



Curriculum layout and syllabus for the program of Master in Sustainable Agriculture and Rural Livelihood (MSARL)



Bangladesh Open University
Gazipur-1705, Bangladesh

Curriculum layout for Master in Sustainable Agriculture and Rural Livelihood (MSARL)

1st Semester (Course Semester)

SL. No.	Course Code	Course Title	Credit Hours	Marks
1.	MSARL 1301	Introduction to Sustainable Agriculture and Rural Livelihood	3	100
2.	MSARL 1302	Advance Technologies for Crop Cultivation	3	100
3.	MSARL 1303	Sustainable Crop Protection	3	100
4.	MSARL 1304	Natural Resource Management	3	100
5.	MSARL 1305	Gender in Agriculture	3	100
Total 5 Courses			15	500

2nd Semester (Course Semester)

SL. No.	Course Code	Course Title	Credit Hours	Marks
1.	MSARL 2301	Rural Development	3	100
2.	MSARL 2302	Sustainable Aquaculture and Fisheries Management	3	100
3.	MSARL 2303	Sustainable Livestock and Poultry Production	3	100
4.	MSARL 2304	Climate Change and Disaster Management	3	100
5.	MSARL 2305	Research Methodology	3	100
Total 5 Courses			15	500

3rd Semester (Course Semester)

SL. No.	Course Code	Course Title	Credit Hours	Marks
1.	MSARL 3301	Agro Processing	3	100
2.	MSARL 3302	Agricultural Extension	3	100
3.	MSARL 3303	Food and Nutritional Security	3	100
4.	MSARL 3304	Entrepreneurship and Agribusiness	3	100
5.	MSARL 3305	Project Planning and Management	3	100
Total 5 Courses			15	500

4th Semester (Project Semester)

Research		Credit	Mark
Project work/study & report writing		12	400
Project defense		3	100
Total		15	500

N.B. 1 course = 3 credits = 100 marks; Each course will carry 70 marks for theoretical examination (semester final), 20 marks for two course assignment & 10 marks for tutorial class attendance.

As per MSARL program regulation:

- **Academic requirement for MSARL program enrollment:** Minimum Bachelor of Agricultural Education degree or Bachelor of Science in relevant discipline from any recognized University / Institute
- **Program Duration:** Four semesters (2 years)
- **Semester duration:** Six (6) months
- **Registration validity:** Valid up to consecutive eight semesters (4 years)

Syllabus for Master in Sustainable Agriculture and Rural Livelihood (MSARL)

Course Title: Introduction to Sustainable Agriculture and Rural Livelihood

Course Code: MSARL 1301

Credit Hrs: 3

Sustainable Agriculture: Definition and objectives of SARL, Concept on sustainable agriculture, Basic principles and issues, Historical perspective of agricultural development and sustainable agriculture, Indicators of sustainable agricultural development, Difference between modern and sustainable agriculture, Advantages and disadvantages of sustainable agriculture

Managements Issues of Sustainable Agriculture: Agricultural sustainability through farming system, Conservation agriculture, Resource conservation technologies, integrated nutrient management and organic farming, Indices of sustainability and sustainability coefficients

Technological Change in Agriculture: Theories of technological and Institutional change in agriculture, Green revolution, Consequences of technological change and productivity in agriculture

Social Structure and Sustainable Livelihoods: Rural social structures, social change, power structures and good governance, Categorical inequality, ascription, race, class, gender and other bases of inequality; Concept of livelihood and food security, Sustainable Development Goals (SDGs), Livelihood strategies of households; Sustainable livelihoods framework and agricultural household systems impact on rural livelihood

Agricultural Policy and Development Planning: Characteristics and role of agriculture; Linkages between agriculture and industry in the developing countries; Agricultural price and food distribution policies in Bangladesh; Subsidy and output price support; Social safety net programs for food security; Steps and strategies of agricultural development planning

Programs in Sustainable Agriculture: Programs related to sustainable agriculture and rural livelihood; Approaches to study sustainable agriculture and rural livelihood issues

