

Preface

The State Agriculture Commission was constituted by the Government of West Bengal (*vide* Gazette Notification No. 2152-Dev./9M-35/06 dt. 21.08.2006) with a comprehensive list of terms of reference which would serve as guidelines for the Commission to make appropriate recommendations for the development of agriculture and associated disciplines like horticulture, animal resources development, fisheries and aquaculture, agricultural marketing, co-operatives, institutional credits, etc. and education, research and training in the relevant fields with the view to ensure the socio-economic uplift of the small holder-dominated farming community of rural Bengal in terms of food and nutritional security and development of agro-based industries, and employment generation with an overall impact on the economy of the State as well.

The Commission started functioning officially from January 15, 2007 when the first formal meeting was held at Khadya Bhavan in Kolkata. Six Sub-committees (with many Working Groups of experts and subject matter specialists) on (i) Crop Husbandry and Farming Systems, (ii) Horticulture and Food Processing Industries, (iii) Animal Resources Development, (iv) Fisheries and Aquaculture, (v) Agricultural Marketing, (vi) Education, Research and Training were duly constituted by the Commission that over the last two years discussed in details the present status and major constraints with a view to making appropriate and most suitable recommendations for the socio-economic improvement of farming communities in West Bengal and for that matter the overall prosperity of the State.

It may be relevant to mention that agriculture in West Bengal is the livelihood of the majority of the rural population of the State living in the villages, with over 90 percent of the cultivators as small and marginal farmers. These poor people besides sustaining their families are till now feeding the rest of the population of our State which have the highest population density in the country and consequently minimum per capita share of arable land at present being only 0.07 hectare for all material activities. With the increasing cost of inputs (seeds, fertilizers and pesticides, etc.), reduction of holding sizes due to excessive fragmentation of land, absence of minimum support price for most of the produces, inadequate market infrastructure and uncertain prices of agricultural produce, especially of highly perishable products, the small farmers from the remote areas are often forced to accept distress sale of their products of hard labour. Management of farm animals is also becoming more difficult due to high cost of feed and fodder and lack of remunerative marketing facilities.

From the deliberations and discussions on various aspects of agriculture and rural development with many government departments, agencies and stakeholders directly or indirectly associated with agriculture, the Commission is of the opinion that the present situation of agriculture in West Bengal, particularly of the small and marginal farmers and also landless rural workers would lead to further decline in socio-economic conditions of the farmers of the State unless remedial measures in terms of technical interventions for ecologically sustainable farming practices, easy institutional credit assurance, remunerative marketing, value addition, etc. are taken up urgently. In the interim report, the major recommendations of the Commission included adoption in phases of low external input requiring location-specific sustainable farming systems using wherever possible inputs of organic nature from available farm-based or locally available resources to increase the efficiency of integrated farming, higher income generation by reducing the input costs for chemical fertilizers and pesticides through their gradual replacement by organics and appropriate locally available biological substitutes and development of efficient marketing strategy for greater financial benefits. The progressively rising contributions and great future prospects of the animal husbandry as well as fisheries and aquaculture sectors, despite formidable constraints, in the upliftment of rural economy have also been emphasized in the report. The Commission reiterates its earlier views on open field trials and commercial cultivation of genetically modified crops, given in the interim report.

Since submission of the interim report in January, 2008, several developments including the release of the UN-sponsored "International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)" involving 58 signatory nations including India, have greatly helped the Commission to

comprehensively build up the future road map for all-round improvement of agriculture and allied sectors. The Commission is happy to note that our independent observations with follow up recommendations in the interim report submitted in January, 2008 are well in tune with that of IAASTD.

Our visits and meetings, as detailed out in the report of the Member-Secretary of the Commission, as well as the very large number of communications from different organizations and individuals in the form of write-ups, statistical data from various sources, important journal papers, e-mail communications, and above all the reports of our formally constituted subcommittees and working groups, have been of enormous help to the Commission to prepare this document.

