

**DEPARTMENT OF HORTICULTURE
POST GRADUATE DIPLOMA IN TEA MANAGEMENT**

SEMESTER – I [16 credits]

HOR-PGD-101: Botany and Crop improvement	(3+1) credits
HOR-PGD-102: Agronomy and Management of tea	(3+1) credits
HOR-PGD-103: Processing, Quality assessment and Product Diversification of tea	(3+1) credits
HOR-PGD-104: Economics and Financial Management of tea industry	(3+1) credits

SEMESTER – II [16 credits]

HOR-PGD-201: Computer application and communication skill development, WTO & Global Issues Related To Tea	(3+1) credits
HOR-PGD-202: Social, environmental and legal aspects in tea	(3+1) credits
HOR-PGD-203: Internship	(0+8 Credits)

Students will be on Internship for 3 months in the middle of 2nd semester after which they will write a project report

Mode of evaluation: Project Report + Viva

The candidates will be assigned a supervisor at the end of I semester

SEMESTER I

HOR-PGD-101: Botany and crop improvement

Unit I: Introduction of Tea

Importance of tea, cheapest hygienic beverage drink, health benefits of tea, generation of employment, domestic revenue earner, and foreign exchange earner.

Geographical Origin of Tea, Origin of Tea Drinking Practice, Cultivation of Tea in different Countries, Cultivation of Tea in India, Global Uniqueness: Cultivation of Tea in Darjeeling And Sikkim.

Unit II: The Science of Tea

Classification of the Tea Plant: Taxonomy, Chemical taxonomy, Morphology Anatomy. Growth Characteristics of the Tea Plant: Freely-growing plant, Root growth, Shoot growth, Pruned and Plucked Bush, Periodic growth, Vertical growth, Radial growth, Harvest Index.

Unit III: Physiology of tea plant

Imbibition, diffusion, osmosis, Photosynthesis, Respiration, Transpiration. Photoperiodism, enzyme, plant pigments, Phenols. Apical Dominance, Dormancy – Quiescent & Winter Dormancy, Physiological activities and Crop productivity.

Unit IV: Genetics and CytoGenetics

Brief history of cell, cell division – Mitosis and Meiosis, the chromosome, Mendelian principles of heredity, Polyploidy- Haploidy, Diploidy, Triploidy, Aneuploidy, Improvement of tea plants (Demonstration in the tea field), Improvement by Selection.

Unit V: Crop improvement

Principles of plant breeding, Improvement of tea plants (Demonstration in the tea field), Improvement by Selection. breeding techniques for improvement of tea.

Practical:

Growth parameter observation in tea, Study on GR application in tea, Estimation of LAI, photosynthetic productivity in tea. Breaking Seed dormancy in tea, Preparation of field records with photo album. Study on diagnostic characters of the different types of tea. Study on mitosis and meiosis. Breeding techniques mutation, hybridisation etc. phenol estimation in tea. Determination of Transpiration, osmotic potential, stomatal frequency, cytology. Spot identification.

HOR-PGD-102: Production technology of tea

Unit I: Propagation

Introduction, propagation by seeds, Vegetative Propagation, Grafting, micropropagation.

Unit II: Soil, Climate and site requirements

Introduction of soil, components of soil, physical and chemical properties of soil. Land topography, Temperature, Rainfall, Wind Movement, Relative Humidity, sunshine hours, Soil characteristics and tea production.

Soil - water - tea plant relationship, Principles and Practice of Irrigation, Principles and Practice of Drainage.

Selection of planting sites, Land preparation, Plant geometry, Planting operations, Post-planting operations.

Unit III: Intercultural operations

Water drainage management, Nutrient management - Essential nutrients, Macro-nutrients, Micro-nutrients, Nutrient content in Soil, Absorption of nutrients by tea roots and leaves, Recommendation for nutrient application, Methods of application, Ground application, Foliar application.

Unit V: Sylviculture and Establishment of Shade Trees

Selection of Shade Tree Species, Shade Tree Nursery, Planting and Regulation of Shade Trees.