Recommended / Supplementary Textbooks

1. Chandrasenkaran, B., Annadurai, K. and Somsundaram, E. 2014. A Text Book of Agronomy. 2014. New Age International (p) Limited Publishers. New Delhi.
2. Chambers R 1983: Rural Development: Putting the last first.
3. Hayami Y and Aoki, m 2001: Development Economics: From the poverty to the wealth of nations, 2nd edition. Oxford university press.
4. Hossain M 1989: Green Revolution in Bangladesh: Impact on growth and distribution of income. University Press Limited, Dhaka
5. IFAD 2009: Gender in Agriculture. Source Book. The World Bank
6. Rahman L 1995: Sustainability of Growth and Development in Agriculture. Bangladesh Journal of Political Economy, Vol. XII, No. 2, 139-152.
7. Yellamanda Reddy, T. and Sankara Reddy, V. 2014. Principles of Agronomy. Kalyani Publishers. New Delhi.

Course Title: Advance Technologies for Crop Production

Course Code: MSARL 1302

Credit Hrs: 3

Introduction to Advance Technology for Crop Production: Concept, Scope and Importance

Crop Management: Agronomic management for improvement of yield and quality of crops; Water and Fertilizer Management

Orchard Floor Management: Cleaning, Spading and Weeding, Sanitation pruning, Frame working, Manuring, Technique to overcome alternate bearing, IPM / ICM

Quality Planting Materials (QPM): Grafts, Layers, Cuttage, Stionic relations, Compatibility and Top working

Special Cultivation Technologies: Organic farming, Crop production under stress condition (drought, flood and salinity), Farming system; Roof top gardening, Artificial pollination, Earthing up, Vine lifting, Mulching, Zero tillage production of Potato, Garlic and Aroids

Quality Seed Production: Isolation, Rouging, Balanced manuring and irrigation, Harvesting, Curing, Storing and Packaging; Seed policy, Certification and Quarantine

Application of Plan Growth Regulators (PGR): Dormancy breaking, Sex ratio, Flower forcing, Apical dominance, Senescence, Fruit thinning and Parthenocarpy

Post Harvest Technology of Crops: Harvesting, Curing, Sorting, Grading, Packaging and Storage

Cultivation Techniques of Potential Crops: Hybrid rice, Sugar beet, Coffee, Strawberry, Dragon fruit, Rambutan and Orange

Recommended / Supplementary Textbooks

1. Bose, T.K. and S.K. Mitra. 1990. Fruits: Tropical and Subtropical. NayaProkash, Calcutta, India.
2. Hartmann, H.T.; D.E. Kester and F.T. Davies Jr. 1990. Plant Propagation: Principles and Practices. Prentice Hall International Inc, U.S.A.
3. Janick J. 1963. Horticultural Science. W.H. Freeman and Co., U.S.A.
4. Edmond JB, Senn. TL, Andrews FS &Halfacre. RG. 1995. Fundamentals of Horticulture. Tata McGraw Hill Pub., New Delhi, Inida.
5. Rahim, M. A., AKM Asharaful Alam and Others. 2011. Underutilized Fruits in Bangladesh. WorldFish, Bioversity International, BAU-GPC and RDA Korea.
6. Rahim, M. A., AKM Asharaful Alam and Others. 2013. Underutilized Vegetables in Bangladesh. WorldFish, Bioversity International, BAU-GPC and RDA Korea.
7. Singh, C; Singh P. and Singh, R. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
8. Chakraverty, A.; Mujumdar, A.S.; Ramaswamy, H. S. 2003. Handbook of Postharvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices, CRC group, Taylor and Francis group.
9. Seed Technology Agrawal oxford & IBH Publishing company Pvt. Ltd. 1995.
10. Principles of Seed Science and Technology (4th Edition) Lawrence O. Copeland and Miller F. McDonald, Springer Science & Business Media, New York, 1999.