This final report prepared by the Commission after in-depth discussion in formal Commission meetings supplemented by innumerable informal meetings among the Commission members was finalized in the last formal meeting of the Commission on January 20, 2009 and necessary drafts were duly communicated and approved prior to sending to the press for printing as a single volume, divided into three broad parts, namely Part I, Part II and Part III.

Part I includes a general introduction giving the present agricultural scenario of the State and most of the contextual issues on agriculture on a global, regional and national level that the Commission considered necessary for an over all holistic approach to a range of highly complex issues facing agriculture and allied sectors specifically in the decade old trade oriented globalized scenario marked with many agreements, disagreements, and controversies against the backdrop of great uncertainties on the future of agriculture with distinct manifestations of global climate changes which are integrally linked with the survival of mankind.

Part II incorporates the recommendations of the Commission on all issues under its terms of reference. These have been put together for the sake of convenience of the policy and decision makers; otherwise, the major text materials would necessitate thorough scanning requiring a lot of time.

Part III deals in a detailed manner the different subjects, namely i) Crop Husbandry and Farming Systems, ii) Horticulture, iii) Animal Resources Development, iv) Fisheries and Aquaculture and also v) Agricultural Education, Research and Extension, vi) Agricultural Marketing, vii) Agricultural Credit, Cooperatives and Self Help Groups. In this part, based on the current status and critical analysis of the same recommendations have been farmed. In all disciplines the structuring and phrasing of the recommendations are topicwise as well as issuewise (within a topic) resulting in their distribution all over the text materials of a particular subject covered in Part III. Although they have been pooled and compiled together in the preceding part, the background of their genesis would become clear only when they are read with the text materials in this part of the report. Their transfer to Part II, as a separate section as mentioned earlier, is a matter of convenience and whoever is interested in their genesis should refer to the third part for details.

The Annexure includes reference materials and additional supporting materials for most issues covered in the text of the report besides giving the maps and agriculture related data of all the districts of West Bengal excluding Kolkata.

In spite of our best efforts, the report prepared for printing with a lot of hurry because of time constraints may contain some typographical and other inadvertent errors for which we express our deep regret in advance.

Sincerest thanks are due to all the Commission members, the conveners and other members of the different sub-committees and working groups as well as all other organizations and experts for their valuable contributions in the preparation of this final report of the Commission. The full list of acknowledged persons, organizations, etc. is given in the 'Acknowledgements' immediately after this prefatory note.

West Bengal State Agriculture Commission
Khadya Bhaban, Kolkata - 700 087
March 9, 2009

R.N. Basu
Chairman

Acknowledgements

The West Bengal State Agriculture Commission acknowledges with thanks the cooperation and ungrudging extension of data, information, knowledge and opinion in all aspects of development of agriculture and allied sectors in West Bengal, received from the following learned persons, scientists, officers, government departments and directorates, universities and research institutes, statutory bodies, organizations, associations and others.

A. Individuals from different disciplines

Crop Husbandry and Farming Systems

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| 1. Shri A. B. Saha | 38. Shri D. P. Ghosh Dastidar | 75. Shri P. Bandyopadhyay |
| 2. „ A. Bandyopadhyay | 39. „ D. Sen | 76. „ P. Bhattacharjee |
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| 6. „ A. K. Dhar | 43. „ G. Chattopadhyay | 80. „ P. K. Mondal |
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| 11. „ A. Mitra | 48. „ J. C. Hore | 85. „ R. Ghosh |
| 12. „ A. Mukhopadhyay | 49. „ J. C. Jana | 86. „ R. K. Biswas |
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| 14. „ A. Pal | 51. „ J. P. Gupta | 88. „ R. K. Sarkar |
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| 20. „ B. Ganguly | 57. „ K. Sen Gupta | 94. „ S. Banerjee |
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| 28. „ B. Singh | 65. „ M. R. Ghosh | 102. „ S. Chakraborty |
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| 33. „ D. K. Das | 70. „ N. Mitra | 107. „ S. Ghosh |
| 34. „ D. K. De | 71. „ N. Pande | 108. „ S. Gupta |
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| 36. „ D. Maity | 73. „ N. Trivedi | 110. „ S. K. Ghosh |
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115. „ S. K. Pan
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137. „ S. Santra
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140. „ T. K. Banerjee
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Horticulture