Unit VI: Disease, pests, weeds of tea plantation and their Management

Diseases (Bacterial, Viral, Fungal and Nematodes) of Tea: Major Pests of Tea, Symptoms, identification and control by chemical, Bio-organic antimicrobial substances and integrated pest management measures, Planters handbook on Plant diseases.

Weed competition with tea, identification of weeds, Manual weed control measures, Herbicides and use of herbicides, Herbicide programs for weed control.

Types of Bio-fertilizers and their effects, Advantages and disadvantages of Bio-fertilizers. Definition of Bio-magnification, Bio-accumulation and Bio-concentration. Substances that bio-magnify including novel organic substances, prey predator relationship and displacement of this relationship due to Bio-magnifications.

Practical:

Soil preparation for propagation of plants in nursery. Preparation of nursery beds and sowing of seeds. Raising of rootstock. Inducing vigorous seedling growth. Practicing different types of propagation methods viz. cuttings, layering, graftings, buddings, micropropagation. Hardening plants in the nursery.

Collection and preparation of soil samples, estimation of moisture, EC, pH and bulk density. Textural analysis of soil by Robinson's pipette method, chemical analysis of soil – Fe₂O₃, P, K, Ca, Mg and S, total N, organic carbon and cation exchange capacity. Spot identification.

HOR-PGD-103: Processing, quality assessment and product diversification of tea

Unit I: Tea Manufacture, Sorting, Packing and Grading

Overview of different types of tea and special emphasis on Black Orthodox Tea, Black CTC Tea, Green orthodox Tea, White Orthodox Tea, Oolong.

Manufacturing of different types of tea. Sorting of Orthodox Tea and Packing, Sorting of CTC Tea and Packing, Sorting of Green Tea and Packing

Unit II: Tea Quality and Tasting

Physical, chemical nature of gradation, quality and testing. International standard of tea quality and testing.

Unit III: Organic Tea

Overview of organic tea, importance, demand, and export potential. Standard of organic tea.

Process of organic tea: Raising planting materials organically in Nurseries.

Land preparation for new (extension planting): selection of land with ideal pH, N-P-K and organic Matter status, isolation of the site from surrounding non-organically cultivated areas, using organic/bio-organic planting mixtures, incorporating organic manures/ composts into the soil, planting healthy plants in proper contour rows, manuring the young tea section with organic/ bio-organic manures – *Ground applications, foliar application*.

Controlling pests & diseases with organic/bio-organic pesticides, sowing green crops in the young tea section, plucking and green leaf handling after plucking, manufacturing, sorting & packing by strictly organic processes according to recommendations of AOCAs and HACCP.

Unit IV: Product diversification

Quality upgradation and diversification, Tea bag, instant tea, various schemes, value addition and business viability.

Practical

Basic instrumentation with special reference to tea testing. Physical and chemical characterization of tea testing. Observation on production of different types of tea. Quality assessment in different types of tea. Survey and project writing on topics related to the paper, i.e., different types of tea manufacturing, organic tea, product diversification, etc.

HOR-PGD-101: Economics, human recourse and financial management of tea industry

Unit I: Infrastructure and Production of tea plantation

Infrastructure Management: Infrastructures required Infrastructures establishment and maintenance, Expenditure on Infrastructures.

Production Management: Field management, Factory Management.

Materials Management: Store indents. Store inventories, Store procurement, Store disbursement.

Human Resource Management: Management Executive cadres, Supporting Cadres (Field and Office staff), Operational Work Force.

Unit II: Finance and Market Management:

Planning: Nature, Scope, Objectives and Significance of Planning, Types of Planning, Process of Planning, Barriers to Effective Planning, Planning Premises and Forecasting, Key to Planning.

