लोक सेवा आयोग

नेपाल कृषि सेवा, बाली संरक्षण समूह, रा. प. प्रथम श्रेणीका पदहरुको खुला र आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र : सेवा सम्बन्धी प्राविधिक बिषय **अङ्क १००**

1. Policy and Strategy

1.1 Government Policy on Pesticide Management.
1.2 Government Policy and Strategy on Post Harvest Programs.
1.3 Government Policy on Sericulture and Apiculture.

2. Management

2.1 Strategic Planning and Use of Logical frame work (Log frame)
2.2. Monitoring and Evaluation- Indicators for plant protection M & E

3. Act, Standards and Guidelines

3.1 Pesticide Act, 2048
3.2 International Code of Conduct on the Distribution and Uses of Pesticides.
3.3 Rotterdam Convention on Prior Informed Consent (PIC) and Stockholm Convention on
Persistent Organic Pollutants (POPs)
3.4 International Standards for Phytosanitary Measures (ISPMs)

4. Entomology

4.1 Introduction
4.2 The insect and the host plant
4.3 Insects and chemical environment of plants.
4.4 Insects and resistant and resistant host plants

5. Insect ecology

Ecological roles of insect pests

5.1 Insect population
5.2 Ecosystems and agroecosystems
5.3 Ecological roles of insect outbreaks

6. National Insect Pests of Agriculture and Their Management

6.1 Cereals
- 6.1.1 Stem borers *(Chilo partellus; Chilo suppressalis; Sesamia inferens; Scirpophaga incertulas*)
- 6.1.2 Green leafhopper (*Nephottetix nigropictus*)
- 6.1.3 Brown planthopper (*Nilaparvata lugens*)
- 6.1.4 Gandhi bug (*Leptocorisa chinensis*)
- 6.1.5 White grubs (*Melolontha* sp.; *Phyllophaga* sp.; *Holotrichia* sp.)
- 6.1.6 Hispa *(Dicladispa armigera*)

6.2 Vegetables
- 6.2.1 Cutworm (*Agrotis ipsilon; A. segetum*)
- 6.2.2 Pumpkin fruitfly (*Bactrocera cucurbitae*), *B. scuteralis, B. tau, B. zonatus,; B. yoshimotoi*)
- 6.2.3 Aphids (*Myzus persicae; Aphis fabae; A. gossypii; A. craccivora; Brevicoryne brassicae*)
- 6.2.4 Red ants (*Dorylus orientalis*)
- 6.2.5 Pod borer (*Lampides boeticus*)
- 6.2.6 Shoot and fruit borer (*Leucinodes orobonalis*)
- 6.2.7 Large white butterfly (*Pieris brassicae nepalensis*)
- 6.2.8 Tomato fruit worm (*Helicoverpa armigera*)
- 6.2.9 Okra jassid (*Empoasca devastans*)

6.3 Fruits

Sub- tropical fruits

6.3.1 Oriental fruitfly (*Bactrocera dorsalis*)
6.3.2 Leafhopper (*Amritodus atkinsoni*)
6.3.3 Gall midge (*Apsylla cistellata*)
6.3.4 Citrus psylla (*Diaphorina citri*)
6.3.5 Green stink bug (*Rhabdocoris humeralis*)
6.3.6 Citrus red scale (*Aonidiella aurantii*)
6.3.7 Banana weevil (*Cosmopolites sordidus; Odoiporus longicolis*)
6.3.8 Pomegranate butterfly (*Deudoryx epijarbas*; *Virachola isocrates*)

Temperate fruits

6.3.9 Apple wooly aphid (*Eriosoma lanigerum*)
6.3.10 San Jose scale (*Quadraspidiotus perniciosus*)

6.4 Commercial Crops
6.4.1 Red spider mite (*Oligonychus coffeae*)
6.4.2 Tea mosquito (*Helopeltis thelvora*),
6.4.3 Jute hairy caterpillar (*Diacrisia oblique*)

7 Pathology

7.1 Importance of Plant Diseases
7.2 Causes of plant diseases
7.2.1. Biotic- Fungi, Bacteria and Bacteria like organisms, Nematodes, Viruses and Virus like agents.
7.2.2. Taxonomy, classification and nomenclature of above pathogens
7.2.3. A biotic- Deficiency and environment related diseases
7.2.4. General characteristics of infectious and non-infectious diseases
7.3 History of Plant Pathology in Nepal.

