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खुल्ला तथा आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको लागि पाठ्यक्रम

Paper: II

Technical Subject

Sub-Group: Agronomy, Plant Breeding and Genetics

A. Agronomy

1. Crop Production

Rice, wheat, maize, finger millet, barley, buckwheat, amaranths, lentil, soybean, chickpea, pigeon pea, mungbean, rapeseed, mustard, groundnut, sugarcane, jute, tobacco, cotton, potato, with respect to:

- 1.1 Introduction, origin and distribution
- 1.2 Botany, morphology and growth stages
- 1.3 Climate and soil
- 1.4 Recommended and pipe-line cultivars and their characters
- 1.5 Cultural practices:- land preparation, seed treatment, planting methods (spacing), planting time, seed rate, , inter-culture operations, harvesting, drying, cleaning, transportation and storage
- 1.6 Weed and weed control: Importance of weed, recommended herbicides and their use, method and time of application
- 1.7 Manures and fertilizers: recommended doses, method of application, time of application
- 1.8 Water management: time and frequency of water application, irrigation methods, water requirement, drainage
- 1.9 Typical cropping calendars and cropping patterns in hills, mid-hills, Terai and inner-Terai
- 1.10 Economics of crop production of major crops (rice, maize, wheat, sugarcane, tobacco, cotton, jute, potato, lentil)
- 1.11 Plant protection measures: causal agent, symptoms and control measures, IPM, use of plant pesticides

2. Climate, Weather and Crop

- 2.1 Climate: temperature, humidity, wind pressure, rainfall, effective rainfall, sunshine hours, soil temperature and their effect in crop production
- 2.2 Climate of Nepal : climatic zones, moisture classes their features and vegetation
- 2.3 Effects of adverse climate and weather in different crops
- 2.4 Climate change, global warming and greenhouse gases: Definition and impact in different crops
- 2.5 Agro-climatic normals for different crops
- 2.6 Weather forecasting and its implication in crop production

3. Tillage

- 3.1 Tillage: objective, significance, limitations and importance in crop production
- 3.2 Zero tillage, minimum tillage and optimum tillage
- 3.3 Condition of soil suitable for cultivation
- 3.4 Tillage and crop establishment methods

4. Land Resources

- 4.1 Physiographic land distribution system of Nepal
- 4.2 Land capability classification and utilization and irrigation suitability
- 4.3 Soil of Nepal and their classifications

5. Weed and Weed Control

- 5.1 Classification of weeds, its importance in crop production, pattern of weed distribution
- 5.2 Common weeds found in major field crops
- 5.3 Herbicides: types of herbicides, herbicide formulation, mode of action, physiology of herbicides, application method and type of nozzle for herbicides, herbicides use in Nepal
- 5.4 Integrated weed management practices in major crops
- 5.5 Economic use of herbicides
- 5.6 Crop-weed competition

6. Soil and Fertilizer

- 6.1 Soil: definition, soil and sub-soil, importance of top soil and sub-soils
- 6.2 Soil texture, soil structure, soil bulk density, soil consistency and their importance in agriculture
- 6.3 Classification of essential elements on the basis of their functions
- 6.4 Functions and deficiency symptoms of essential elements
- 6.5 Determination of nutrient requirement of major crops
- 6.6 Soil pH, its measurement, liming material for correcting soil pH, liming materials and their reactions in soil
- 6.7 Soil organic matter, nutrient content of different manures and importance of organic matter
- 6.8 Recommended dose of nutrients, method of application and time of application
- 6.9 Recommendation of nitrogen, phosphorous and potassium on the basis of soil analysis
- 6.10 Green manure: benefit of green manure, green manuring and green leaf manuring, influence of leguminous green, manure, desirable characteristics of green manure, plant suitable for green manure, aerobic and anaerobic decomposition and its effect on soil, constraints of green manuring
- 6.11 Soil fertility and productivity and their indicators

7. Farming System and Outreach Research

- 7.1 Introduction to farming system, system approach in agriculture, and component/ determinants of farming system
- 7.2 Social, economic and institutional aspects of farming system
- 7.3 Intensive cropping, sequential cropping systems, management of different cropping systems and evaluation of cropping systems
- 7.4 On-farm farming system research: methodology, characteristics of FSR, frame work of FSR methodology, diagnostic phases (RRA, Agro ecosystem, analysis, conventional survey)
- 7.5 Gender perspective of technology generation and adoption