Accounting: Accounting concepts, conventions and principles; Indian Accounting Standards, Preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill. Global production of Tea, Supply - Demand matrices in Global Market with special reference to Darjeeling and Sikkim Tea, Marketing Chain of Tea, Brand Value of Darjeeling and Sikkim Tea. Marketing to EU and other Asian countries demanding certified organic tea. Tax structure in tea industry

Unit III: Globalization, WTO & Global issue related to tea

General introduction to globalization of trade, market, finance and labour, Significance of Tea in the global market, New Players in the Tea Market and their impact on Darjeeling Tea, Analysis of causes of loss of traditional market and prospects of emerging markets for tea

GATT, Uruguay Round, WTO- General Introduction

Rules of Origin, Tariff hopping, Reciprocity

TRIPS- focusing on GI and Trade Mark

SPS Agreement

Agreement on Agriculture

Unit IV: Processes of Development and tea Plantation

- i) Tea Plantation Sector and Indian Economy, Contribution of Plantations to National Income and Foreign Exchange
- ii) Differences between Estate Farming and Peasant farming with special focus on small scale farming in tea Plantations and their livelihoods.
- i) Regional Trade Agreements and its impact on Plantations; ASEAN-FTA, Indo-Sri Lanka FTA
- ii) Concept of Fair Trade, supply chain analysis and market linkages; Fair Trade-welfare mechanisms and tea Plantation system.

Unit-V: Institutional Aspects of Plantations

- i) Role of various public Institutions on tea Plantation Development: Tea Board, and Challenges ahead
- ii) Role of Planters Associations in Development
- iii) Role of Trade Unions and Plantation Development
- iv) Role of NGOs and Smallholders Organisations in Plantation Development
- v) Institutional comparison of Indian Tea Industry with special reference to Sri Lanka and India.

Practical:

Preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory. Survey and project writing on topics related to the paper, i.e., Infrastructure, human resource, Globalization, WTO & Global issue related to tea, Tea Plantation Sector and Indian Economy, Contribution of Plantations to National Income and Foreign Exchange- case study; institutional aspects of tea plantation, etc.

SEMESTER II

HOR-PGD-201: Computer application and communication skill development

Unit I: Computer applications

Introduction to computers and personal computers, basic concepts, operating system, DOS and Windows 95, introduction to programming languages, BASIC language, concepts, basic and programming techniques, MS Office, Win Word, Excel, Power Point, introduction to Multi-Media and its application. VISUAL BASIC - concepts, basic and programming techniques, introduction to Internet.

Unit II: Communication Skills

Structural and functional grammar; meaning and process of communication, verbal and non-verbal communication; listing and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking, group discussion. Organizing seminars and conferences.

Practical:

Construction of frequency distribution table and its graphical representation, histogram, frequency polygon, frequency curve, bar chart, simple, multiple, component and percentage bar charts, pie chart, mean, mode for row and grouped data, percentiles, quadrille, and median for row and grouped data, coefficient of variation, 't' test for independent, will equal and unequal variants, paired 't' test, chi-square test for contingency tables and theoretical ratios, correlation and linear regression. Studies on computer components – BASIC language, VISUAL BASIC, programming techniques, MS Office, Excel, Power Point.

HOR-PGD-202: Social, environmental and legal aspects in tea

Unit I: Population Variation, composition and Socio economic development

Ethnic composition and ethnic groups, Social life.

Migration and occupation, Relationship between ethnicity and migration, Social and educational institutions- related to tea industry. Women in the tea gardens. Perspectives on Health, Education and Social Security.

Unit II: Environmental prospective in Tea Industry

Problems, Impacts, Adaptation, Mitigation, Climate Change and Livelihood Issues, National Action Plan on Climate Change.

Environmental impact on tea industry, Global Environmental Policies and Protocols, National Environmental Policy, Environmental Debate and Plantation agriculture with special

reference to tea, Micro-level success stories. Measures for minimization of environmental degradation, effect of climate change and future of tea industry.

Natural Resources and Sustainable practices: Crops, soil erosion, soil fertility, Pollution, Energy, Carbon sequestration, Biodiversity, Sustainable development.