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3. „ A. K. Lahiri
4. „ A. K. Mitra
5. „ A. Roy
6. „ B. Ghosh
7. „ D. C. Pal
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9. „ D. Mukherjee
10. „ D. Sanyal
11. „ G. G. Maity
12. „ H. N. Samaddar
13. „ J. Kabir

14. Shri L. N. Maity
15. „ M. Fonning
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17. „ M. K. Sadhu
18. „ N. Roy Choudhury
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20. „ P. K. Chattopadhyay
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22. „ P. K. Pramanik
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27. „ S. K. Mitra
28. „ S. K. Roy
29. „ S. N. Ghosh
30. „ S. R. Ghosh
31. „ T. K. Maity
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Animal Resources Development

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4. „ A. Mazumder
5. „ A. P. Chattopadhyay
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7. „ A. Samanta
8. „ A. Sarkar
9. „ A. Sinha
10. „ B. Das
11. „ B. K. Ghosh
12. „ B. Paul
13. „ B. Roy
14. „ C. Guha
15. „ C. Raha
16. „ D. Chakraborty
17. „ D. K. Das
18. „ D. N. Jana
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21. „ G. C. Chakraborty
22. „ G. Choudhury
23. „ G. K. Sen
24. „ G. L. Ghosh
25. „ J. Choudhury
26. „ J. L. Chakraborty
27. „ K. Saha
28. „ M. K. Bhowmik

29. Shri M. K. Tewari
30. „ M. Maity
31. „ M. Mitra
32. „ M. Mukherjee
33. „ M. Nandy
34. „ N. Chakraborty
35. „ N. K. Bhattacharyya
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37. „ P. K. Das
38. „ P. R. Ghosh
39. „ P. Roy
40. „ R. Ghosh
41. „ R. Mazumder
42. „ R. Mukherjee
43. „ S. Bhattacharyya
44. „ S. Biswas
45. „ S. Das

Fisheries & Aquaculture

1. Shri A. K. Dutta
2. „ A. Mahalanabish
3. „ B. Basak
4. „ G. Sarkar
5. „ K. C. Dora
6. „ K. K. Vass
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10. „ P. K. Pandit
11. „ R. Sen Gupta
12. „ S. Bhattacharyya
13. „ S. Chakraborty
14. „ S. D. Ghosh
15. „ S. P. De
16. „ U. Bhoumik

Agricultural Education

Research & Extension

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3. „ A. K. Roy
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5. „ C. S. Chakraborty
6. „ G. L. Roy
7. „ K. Ghosh
8. „ M. Ghosh
9. „ M. K. Majumder
10. „ N. Mondal
11. „ R. K. Samanta
12. „ T. Das Gupta

Agricultural Credit & Co-operatives

1. Shri A. Bandyopadhyay

B. Different departments and directorates

1. Agricultural Marketing
2. Agriculture
3. Animal Resources Development
4. Backward Classes Welfare
5. Biotechnology
6. Co-operation
7. Development & Planning
8. F.P.I. & Horticulture
9. Finance
10. Fisheries, Aquaculture and Fishing Harbours
11. Forest
12. Land & Land Reforms
13. Micro & Small Scale Enterprises and Textiles
14. Panchayat & Rural Development
15. Paschimanchal Unnayan Affairs
16. Self Help Group & Self Employment
17. Sundarban Affairs
18. Water Resources Investigation & Development

C. Universities/ Research Institutes

1. Bidhan Chandra Krishi Viswavidyalaya
2. Central Inland Fisheries Research Institute
3. Central Research Institute of Jute & Allied Fibres
4. Central Sericulture Research & Training Institute
5. Indian Institute of Technology, Kharagpur