8. Sustainable Agriculture

- 8.1 Definitions
- 8.2 Differences between modern and sustainable agriculture
- 8.3 Problem of modern agriculture and management practices



- 8.4 Positive and negative implication of sustainable and modern agriculture
- 8.5 Impact of green revolution in food and nutritional security
- 8.6 Role of agro-forestry and its management for sustainable crop production

9. **Crop Physiology:** Photosynthesis, respiration, photo-periodism, transpiration, physiological stress in crops, crop water stress indices and crop stress detection

B. Plant Breeding and Genetics

1. Plant Genetics

- 1.1 Cell division
- 1.2 Linkage and crossing over
- 1.3 Probability and its application in plant breeding
- 1.4 Gene action and partition of genetic variance
- 1.5 Heterosis and inbreeding
- 1.6 Heritability
- 1.7 Quantitative and qualitative traits, their gene action and interaction
- 1.8 Gene interaction
- 1.9 Combining ability
- 1.10 Basic concept of molecular biology – gene structure, regulation, and manipulation
- 1.11 Population genetics and its structure
- 1.12 Quantitative genetics and Hardy-Weinberg law

2. Plant Breeding

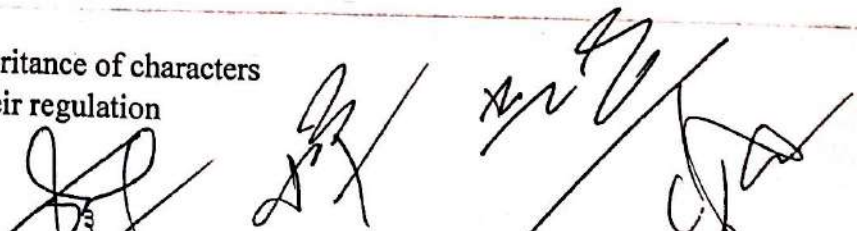
- 2.1 Self and cross pollinated crops
- 2.2 Breeding methods for self and cross pollinated crops and vegetatively propagated crops
- 2.3 Breeding objective and priority setting
- 2.4 Breeding for insect and disease resistance
- 2.5 Breeding for stress factors
- 2.6 Mutation in crop improvement
- 2.7 Poliploidy and its use in plant breeding
- 2.8 Distant hybridization in plant breeding
- 2.9 Male sterility and its application in crop improvement
- 2.10 Genotype x Environment interaction
- 2.11 Hybrid seed production

3. Plant Genetic Resources

- 3.1 Germplasm collection, conservation and utilization
- 3.2 Biodiversity and its significance to community and country
- 3.3 WTO: its significance to Nepal
- 3.4 Plant breeders' right / Intellectual property right
- 3.5 Patents hip of variety and product – significance to Nepal

4. Biotechnology in crop improvement

- 4.1 Genes and molecular basis of inheritance of characters
- 4.2 DNA, RNA gene structure and their regulation
- 4.3 Plant biotechnology



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- 4.4 Tissue culture, cell culture, embryo culture, anther culture
- 4.5 Somatic hybridization
- 4.6 Genetic engineering in plants
- 4.7 Molecular markers and their use in plant breeding
- 4.8 Achievements and future of molecular breeding

5. Seed Technology

- 5.1 Seed act in Nepal
- 5.2 Seed quality, seed classes, and seed testing
- 5.3 Formal and informal seed production system in Nepal
- 5.4 Community level seed production –constraints and opportunity
- 5.5 Seed certification procedures and seed certification standards in major crop in Nepal

6. Agricultural Statistics

- 6.1 Field plot techniques
- 6.2 Experimental designs
- 6.3 Chi-square test, probability
- 6.4 Analysis of variance and covariance
- 6.5 Correlation and regression analysis
- 6.6 Methods of statistical analysis for cropping systems
- 6.7 Stability and adaptability analysis-new techniques
- 6.8 Computer packages and its role in data processing

7. Others

- 7.1 Importance of agricultural research in relation to WTO
- 7.2 Status of plant breeding research in Nepal
- 7.3 Areas of collaborations with IARCs in crop improvement
- 7.4 Participatory plant breeding and on farm research
- 7.5 Stakeholders in research and development in Nepal
- 7.6 Agricultural marketing and agri-bussiness of field crops
- 7.7 Major constrains and opportunities of crops research and its production in Nepal



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