative International Project Concepts** – several concept notes are under circulation to various international funding agencies.
- **Successful International cooperation agreement** with NCU, Taiwan, AVRDC -World Vegetable Center, Taiwan; KMUTT, Thailand, HAU, China, YAU, China, Royal University of Agriculture, Cambodia.
- **International student training** – NCU, Taiwan; KMUTT, Thailand; YAU, China; TNAU, Annamalai University, Kerala Agriculture University, India; CASE – Jamaica, BFRC – Bangladesh, Japan, Cambodia, LaoPDR.
- **Head, Crop and Soil Management and Olericulture** in World Vegetable Center (AVRDC), Taiwan.
- **Implemented and supervised International Vegetable Research projects** in the Philippines, Cambodia, Vietnam, Laos, China, India, Thailand.
- **Successful funding** from Council of Agriculture, Taiwan; ADB.
- **AVRDC's representative and Steering Committee member in CGIAR**- Future Harvest – Rebuilding Afghanistan Agriculture Initiative.
- **Strengthened NARS linkage** with the Philippines, Cambodia, Vietnam, Laos, China, India, Syria, Thailand and Afghanistan.
- Participated in AVRDC Strategic Planning workshop
- Conducted Strategic planning workshops and finalized research strategies and directions for Crop and Soil management and Olericulture Units.
- **Trained NARS** from the Philippines, Taiwan, Cambodia, LaoPDR, China, Vietnam, Japan.
- **Countries traveled** - India, Australia, Canada, USA, the Philippines, LaoPDR, Vietnam, Cambodia, China, Syria, Malaysia, Singapore, Thailand.
- **International funding network contacts** – ADB, CIDA, IDRC, USAID, GTZ/BMZ, MOFA, DANIDA, RDA- Korea, FAO, UNIDA.

#### **XIX UNIVERSITY Administration, Management, and Service**

2011-Current: Department Head, Environmental Sciences, NSAC.

2010-Current: Founding Director, Christmas tree Research Centre, NSAC.

2008 –2010: Faculty Graduate Studies Coordinator, NSAC.

2005-current: Member, Research Committee, NSAC.

2005- 2010: NSERC Representative, NSAC  
2008- current: Member, Faculty council – Faculty of Graduate Studies, Dalhousie University.  
2006-current: Member, Academic Policy Committee, NSAC  
2006- 2008: Chair, Faculty Council, NSAC.  
2004- 2006: Vice-Chair, Faculty Council, NSAC.  
2004- 2008: Member, Procedures committee, NSAC  
1998- current: Member, Faculty of Graduate Studies, Dalhousie University.  
2002-2003: Chair, Steering Committee: Acadia Seaplants Limited AIF Initiative.  
Partnership development, Concept development, Proposal development, Organizing workshops.  
2001 - 2002: Steering Committee Member Representative for NSAC, Atlantic Network on Bioactive Compounds, UPEI. Atlantic Innovation Fund (AIF)  
Chair steering committee meetings at NSAC, conduct workshop, proposal development, planning, team building, conflict resolution, infrastructure proposal development.  
2002: Volunteer-Facilitator, Departmental Strategic Plan (Research), NSAC.  
1998 – 2001: Member, Graduate Policy Working Committee.  
1998 – 2002: Graduate Program Advisor, Department of Plant & Animal Sciences, Nova Scotia Agricultural College, Truro, NS.  
1998-1999: Member, Research Committee, Nova Scotia Agricultural College, Truro, NS. Canada.  
Strategic research plan development, Project proposal review, Visibility enhancement, Recommendations to the Principal, NSAC.  
1998 - Till date Member, Faculty Council, Nova Scotia Agricultural College, Truro, NS. Canada.  
1998-2001: Chairman, Laboratories Committee, Nova Scotia Agricultural College, Truro, Canada.  
1998-2001: Member, Atlantic Vegetable Research Committee  
1998-Till date: Member, Horticulture Nova Scotia Research Group  
1998-Till date: Member, BioAtlantic Tissue culture Association  
1998-Till date: Member, Carrot Research Advisory Committee  
1991-1994: Member, Syndicate, Annamalai University, India.  
- University Policies.  
1989-1994: Member, Academic Council, Annamalai University, India.  
1989-1994: Chairman, Board of Studies (Horticulture)  
1989-1994: Chairman, Board of Selection (Horticulture)  
1989-1994: State Advisor, Temple gardens development, State Government of Tamil Nadu, India.  
1989-1994: Chairman, University gardens development  
1982-84: Member, Academic Council, Tamil Nadu Agricultural University, Coimbatore.  
1989-94: Member, Research Project Review committee, Indian Council of Agricultural Research, New Delhi, India.

**XX. TRAINING AND EXPERIENCE**

- University Management
- University, Corporate R and D and International R and D experience.
- Research Management
- Group Dynamics
- Team building
- Recruitment/Human Resource Development
- Recruitment
- Budget/Financial Management
- National and International R and D Grant Proposal Development, Project Development and Implementation
- Strategic Plan and Rolling Plan Development.
- Project Monitoring and Review.
- Industry and Institution Linkage and Promotion
- International Research Centers and Universities
- Networking
- Provincial, Federal, International funding agency linkage.
- Partnership building
- Mentoring

**XXI. MEMBERSHIP IN PROFESSIONAL BODIES**

- Member, International Society of Horticultural Science (Current)
- Member, Nova Scotia Institute of Agrologists (Current)
- Member, American Society of Horticultural Science (Current)
- Member, Canadian Society of Horticultural Science (until 2004)
- Member, Canadian Society of Plant Physiology (until 2002)
- Member, Atlantic Vegetable Research Committee (until 2000)
- Member, Atlantic Tissue culture Association (until 2002)
- Life member, Indian Society of Horticulture
- Life member, Indian Society of Spices