6. Institute of Agricultural Science, Calcutta University
7. Jadavpur University
8. Krishi Vigyan Kendras of West Bengal
9. National Bureau of Soil Survey & Land Use Planning
10. National Centre of Organic Farming (NCOF), Ministry of Agriculture (GOI) Ghaziabad
11. National Institute of Research on Jute & Allied Fibre Technology
12. Palli Siksha Bhaban, Sriniketan
13. Ramkrishna Mission Loka Siksha Parishad, Narendrapur
14. State Research Institute on Rice, Pulses & Oilseeds
15. Uttar Banga Krishi Viswavidyalaya
16. West Bengal University of Animal & Fishery Sciences

D. Different Statutory/ Autonomous Bodies

1. Gorkha Hill Council
2. Kalyani Municipality
3. National Bank for Agricultural & Rural Development (NABARD)
4. National Institute of Nutrition, Hyderabad
5. Paschimanchal Unnayan Parsad
6. State Planning Board
7. Sundarban Development Board
8. Uttar Banga Unnayan Parsad
9. West Bengal State Seeds Corporation Ltd.

E. Farmers' Organizations

1. Agragami Kisan Sabha
2. Paschim Banga Kisan O Khetmajdoor Congress
3. Paschim Banga Pradeshik Krishak Sabha
4. Paschim Banga Pradeshik Krishak Sabha, B.B. Ganguly Street
5. Sanjukta Kisan Sabha

F. Voluntary Organizations and Institutes

1. Centre for Sustainable Agriculture, Secunderabad
2. Development Research Communication Service Centre, Kolkata
3. KALYAN (Purulia)
4. Paschim Banga Vigyan Mancha
5. PRADAN

G. Associations

1. Research Scholars' Associations of BCKV, UBKV & WBUAFS
2. Seedsmen Association of Bengal
3. State Agricultural Technologists' Service Association
4. State Agricultural Technologists' Service Association (Original)
5. State Fishery Officers' Association
6. Teachers' Associations of BCKV, UBKV & WBUAFS

H. Others

1. District Magistrates of all districts
2. Sabhadhipatis of all districts

The Commission thankfully acknowledges the valuable contributions of its members. Thanks are also due to the members of staff of the office of the Commission for their hard work and untiring services rendered in the preparation of the report.

Acronyms

ADO: Agricultural Development Officer
AEZ: Agricultural Export Zone
AI: Artificial Insemination
AICRP: All India Co-ordinated Research Project
AIIH&PH: All India Institute of Hygiene and Public Health
AKST: Agricultural Knowledge, Science and Technology
AMCU: Automatic Milk Collection Unit
APEDA: Agricultural and Processed Food Products Export Development Authority
ARD: Animal Resources Development
ART: Assisted Reproductive Technology
ATMA: Agricultural Technology Management Agency
BCKV: Bidhan Chandra Krishi Viswavidyalaya
BDB: Biodiversity Board
BDO: Block Development Officer
BENFISH: West Bengal State Fishermen's Co-operative Federation Limited
BIS: Bureau of Indian Standard
BMC: Bulk Milk Cooler
BMF: Buck Mother Farm
BOLT: Build, Operate, Lease and Transfer
BOT: Build, Operate, and Transfer
BPL: Below Poverty Line
CADA: Command Area Development Authority
CADC: Comprehensive Area Development Corporation
CAP and MAP: Controlled and Modified Atmospheric Packaging
CC: Cash Credit
CD: Compact Disc
CFTRI: Central Food Technological Research Institute
CHG: Community Herbal Garden
CIFT: Central Institute of Fishery Technology
CLA: Conjugated Linoleic Acid
CMC: Calcutta Municipal Corporation, now KMC : Kolkata Municipal Corporation
CMP: Clear Milk Product
CP: Crude Protein
CRIJAF: Central Research Institute for Jute and Allied Fibres
CSA: Center for Sustainable Agriculture
DAC: Department of Agriculture & Co-operation
DASD: Directorate of Arecanut Species Development
DCP: Digestible Crude Protein
DFAB: Division of Fur Animal Breeding
DOC: De-Oiled Cake
DRDA: District Rural Development Agency
DRDC: District Rural Development Cell (of Zilla Parisad)