Course Title: Sustainable Crop Protection

Course Code: MSARL 1303

Credit Hrs: 3

Introduction to Pests and Diseases: Pest concepts, Pest and disease management scenarios in sustainable crop protection in Bangladesh, Abiotic and biotic factors of pest outbreak and disease development, Brief bioecology of major insect pests of principal crops, Introduction to fungi, bacteria, virus, nematode and their infection process in plant disease development, Major fungal, bacterial, viral and nematode diseases of important crops

Management of Pests and Diseases: Major control strategies of insect pests and plant diseases: mechanical, cultural, physical, legislative, host resistance, biological and chemical control, Biopesticides in crop protection: tools and methods, Insect interference methods - use of pheromones and sterile insect technique, Principles of IPM, Development of IPM programmes, GIS for pest and disease control strategy

Management of Pests in Storage: Mechanism of transmission of seed borne pathogens, Detection and identification of seed borne pathogens and insects, Seed health testing methods, Control of insects, rats and seed borne pathogens, Seed treatment procedures.

Management of Post Harvest Diseases: Factors influencing post harvest diseases: maintenance of storage environment, Nature of damage caused by post harvest diseases, harvesting precautionary measures, Management of storage diseases: tools and procedures

Mite Pests and Control Options: Phytophagous mites and classification, Influence of main ecological factors for mite infestation in agro ecosystem, Management tools of mite pests in crop field

Vertebrate Pests and Management: Types of vertebrate pests in crop field, Rat species and their extent of damages to crop plants and grains, Rat management practices in the field

Pesticides in Crop Protection: Definition of agrochemicals and their uses, Classification of pesticides, Historical chemical use worldwide and in Bangladesh, Harmful effect of pesticides on health and environment and counteracting measures, Pesticide resistance management, Analysis of pesticide residues in agro products

Recommended / Supplementary Textbooks

1. Alam, M.Z. 1971. Pests of Stored Grains and Other Stored Products and Their Control. Agil. Inf. Serv., Dhaka.
2. Baker, K.F. and R. J. Cook. 1982. Biological Control of Plant Pathogens. American Phytopathological Society, USA.
3. Debach, P. and D. Rosen. 1991. Biological Control by Natural Enemies (2nd Edn.). Cambridge University Press, New York, USA.
4. Dent, D. 1993. Insect Pest Management. CAB International, UK.
5. Dube H. C. 1980. A Text Book of Fungi, Bacteria and Viruses, Bio-Green Book, New Delhi, India.
6. Evans, G. O. 1992. Principles of Acarology, CAB International, Wallingford, UK.
7. George N. Agrios. 2016. Plant Pathology (6th Edn.), Academic Press, California, USA.
8. Islam, Z. and D. Catling. 2012. Rice Pests of Bangladesh: Their Ecology and Management. The University Press Ltd.
9. Singh R. S. 2009. Introduction to Principles of Plant Pathology. Oxford and IBH Publication, India.
10. Tembhare, D.B. 2005. Modern Entomology. Himalaya Publishing House, Delhi, India.
11. Van Der Plank J.E. 1980. Plant Disease: Epidemics and Control. Academic Press, USA.
12. Webster, J. and R.W.S. Weber. 2007. Introduction to Fungi (3rd Edn.). Cambridge University Press. UK.

Course Title: Natural Resource Management

Course Code: MSARL 1304

Credit Hrs: 3

Introduction: Concept of natural resource, Classification of natural resources, Scope and importance of natural resource managements

Natural Resources Conservation and Management: Human life on earth: Past, present and future; History of natural resources conservation, Approaches to natural resources management, Basic reason of the depletion of natural resources and their conservation strategies, Haor and hill agriculture

Water Resource Management: Definition and concept of water resources management, Hydrology and its development (water cycle, worldwide supply & national consumption), Uses of surface and groundwater in different purposes, Droughts, conflicts over water use, Types, properties and uses of hydraulic structure (dam, weir, barrage, spillways ,etc.), Flooding: problems, protection techniques, management in Bangladesh, Sources of water pollution and attenuation techniques of pollution, Water quality and environment pollution