**XXII. SKILLS**

<ul style="list-style-type: none"> <li>➤ Relationship building</li> <li>➤ Facilitator</li> <li>➤ Team leader</li> <li>➤ Leadership building</li> <li>➤ Human resource development</li> <li>➤ Strong believer of Science and Technology</li> <li>➤ Relationship builder</li> <li>➤ Excellent attitude.</li> <li>➤ Professionalism</li> <li>➤ Connects with people quickly</li> <li>➤ “People first” philosophy</li> <li>➤ Discoverer and innovator</li> <li>➤ Self motivated</li> </ul>	<ul style="list-style-type: none"> <li>➤ Efficient communicator</li> <li>➤ Respect for all living beings.</li> <li>➤ Punctual</li> <li>➤ Confident</li> <li>➤ Hard working</li> <li>➤ Sincere</li> <li>➤ Strong judgment</li> <li>➤ High ethical and moral standards</li> <li>➤ Highly flexible</li> <li>➤ Friendly</li> <li>➤ Concern for others</li> <li>➤ Helping and motivating</li> <li>➤ Volunteerism</li> <li>➤ Task oriented, results based approaches</li> <li>➤ Community development (training young scientists)</li> </ul>
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**XXIII. LEADERSHIP**

<ul style="list-style-type: none"> <li>• Leadership in establishing Christmas trees Research Centre.</li> <li>• Chair, Smart Trees and Technologies Initiative – AIF Proposal.</li> <li>• Leadership in establishing Atlantic Canada Christmas tree Research and Development Consortium.</li> <li>• Demonstrated leadership in horticulture sector</li> <li>• Demonstrated leadership in generating grants from NSERC, CFI, AIF, AAFC-MII, Technology Development, AWARD 2000, AgriFocus 2000, AgriFutures, Council of Agriculture, Taiwan, Asian Development Bank (while at WVC), Indian Council of Agricultural Research (ICAR), Ministry of Coal.</li> <li>• Leadership in establishing an Edible Horticulture Program at NSAC.</li> <li>• Leadership in establishing Processing Carrot Research Program at NSAC.</li> <li>• Leadership in establishing Rhubarb Research at NSAC.</li> </ul>	<ul style="list-style-type: none"> <li>• Leadership in developing multi-million \$ proposals for CFI for a Centre for Plant Environmental Stress Research.</li> <li>• Demonstrated Global horticulture leadership.</li> <li>• Leadership in training Highly Qualified Professional – over 100 HQPs were trained.</li> <li>• Leadership in strategic planning for Crop and Soil management.</li> <li>• Leadership in establishing successful partnership with Agri-food industries.</li> <li>• Leadership in Research team building, training, and retraining and retaining.</li> <li>• Leadership in successful CIDA funded international project in Cambodia.</li> <li>• Leadership in developing a successful ADB funded project.</li> </ul>
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<ul style="list-style-type: none"> <li>• Leadership in establishing Christmas Tree Research at NSAC.</li> <li>• Leadership in establishing Marine Bioproducts Research at NSAC. (Chair, Marine Bioproducts AIF proposal development, Acadian Seaplants Ltd).</li> <li>• Leadership in establishing Agroinformatics Research at NSAC</li> <li>• Demonstrated leadership in establishing national level and world-class research programs.</li> </ul>	
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#### XXIV. KNOWLEDGE ABOUT UNIVERSITY, NATIONAL RESEARCH INSTITUTIONS AND GLOBAL RESEARCH CENTRES

<ul style="list-style-type: none"> <li>• Knowledge on Global Agriculture and Horticultural Systems.</li> <li>• Network with several international universities and research centres.</li> <li>• Knowledge about international funding organizations.</li> <li>• Demonstration partnership building with various national, international universities and research centres, and funding agencies.</li> <li>• Excellent knowledge on Canadian University research and innovation environments.</li> <li>• Knowledge on key Atlantic industries and organization, universities.</li> <li>• Knowledge in global issues, organizations, and demonstrated abilities to link and establish partnership and collaboration.</li> <li>• Good knowledge about national, provincial and regional funding agencies and guidelines.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge on university issues and policies relating to research and infrastructure</li> <li>• Knowledge on university administration, finance management, policies and strategic plans.</li> <li>• Knowledge on universities research productivity and intensity.</li> <li>• Global knowledge on scientific development, international organizations.</li> </ul>
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#### XXV. ABILITIES

<ul style="list-style-type: none"> <li>• Excellent people skills</li> <li>• Proven communication skills (oral and in writing)</li> <li>• Demonstrated leadership and Relationship building</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent fund generation skills/ Proposal development and review</li> <li>• Outstanding out reach skills.</li> <li>• Knowledge about regional universities, federal research institutions,</li> </ul>
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<ul style="list-style-type: none"><li>• Excellent team building, group dynamics, conflict resolution, financial management, human resource management, training, strategic planning, policy development.</li><li>• Able to work under pressure</li><li>• Innovator and discoverer</li></ul>	<p>community colleges and track record of collaborations with some.</p> <ul style="list-style-type: none"><li>• Believes in collegiality, professionalism, interpersonal relationship at all levels.</li><li>• Knowledge about various provincial, regional and national funding agencies including NSERC, CFI funding programs.</li><li>• Ability to establish partnership with various industries and work with diverse, multi-national staff, stakeholders.</li></ul>
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**Reference available upon request**