DTW: Deep Tube Well
 DUS: Distinctness Uniformity Stability
 EOU: Export Oriented Unit
 FAO: Food and Agricultural Organization
 FCO: Fertilizer Control Order
 FEO: Fishery Extension Officer
 FLD: Front Line Demonstration
 FMDV: Foot and Mouth Disease Vaccination
 FPI & Hort: Food Processing Industries & Horticulture
 FPI: Food Processing Industry
 FPO: Food Product Order
 FST: Frozen Semen Technology
 GAP: Good Agriculture Practice
 GDP: Gross Domestic Product
 GHG: Green House Gas
 GI: Geographical Indication
 GIS: Geographic Information System
 GLOF: Glacial Lake Outburst Flood
 GMC: Genetically Modified Crop
 GMO: Genetically Modified Organism
 GMP: Good Manufacturing Practice
 GOWB: Government of West Bengal
 GP: Gram Panchayat
 GW: Ground Water
 HACCP: Hazard Analysis with Critical Control Point
 HDC: Horticulture Development Corporation
 HSPF: Hydrological Simulation Programme FORTRAN
 IAAKSTD/IAASTD: International Assessment of Agricultural Knowledge, Science and Technology for Development
 IAH&VB: Institute of Animal Health and Veterinary Biologicals
 IBA: Indian Bankers' Association
 ICAR: Indian Council of Agricultural Research
 ICMR: Indian Council of Medical Research
 ICT: Information Communication Technology
 IFOAM: International Federation for Organic Agriculture Movement
 IFS: Integrated Farming System
 IIT: Indian Institute of Technology
 IMD: Indian Meteorology Department
 INM: Integrated Nutrient Management
 IPM: Integrated Pest Management
 IPNS: Integrated Plant Nutrient System
 IPR: Intellectual Property Rights/ Patent Rights (PR)
 IQF: Individual Quick Freeze

ISM & H: Indian Systems of Medicine and Homeopathy
 ISO: Indian Standard Organization
 IT: Information Technology
 ITDB: Integrated Tribal Development Board
 ITDP: Integrated Tribal Development Project
 ITK: Indigenous Traditional Knowledge
 KCC: Kissan Credit Card
 KIA: Indo-US Knowledge Initiative in Agriculture
 KPS: Krishi Projukti Sahayak.KVK: Krishi Vigyan Kendra
 LAMPS: Large Sized Multipurpose Co-operative Society
 LDTW: Low Duty Tube Well
 LPDC: Livestock Processing Development Corporation
 LR: Land Revenue
 LTCCS: Long Term Co-operative Credit Structure
 LTRAS: Long Term Research on Agricultural System
 LWY: Large White Yorkshire
 MCM: Million Cubic Meter
 MNC: Multi National Company
 MOET: Multiple Ovulation and Embryo Transfer
 MPT: Multiple Progeny Testing
 MSPU: Mushroom Spawn Production Unit
 NABARD: National Bank for Agricultural and Rural Development
 NAFED: National Agency for Export Development
 NAFED: National Agriculture Co-operative Marketing Federation of India
 NAIS: National Agriculture Insurance Scheme
 NAP: National Agricultural Policy
 NBSSLUP: National Bureau of Soil Survey and Land Use Planning
 NCDC: National Climatic Data Centre
 NCF: National Commission on Farmers
 NCOF: National Centre of Organic Farming
 NDDB: National Dairy Development Board
 NECC: National Egg Co-ordination Committee
 NGO: Non-Government Organization
 NHB: National Horticulture Board
 NHM: National Horticulture Mission
 NICD: National Institute of Communicable Diseases
 NIRJAFT: National Institute of Research for Jute and Allied Fibre Technology
 NMTHK: National Mission of Traditional Health Knowledge
 NPCBB: National Project for Cattle and Buffalo Breeding
 NPK: Nitrogen, Phosphorus, Potassium
 NPM: Non-Pesticidal Management
 NPV: Nuclear Polyhydrosis Virus
 NREGA: National Rural Employment Guarantee Act