Food Resources: Food supply from agricultural resources (Agriculture, fisheries and livestock), World agriculture system, Climate changes and food security, Food from cereals, Fruits and vegetables etc, Fish from fresh water and marine resources, Issues and challenges for resource supply, Blue economy

Forests and Wildlife Resources: History of plant and animal extinction, Over-exploitation, Deforestation, Endangered species management, Sustainable forest and agro-forestry management, developing and developed world strategies for forestry, Medicinal plant: benefits, scope, challenges & management

Mineral Resources: Abundances of mineral resources, Key mineral resources in Bangladesh, Processing of mineral resources

Energy Resources: Energy concepts: energy quality, energy efficiency and net useful energy, History of energy resources, Renewable and non-renewable energy resources and it's uses for growing energy needs in Bangladesh

Recommended / Supplementary Textbooks

1. Owen O. S, Chiras D. D and Reganold J. P, 1998. Natural resources conservation-management for a sustainable future, 7th Ed. Prentice Hall, New Jersey
2. Francois Ramade, 1984. Ecology of Natural Resources. John Wiley & Sons Ltd.
3. Harikesh N. Mishra, 2014. Managing Natural Resources- Focus on Land and Water. PHI Learning Publication.
4. Rogers, Peter P., Kazi F. Jalal, and John A. Boyd, 2007. An Introduction to Sustainable Development. Earthscan.
5. Tiwari, G.N. and M. K. Ghosal, 2005. Renewable Energy Resources: Basic Principles and Application, Narosa Publishing.
6. Bhojvaid P.P, 2008. Bio-fuels towards a greener and secure energy future.
7. Solanki C. S, 2009, Renewable Energy Technologies-A Practical Guide for Beginners, PHI Learning Pvt. Ltd., New Delhi.
8. West, P.W. Trees and Forest Management. 2004, Springer Publication.
9. Adrian Newton, 2007. Forest Ecology and Conservation: A Handbook Techniques. Oxford University Press
10. Murthy, V.V.N. 2009. Land and Water Management, 5th edition, Kalyani Publishers.

Course Title: Gender in Agriculture**Course Code: MSARL 1305****Credit Hrs: 3**

Introduction: Gender related major concepts : Gender, role, gender division of labor, gender needs (both practical and strategic), gender position, equality, equity, awareness, empowerment and gender development, gender neutrality, gender balanced approach; gender based violence, Gender identities of women : social, biological, psychological and cultural interpretation.

Gender as a Development Issue in Agriculture: Women in development (WID), Women and development (WAD), Gender and development (GAD), Gender empowerment measure (GEM), Women, agriculture and development (WAGD).

Gender Roles : Gender equity and equality in agriculture: Women's contribution in agriculture and recognition of their contributions, Women's participation in agricultural activities, such as – planting, storing seeds, preparing fertilizer for cultivation, harvesting, drying and processing paddy for marketing, fisheries; livestock-poultry; homestead gardening; indigenous practices.

Policies and Legal Dimensions in Gender and Agriculture: Legal rights and gender : Formal recognition of women agriculture workers; equity in their labor and payment; inclusion and women in agricultural activities : distribution of fertilizer and agricultural tools and equipments; access to credit or loan; distribution of agricultural materials, Training and skill development : Developing Women's agricultural skill; diagnosis and remedies for the diseases of farm animals, poultry, fish crops & plants, access to training on preventive measures to save lives; agricultural goods; livestock etc. from different disasters, Gender friendly management and marketing process in agriculture : Marketing of agricultural goods produced by women farmers, protection from harassment & violence, Improving situation of gender based discrimination in different sectors : education; primary health care; reproductive health; food and nutrition, water and sanitation.