8. Plant Diseases of National Importance and Their Management

8.1 Cereals (Rice,wheat,maize, fingermillet)
8.1.1 Rice: Blast (*Pyricularia grisea*), Bacterial leaf blight (*Xanthomonas campestris* p.v. oryzae), Sheath blight (*Rhizoctonia solani*), Foot rot (*Fusarium moniliforme*), Brown spot (*Helminthosporium oryzae*). False smut (*Ustilaginoides virens)*
8.1.2 Wheat: Rusts *(Puccinia graminis tritici*, *P. recondite* and *P. striiformis*), Loose smut (*Ustilago tritici*), Foliar blight (*Bipolaris sorokiniana* and *Drechslera tritici-repentis*), Powdery mildew (*Erysiphe graminis tritici*), Bunt (*Tilletia caries and T. foetida*)
81.3 Maize: Stalk rot (*Erwinia carotovora*), Northern Leaf blights (*Exserohilum turcicum),* Southern leaf blight (*Bipolaris maydis*), Banded leaf and sheath blight (*Rhozoctonia solani*), Ear rot (*Fusarium vertilloides.)*
8.1.4 Fingermillet: Blast (*Pyricularia grisea*) and Cercospora leaf spot (*Cercospora eleusine*).
8.2 Vegetables (Potato,tomato,cruciferae, cucurbitaceae)
8.2.1 Potato: Blights (*Pytopthora infestans* and *Alternaria* spp.), Bacterial wilt (*Ralstonia solanacearum*), Rhizoctonia rot (*Rhizoctonia solani*), Wart (*Synchytrium endobioticum*), Viral diseases
8.2.2 Tomato: Wilts (*Ralstonia solanacearum*), Blight(*Phytophthora infestans* and *Alternaria* spp.), Root knots (*Meloidogyne* spp.*),* Damping-off (*Pythium* spp., *Fusarium* spp. and others).

8.2.3 Cruciferae: Clubroot (*Plasmodiophora brassicae*), Alternaria leaf spot (*Alternaria brassicola* and *A. brassicae*), Camping-off (*Pythium* spp. and others), Stalk rot (*Scleritinia sclerotiorum*). white rust (*Albugo* spp.)

8.2.4. Cucurbitaceae: Powdery mildew (*Erysiphe* spp.), Downey mildew (*Peronospora cubensis*), Viral diseases.

8.3 Fruits/Plantation crops (Citrus, mango, apple, pear, banana, papaya, tea)

8.3.1 Citrus: Gummosis, Foot and root rots (*Phytophthora* spp.), Greening /Huanglungbin (*Liberibacter asiaticum*), Powdery *mildew (Odium spp.),* Tristeza *(Virus),* Pink disease *(Pellicularia salmonicolor),* Anthracnose (*Colletotrichum gloesporioides*), Scab (*Elsinoe fawcetti*), Citrus decline (disease complex)

8.3.2 Apple and temperate fruits: Scab (*Venturia inaequalis*), Pink (*Pellicularia salmonicolor*) and root rot (complex), Powdery mildew (*Odium* spp.)

8.3.3 Mango: Black tip (S-pollution), Mango malformation, Anthracnose (*Colletotrichum gloesporioides*)

8.3.4 Banana: Wilt (*Fusarium* spp.), Sigatoka or leaf spot (*Mycosphaerella),* Bunchy top (viral)

8.3.5 Papaya: Ring spot (Virus), Leaf curl (Virus), Collar and root rot (complex).

8.3.6 Tea: Blister blight (*Exobasidium vexans*), Black rot (*Corticium* spp.)

8.4. Commercial crops:

8.4.1 Rhizome rots of ginger (complex),

8.4.2 Red rot of sugarcane (*Colletotrichum gleosporioides*)

8.4.3 Charcoal rot of Jute (*Macrophomina* spp.)

8.4.4 Mustard: white rot (*Sclerotinia sclerotiorum*), Alternaria leaf spot (*Alternaria* spp), Witch weed (*Striga* spp.)

8.4.5 Lentil: Grey mould (*Botrytis cinerea*.), Leaf blight (*Stemphyllium sarciniformae*.) and wilt complex (*Fusarium, Rhizoctonia and* others)

9. Mechanism of Infection by Plant Pathogen and Stages in the development of diseases

9.1 Penetration
9.2 Infection
9.3 Incubation
9.4 Reproduction
9.5 Dissemination
9.6 Off-season survival of pathogens

10. Defense Mechanisms of Host Plants

10.1 Structural defense
10.2 Biochemical defense

11. Effects of Plant Pathogens on Host and Host Physiology

11.1 Structure, growth and reproduction of the host.
11.2 Host photosynthesis
11.3 Host respiration and
11.4 Translocation of water and nutrients in the host plant.
11.5. Effect on transpiration