Unit III: LEGAL PERSPECTIVES

Minimum Wages Act, 1948

Equal Remuneration Act, 1976

Employees Provident Fund and Miscellaneous provisions Act 1952

Plantation Labour Act 1951 as amended in 2010

Workmen's Compensation Act, 1923

Child labour prohibitions and Regulation Act, 1986

History of Trade Union Movement in Tea Plantations

The Trade Unions Act 1926

Collective Bargaining

Factory Act

Negligence – Tort

73rd amendment Act, State and Central Schemes, private Sector participation: Corporate Social Responsibilities.

GI Act, Trade Mark Act – Relevance to Tea plantations

GI of Darjeeling Tea, Trade Marks Act (Instances of benefits, violation)

Disputes Settlement

Practical: Survey and project preparation relevant areas according to the paper, i.e., Ethnic composition and ethnic groups, Social life, Environmental impact assessment on tea industry, effect of climate change and future of tea industry, Climate Change and Livelihood Issues, National Action Plan on Climate Change, legal issues related to tea industry, etc.

HOR-PGD-203: Internship

Students will be on Internship for 3 months duration. In which they are expected to undergo in house training attached with tea industry. Make observation on all aspects of tea industry and will write a project report

Mode of evaluation: Project Report + Viva

The candidates will be assigned a supervisor at the end of I semester.

SUGGESTED READINGS:

A. Science Disciplines

Science & Practice in Tea Culture, 2008. Tea Research Association, Tocklai Experimental station, Jorhat – 785008.

An Account of the Cultivation and Manufacture of Tea in China, 1848. Longman, Brown, Green and Longmans, London.

The Culture and Marketing of Tea (3rd edition, 1964. Oxford University Press, London.

Economic Crisis in Tea Industry: Strategies of Scientific Management.

Tea Encyclopaedia, Tocklai experimental Station, Jorhat- 785008.

Eden, T. 1976. *Tea*, 3rd Ed. Longman Group Ltd., London

Luckwill, L.C. and C.V. Cutting. 1969. *Physiology of Tree Crops*. Cutting Academy Press, London

Carr, M.K.V. and Susan Carr. Ed., 1971. *Water and the Tea Plant*.

Wilson, K.C. and M.N. Clifford. 1992. *Tea Cultivation to Consumption*. Chapman & Hall, London

Uker's *All about Tea*, 1985. The tea and Coffee trade Journal Company, New York.

Diseases of tea and Associated Crops in North East India, 1960. Memorandum No. 26. Tocklai Experimental Station, Jorhat.

Tea Pests and Disease and their Control, 1952. W. Heffer and Sons Ltd., Cambridge.

Pests of Tea in North-East India and their Control, 1994. Memorandum no. 27, Tocklai Experimental Station, Jorhat.

Report of P.C. Borooah Committee, 1969. Government of India, New Delhi

Report of Lamond Committee, 1971. Indian Tea Association, Royal Exchange, Calcutta

Annual Reports of Indian Tea Association, Tocklai Experimental Station, Jorhat

Two and a Bud, The journal of the Tocklai Experimental Station, Jorhat – 785008

Proceedings of Tocklai Conferences, Tocklai Experimental Station, Jorhat – 785008

Tea Quarterly. Journal of Tea research Institute of Ceylon

Annual Reports of Tea Research Institute of Ceylon.

Contemporary Tea Time. Quarterly Journal of Contemporary Brokers pvt. Ltd.

The Assam review and Tea News. Monthly journal.

B. Social Sciences

Asopa, V.N., (2000); *Competitiveness in Global Tea Trade*, report submitted to the Ministry of Agriculture, Government of India.

Asopa, V.N., (2007). *The Tea Industry of India: The Cup Cheer has Tears*, Working Paper, Indian Institute of Management, Ahmedabad

Awasthi, R.C.: *Economics of Tea Industry in India*, United Publishers, Guwahati, 1975.