Gender and agriculture in Bangladesh: Issues and Policy Environment: Policy environment related to gender and agriculture, National policies, programmes and issues in gender, agriculture and development, Role of NGOs in gender based participation of women in agriculture, International Conventions: Women's rights and empowerment in agriculture, Gender and sustainable development, Women cooperatives

Role of Media in Empowering Women in Agriculture: Rationale of involving of media, Role of media and their functions in assessing the participation/role of women in agriculture, Case Studies on media related to women in agriculture

Recommended / Supplementary Textbooks

1. Boserup, Ester (1971), *Women's Role in Economic Development*, London: George Allen and Unwin Ltd.
2. Moser, Carolin O.N. (1994), *Gender and Development-Theory Practice and Training* London, New York: Routledge.
3. Nasreen, Mahbuba, (2017), *Bangladesh National Conservation Strategy : Gender Issues*, Department of Forest, GoB.
4. Duza. Asfia, Hamid A. Begum (1993), *Emerging New Accents: A Perspective of Gender and Development in Bangladesh*, Dhaka: Women for Women.
5. Mahmud, Simeen (1990), *Women and Employment in Bangladesh*, BIDS. Dhaka.
6. UNICEF, *The Situation of Women in Bangladesh*, Dhaka.
7. Nasreen, Mahbuba, et.al. (2007), *Poribesh Samajbiggan*, Dhaka: Tapan Prokashon.
8. রহমান, শাহীন (১৯৯৮), জেডার প্রসঙ্গ, ঢাকা: স্টেপস টুয়ার্ডস ডেভেলপমেন্ট।
9. বেগম, মালেকা (২০০২), নারী আন্দোলনের পাঁচ দশক, ঢাকা : অন্য প্রকাশ।
10. জাতিসংঘ (১৯৯৭), জাতিসংঘ চতুর্থ বিশ্ব নারী সম্মেলন, ঢাকা : রাজকীয় ডেনমার্ক দূতাবাস।

Course Title: Rural Development**Course Code: MSARL 2301****Credit Hrs: 3**

Introduction to Rural Development: Basic concepts of rural development, History of rural development, Importance and scope of rural development

Rural Community and Institutions: Composites and characteristics of rural communities, Evolution of rural community, Major problem in rural communities, Traditional rural social institution in Bangladesh, Roles and functions of social institutions

Rural Infrastructure and Land Reform: Rural development constructs, Rural infrastructure and development, Land reform and community engagement, Rural Policy, Development avenues for the rural poor

Agrarian Stratification and Social Problems: Agrarian and peasant's society, Agricultural household model, Land tenure system and its function, Characteristics, types and function of agrarian social stratification in Bangladesh, Rural development Issues and social Problems

Rural Development Approach in Bangladesh: Experience in Rural development, Village agriculture and industrial development (V-AID) program, Approaches and strategies of different organization in Rural Bangladesh; Cumilla model, BRDB, RDA, PKSF, BRAC, Grameen Bank etc.

Local Government and Rural Power Structure in Bangladesh: Evolution, structure and composition of local government, Function of local government in Bangladesh, Elements and importance of rural power structure development, changing rural power structure in Bangladesh

Poverty and SDGs in Rural Development: SDGs and poverty alleviation programs, Integrated rural development program and policy, Aspects of Implementation of integrated rural development program, Women in development program and micro credit, Role of GO and NGOs in Rural development