12. Effects of Environment on Plant Disease Development

12.1 Effect of Temperature
12.2 Effect of Moisture or humidity
12.3 Effect of light
12.4 Effects of pH (Soil or substrate/host)

12.5 Effect of host plant nutrition

13.Genetics and Disease Resistance in Plants

13.1 Host-pathogen interfaces
13.2 Gene for gene concepts
13.3 Types of resistance: Horizontal, Vertical, Field, Tolerance, genetics of host resistance, tolerance. Nature of resistance, genetics of host resistance,

14. Plant Disease Epidemiology and Forecasting

14.1 Measurement of disease and loss assessment
14.2 Plant disease epidemics
  14.2.1 Pattern and types of epidemics.
  14.2.2 Factors affecting development of epidemics
14.3 Forecasting of epidemics based on weather and inoculums

15. Plant diseases of special environment

15.1 Seed-borne diseases, their significance and their management
15.2 Seed health-testing techniques
15.3 Soil-borne diseases and their management

16. Biotechnology in Plant Pathogens

16.1 Wide hybridization for incorporation of alien genes
16.2 Expansion of gene pools through somatic hybridization
16.3 Incorporation of novel genes through genetic engineering
16.4 Isozymes and RFLP markers for tagging resistant genes
16.5 Nuclic acid probes as diagnostic tools for pathogens
16.6 GMO Issues.

17. Toxicology

17.1 Pesticide Hazard and Risk
17.2 Pesticide Classification on the basis of LD_{50}
17.3 MRL & ADI
17.4 Selectivity and Resistance
17.5 Pesticide residue in plant products
17.6 Metabolism of insecticides and fungicides
17.7 Developing pesticide resistance insects and their management
17.8 Execution of Pesticide Act and Regulation in the country

18. Integrated Pest Management (IPM):

18.1 Importance of Agro-ecosystem
18.2 Crop damage and Economic Injury level
18.3 Progress of Economic Threshold Level (ETL) in Nepal
18.4 Concept of Pest Management
18.5 Importance of Agro-ecosystem and Economic Injury level
18.6 History and Progress in IPM in Nepal
18.7 Farmer Field School
18.8 Economic-injury level (EIL)
18.9 Economic Threshold (ET)
18.10 Calculation of Economic Decision Levels

19. Alternatives to Conventional Pesticides for Insect Pest Management

19.1 Biological Control
19.2 Bioactive plant parts and herbs

19.3 Microbial pesticides
19.4 Bioactive inert materials
19.5 Genetically Modified Organism

20. Survey & surveillance of crop insects and diseases

20.1 Importance.
20.2 Documentation

21. Concept and importance of organic farming

21.1 Bio-rational and Bio-intensive Approaches
21.2 Bio-technological Approaches
21.3 Bio-pesticides
21.4 Graft technology with resistant materials
21.5 Ecosystem Management and Biodiversity.

22. Plant Quarantine

22.1 Importance and role of Plant Quarantine in Nepalese Agriculture system in the context of WTO/SPS.
21.2 Prohibitions and restrictions regarding the import of plants or plant products into Nepal.

23. Post Harvest

23.1 Post harvest technology for market oriented vegetable and fruit crops.
23.2 Alternatives of Pesticides in Storage.

24. Insects and Fungi of Industrial Use

24.1 Sericulture:
- 24.1.1 Potential of sericulture development in Nepal.
- 24.1.2 Role of private sector and NGOs in sericulture development.
- 24.1.3 Problems and constraints in sericulture industry.

24.2 Apiculture:
- 24.2.1 Promotion of bee products, marketing and trade in the context of
- 24.2.2 Major concerns on legal basis and controls, quality and control of pesticides.
- 24.2.3 Bee poisoning and avoiding honey bee losses when using pesticides

24.3 Mushroom:
- 24.3.1 Importance and cultivation technique of mushroom.

24.4 Lac culture:
- 24.4.1 Lac insect, its importance and scope

25. Weed Science

25.1 Emerging weeds problem
25.2 Herbicide, environmental impact and management practices of weed.

26. Statistics in Plant Disease

26.1 General knowledge of statistical tests, designs, data transformation, field plot techniques and laboratory experiments, analysis of variance, mean separation, result interpretation, research presentation and useful statistical softwares.

27. Use of computer for decision making and forecasting disease and insect pest epidemics

27.1 Computer Modeling for Crop loss
27.2 GIS for diseases and crop loss

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