Baruah, A.k. 1991. *Social tension in Assam middle Class Politics*. Guwahati: Purbanchal

Baruah, S. 2001. *India Against Itself: Assam and the Politics of Identity*. New Delhi: Oxford University Press.

Bhowmik, Sharit: *Class Formation in the Plantation System*, People's Publishing House, New Delhi, 1981.

Choudhuri, A.: *Enclaves in Peasant Society: Political Economy of Tea in Western Dooars in Northern Bengal*, People's Publishing House, 1995.

Courtenay, P. P. 1965. *Plantation Agriculture*. London: Bell.

Dickenson, J. P. et al. 1983. *A Geography of the Third World*. Cambridge: Cambridge University Press.

DasGupta, Keya. 2005. *Plantation Labour in Brahmaputra valley: regional enclaves in a colonial context*. In Gwyn Campbell (ed.). *Abolition and its aftermath in Indian Ocean Africa and Asia*. Routledge, London and New York, pp. 169-179.

Deodhar, S. Y. and Intodia, V., (2002), *What's in a Drink that You Call a Chai?: Quality Attributes and Hedonic Price Analysis of Tea*, W.P. No.2002-05-05, Indian Institute of Management, Ahmedabad.

Gohain, H. 1985. *Assam: A burning Question*. Guwahati: Spectrum

Guha, A.: *Planter Raj to Swaraj: Freedom Struggle & Electoral Politics in Assam*, Tulika Books, 1977.

Hannan, A.: *Relevance of Fair Trade*, *Development and Change*, MIDS, Vol XIII No.2, pp.203-223.

Jones, C. F and G. G. Darkenwald. 1954. *Economic Geography*. New York: Macmillan.

- Karotemprel, S. and B. Dutta Roy (eds.). 1998. *Tea garden Labourers of North-East India: A Multidimensional Study on the Adivasis of the Tea gardens of North-East India*. Eastern book Corporation.
- Khawas, Vimal 2006. *Socio-economic Condition of Tea Garden Labourers in Darjeeling Hills*. Monograph, New Delhi: Council for Social Development, Pages: 73.
- Kundu, A and Raza, M: *Indian Economy-the Regional Dimension*, Spectrum, New Delhi, 1982.
- Lama, M.P. and Sarkar, R.L.: *Tea Plantation Workers in the Eastern Himalayas*, Atma Ram and Sons, Delhi, 1986.
- Mishra, R.P. (ed.): *Regional Planning: Concepts, Tools, Techniques and Case Studies*, Concept, New Delhi, (1992, Revised edition).
- Mohapatra, A.C. and Pathak, C.R. (eds.): *Economic Liberalisation and Regional Disparities in India*, Star Publ. House, Shillong, 2003.
- Pulloppillil, Thomas. 1999. *Identity of Adivasi in Assam*. Delhi: India Publishers.
- Raza, M. (ed.): *Regional Development*, Heritage, Delhi, 1988.
- Singh, S.N. and others. 2006. *Socio-Economic and Political problems of Tea garden Workers: A Study of Assam*. New Delhi: Mittal.
- Thomas, C. Y. 1984. *Plantations, Peasants and State: A Study of the Mode of Sugar Production in Guyana*. Los Angeles: Center for Afro-American Studies, University of California; Mona, Jamaica: Institute of Social and Economic Research, University of West Indies.
- Tiffen, Mary and Michael Mortimore. 1990. *Theory and Practice in Plantation Agriculture: An Economic Review*. ISBN: 0 85003 124 9
- Van Royen, W. 1954. *The Agricultural Resources of the World*. New York: PrenticeHall.
- Voladet , Saykham, 2009 . *Sustainable Development in the Plantation Industry in Laos: An Examination of the Role of the Ministry of Planning and Investment*. Winnipeg, Manitoba Canada : International Institute for Sustainable Development (IISD).
- Xaxa, Virginious (n.d.). *Adivasi Leadership in Tea estate. Labour File*.
<http://www.labourfile.org/ArticleMore.aspx?ID=846>