Recommended / Supplementary Textbooks

1. Chambers R. 1983. Rural Development: Putting the last first.
2. Green GP. 2014. Hand Book of Rural Development. Elger Pub.
3. Singh K. 2009. Rural Development: Principles, Policies and Management. Sage Pub.
4. Maartje van Lieshout, Art Dewulf, Noelle Aarts & Catrien Termeer. 2012. Doing scalar politics: interactive scale framing for managing accountability in complex policy processes, *Critical Policy Studies*, 6(2), 163-181, DOI: 10.1080/19460171.2012.689736
5. Leeuwis, C. 2004. The management of an interactive innovation process. In Leeuwis C. & A. van den Ban (Eds.) *Communication for Rural Innovation; Rethinking agricultural extension*, pp. 247- 275. Blackwell Science, Oxford
6. Singh. K, (2009) Rural Development: Principles, Policies and Management. <http://dx.doi.org/10.4135/9788132108399>
7. গ্রামীণ ও শহর সমষ্টি উন্নয়ন (২০১৭), ড. মো: নূরুল ইসলাম, তাসমিয়া পাবলিকেশন্স, এলিফেন্ট রোড, ঢাকা-১২০৫।
8. উন্নয়নের সমাজবিজ্ঞান (২০১৭), জাহিদ, জুলফিকার, হাজারী, কবীর পাবলিকেশন্স, ৩৮/৩ বাংলাবাজার, ঢাকা- ১১০০।
9. গ্রামীণ ও শহর সমষ্টি উন্নয়ন (২০১৭), মো: শহিদুল্লাহ, গ্রন্থকুটির পাবলিকেশন্স, বাংলাবাজার, ঢাকা- ১১০০।

Course Title: Sustainable Aquaculture Management

Course Code: MSARL 2302

Credit Hrs: 3

Aquaculture and Fisheries: Importance of aquaculture and fisheries, Comparison of aquaculture and fisheries industries with terrestrial, Agricultural sources of food production, Principles of developing sustainable aquaculture and fisheries in different environments/conditions

Aquaculture Nutrition: Nutritional requirements of key aquaculture species, Assessment of the sustainability of feed production technologies, Relationship between nutrition and fish health & aquaculture productivity

Disease and Health Management Aspects in Aquaculture: Factors that influence disease processes in cultured fishery species including viral, Bacterial, parasitic and non-infectious disease, Importance of operations and management on the development & impact of disease in optimizing welfare & developing sustainable and ethical aquaculture practices

Management, Husbandry and Sustainability in Aquaculture: Production management and business management of modern aquaculture practices, Environmental, social and economic sustainability of aquaculture, Good aquaculture practices (GAP) for sustainability

Fishery Production and Productivity: Current status of fisheries resources and their annual production trends in both inland- and marine-waters, Concepts of sustainable fisheries and different sustainable fisheries models

Sustainable Management of Fishery resources and Livelihood Aspects: Concepts, Goals and objectives of sustainability in fishery management, Artisanal and commercial fishery management and their relationships with livelihood aspects

Aquaculture and Fishery Products, Marketing and Food Safety: Markets, Products, Processing and food safety aspects of aquaculture and harvested fishery products, Measures to establish safety and quality of fishery products towards development of sustainable aquaculture and fishery

Local and Global Impacts in Relation to Aquaculture and Fisheries: Environmental and economic impacts of aquaculture and fishing operations on both local and global scales, Impacts of climate change on aquaculture and fishery

Aquaculture and Fishery Policies and Regulations: National and international fishery policies and regulations concerning aquaculture and sustainable fishery management

Recommended / Supplementary Textbooks

1. Hayami Y 2001: Development economics: From the poverty to the wealth of nations, 2nd edition. Oxford university press.
2. Higgins B 1994: Economic Development: Problems, Principles and Policies. UBL, New Delhi.
3. Hossain M 1989: Green revolution in Bangladesh: Impact on growth and distribution of income. University Press Limited, Dhaka
4. Meir GM 2008: Leading Issues in Economic Development. 8th Edition, Oxford University Press.
5. Food Day October 1997.
6. Rahman L 1995: Sustainability of growth and development in agriculture. Bangladesh Journal of Political Economy, Vol. XII, No. 2, 139-152.

Course Title: Sustainable Livestock and Poultry Production**Course Code: MSARL 2303****Credit Hrs: 3**

Introduction to Livestock and Poultry: Present status and future prospects; Animal production systems; Breeds of cattle, buffalo, sheep, goat and poultry; Animal behavior vis-à-vis adaptation and production in tropics; Organic farming system; Industrialization of livestock sector

Production and Management of Livestock and Poultry: *Ruminant Animals:* Cattle, buffalo, sheep and goat production trends and factors affecting them; Care and management, feed conversion efficiency; Animal behavior and welfare. ***Poultry:*** Brooding, growing, laying and breeding flocks management; Bio-security and environmental consideration; Cage layer and light management; Hatchery management; Management during stress; Chick sexing; Maintenance of farm records.