NREGS: National Rural Employment Guarantee Scheme
 NSSO: National Sample Survey Organization
 NTFP: Non-Timber Forest Product
 NWDPRA: National Watershed Development Programme of Rainfed Area
 OA: Organic Agriculture
 OM: Organic Management
 ONBS: Open Natural Breeding System
 OPE: Open Pan Evaporation
 OTA: Organic Trade Association
 OTS: One Time Settlement
 P&RD: Panchayat and Rural Development
 PACS: Primary Agricultural Co-operative Credit Society
 PCARDB: Primary Co-operative Agricultural and Rural Development Bank
 PDS: Public Distribution System.PG: Postgraduate
 PHT: Post Harvest Training
 PMGSY: Prime Minister Gram Sarak Yojana
 PPP: Public Private Partnership
 PPR: Peste-des-Petits in Ruminants
 PR: Panchayati Raj
 PR: Patent Right
 PSB: Phosphate Solubilizing Bacteria
 PTP: Progeny Testing Programme
 PUP: Paschimachal Unnayan Parsad
 PVPFR: Plant Variety Protection and Farmers' Right
 PWD: Public Works Department
 QIT: Quantitative Inheritable Trait
 QTE: Qualified Technological Equipment
 R&D: Research and Development
 RBI: Reserve Bank of India
 RD: Ranikhet Disease
 RET: Rare Endangered and Threatened
 RIDF: Rural Infrastructure Development Fund
 RIR.: Rhode Island Red
 RKVY: Rashtriya Krishi Vikash Yojana
 RMC: Regulated Market Committee
 RRB: Regional Rural Bank
 RRS: Regional Research Station (Under SAU)
 RRSS: Regional Research Sub Station
 RTS: Ready to Serve
 SAD: Small Animal Development
 SAMETI: State Agricultural Management & Extension Training Institute
 SATSA: State Agricultural Technologists' Service Association
 SAU: State Agricultural University

SDP: State Domestic Product
 SERP: Society for Elimination of Rural Poverty
 SGSY: Swarnajayanti Gram Swarojgar Yojana
 SHG: Self Help Group
 SLBC: State Level Bankers' Committee
 SMP: Skimmed Milk Product
 SPS: Sanitary and Phytosanitary
 SRI: System of Rice Intensification
 STCCS: Short Term Co-operative Credit Structure
 STL: Soil Testing Laboratory
 STW: Shallow Tube Well
 TCPC: Training-Cum-Production Centre
 TDN: Total Digestible Nutrient
 THS: Traditional Health System
 TK: Traditional Knowledge
 TPS: True Potato Seed
 TSS: Total Soluble Solid
 TTP: Trainers' Training Programme
 UBKV: Uttar Banga Krishi Viswavidyalaya
 UG: Undergraduate
 UN: United Nations
 UNESCO: United Nations Educational, Scientific and Cultural Organization
 UUP: Uttaranchal Unnayan Parsad
 VAM: Vesicular-arbuscular mycorrhiza
 VAP: Viable Action Plan
 VCI: Veterinary Council of India
 VLP: Virtual Learning Protocol
 VLP: Virus Like Particle
 WBIDC: West Bengal Industrial Development Corporation
 WBSAC: West Bengal State Agriculture Commission
 WBSCARDB: West Bengal State Co-operative Agricultural and Rural Development Bank
 WBSCB: West Bengal State Co-operative Bank
 WBSFP&HDC: West Bengal State Food Processing and Horticulture Development Corporation
 WBSSC: West Bengal State Seed Corporation Limited
 WBUAFS: West Bengal University of Animal and Fishery Sciences
 WDCCS: Women Dairy Cooperation Society
 WEBREDA: West Bengal Renewable Energy Development Authority
 WHO: World Health Organization
 WTO: World Trade Organization

NB: The State of West Bengal and the West Bengal State Agriculture Commission have been mentioned in many places of the text as 'State' (with a Capital S) and 'The Commission', respectively to avoid verbosity.

REDEFINED AGRO-CLIMATIC SUBREGIONS OF WEST BENGAL