Feeding of Livestock and Poultry: Nutritional requirements and feeding management; Feed additives; Least cost ration formulation; Systems of feeding; Processing and storage of conventional, non-conventional and agro-industrial feed ingredients and fodder; Production of annual, perennial and hydroponic fodder; Fodder calendar; Utilization of natural, organic, functional and health feed.

Reproduction Management of Livestock: Reproductive systems; Climate and nutrition affecting reproductive performance; Heat detection and artificial insemination; Assisted reproductive techniques; Repeat breeding; Infertility and its prevention; Early pregnancy diagnosis; Transgenic livestock; Familiarity with different innovative techniques and technologies for livestock.

Shelter of Livestock and Poultry: Housing systems, site selection and lay out of livestock and poultry houses; Space requirements; Housing designs; Construction of cheap livestock and poultry houses; Disposal of animal wastes and carcasses.

Health Management for Livestock and poultry: Preventive measures of diseases; Hygiene and sanitation; Symptoms of ill health, important infectious diseases and their prevention, control and treatment; Vaccination; Parasites and their control; First aid at farms; Segregation and quarantine management.

Animal Farming and Environment: Concept, objectives, factors affecting and constraints of integrated livestock farming and climate change; Contribution of livestock to different farming systems; Contribution of ruminant, adaptation and mitigation strategies for methane emission; Environmental implications of livestock production.

Economics and Marketing of Livestock and Poultry and their Products: Economic principles, insurance and financing; Project formulation and establishment; Grading; Marketing channel; Transportation; Export of products and by-products; Pricing and marketing; Role of cooperatives in poultry farming.

Recommended / Supplementary Textbooks

1. Livestock Production and Climate Change. P.K. Malik, R. Bhatta, J. Takahashi, R.A. Kohn and C.S. Prasad, CABI Pub.
 2. Textbook of Animal Husbandry and Livestock Extension, P. Mathialagan, International Book Distributing Co.
 3. Handbook of Livestock Management, Battaglia Richard A.
 4. Poultry Production in Hot Climates. Nuhad J Dagher, CABI Pub.
 5. Principles of Cattle Production, Clive J. C. Phillips, CABI Pub.
 6. Livestock Husbandry Techniques, McNitt, J. I., Granada Pub., UK.
 7. The Care and Management of Farm Animals, Scott, W. N., Bailliere Tindall Pub., UK.
 8. Basic Animal Nutrition and Feeding. W. Pond, K. Pond, P. Schoknecht and D. Church, Wiley Pub.
 9. Reproduction in Domestic Animals (Fourth Edition), Perry T. Cupps, Academic Press.
 10. Ruminant Physiology: Digestion, Metabolism, Growth and Reproduction, Pierre Cronje, CABI Pub.
১১. পশু পালন ও চিকিৎসাবিদ্যা, এম এ সামাদ, নিত্রিক এপিক প্রকাশনী, ময়মনসিংহ।

Course Title: Climate Change and Disaster Management in Agriculture**Course Code: MSARL 2304****Credit Hrs: 3**

Introduction to Climate and Climate Change : Definition, Basic feature of Climate Change, Causal factors of Climate Change, Current context of Climate Change- The Global Scenario, Sectoral Impacts of Climate Change : Crop; Forestry; Fisheries; Livestock and Poultry

Global Warming and Climate Change: Concept of Greenhouse Gas (GHG), Present Scenario of GHG (CO₂, Methane and Nitrous Oxide) emission; Global and Bangladesh context, Nexus of GHG, Global Warming and Climate Change in agriculture

Climate Change Scenario and Agricultural Vulnerability in Bangladesh: Nature and extent of Climate Change in Bangladesh, Climate vulnerable areas in Bangladesh in relation to agriculture - Hill area, *Haor* Area, Coastal area, Barind area and *Char* area, Impacts of Climate Change on the livelihood of vulnerable groups, marginal and landless farmers, ethnic minority groups, women, children and elderly people

Disaster Risk in relation to Climate Change: Basic concept of hazard and disaster; Definition, Types of hazard and disaster, History of hazard and disaster, Component of hazard and disaster, Dimension and phases of disasters, Occurrence and impact of different types of hazard and disaster in Bangladesh and its impact on agriculture, Linking Climate Change, Hazards, Disaster and Agriculture

Climate Change Impact Mitigation in Agriculture: Basic concept of mitigation, Mitigation measures in agriculture: Adaptation of Climate Smart Agriculture (CSA) for crops, fisheries and livestock, Community based Climate Change Impact Mitigation- Bangladesh context, Indigenous knowledge, practices and their integration with advanced science and technology for climate change mitigation

EIA (Environment Impact Assessment) and SIA (Social Impact Assessment) as tools in Mitigation in Agriculture: Basic concept of EIA and SIA, EIA as a process, screening, assessment of environmental consequences of a plan, policy, program or actual projects, EIA as a mitigation tool, technique and method, Basic concept and feature of SIA, SIA as a framework of for assessing the impact of climate change on agriculture.

Agricultural Insurance: Role of Insurance as a means of financial protection and risk coverage against loss of or damage of standing crops, livestock, fisheries, forestry, household & items etc. due to extreme climatic and human induced disasters. Role of government, NGO's, INGO's, financial institutions and corporate social services in providing the finance to the affected farmers with micro insurance support with payment index.

Disaster Risk Reduction and Risk Management: Assessing Disaster Risk: Disaster risk and damage potential of disaster (some case studies on major disasters in the context of agriculture and livelihood), Assessment of Disaster Risk; CRA, CVA (Capacity and Vulnerability Assessment), Disaster risk reduction mechanism: Preparedness, Mitigation and Prevention, Adaptation and Rehabilitation, Disaster Risk Management (DRM) Plan: Preparing Hazard, Profiling vulnerability, Analysis of the role of different Stakeholders vulnerability, Preparedness, Mitigation and Prevention plans in agriculture, Implementing DRM plan- Role of government, NGOs, Development partners, Private sector and Community people.

Regulatory and Policy Frameworks for Disaster Management in Agriculture: Legal and Policy Frameworks and their Roles and Responsibilities; IPCC, UNFCCC, UNCCD, UNISDR, CBD, CDM, AFOLU, Sendai Framework for Action, Kyoto Protocol, COP, Bangladesh Climate Change Strategic Action Plan, NAPA, Disaster Act, SOD (Standing Orders on Disasters)

Recommended / Supplementary Textbooks

1. Alka Chauhan et al.: Climate Change, Disaster Management and Environment, Discovery Publishing House Pvt. Ltd., India, 2016.
2. Allen, K.M.: Community-based disaster preparedness and climate adaptation: local capacity-building in the Philippines. Wiley, 2006. Disasters, vol. 30, no. 1, pp. 81-101.
3. Coppola, D. P.: Introduction to international disaster management. Oxford: Butterworth-Heinemann (Elsevier), 2007.
4. Enander, A.: Human needs and behaviour in the event of emergencies and social crises. Swedish Civil Contingencies Agency, Karlstad., 2010. In Fredholm, L. & Göransson A-L (Eds) Emergency Response Management in Today's Complex Society.
5. Handmer, J. and Dovers, S.: Handbook of Disaster Policies and Institutions. Routledge. 2013.
6. IFRC: Contingency planning guide. International Federation of Red Cross and Red Crescent Societies, Geneva, Switzerland., 2012.
7. IPCC, Summary for Policymakers, in Climate Change: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, et al., Editors. Cambridge University Press: Cambridge. 2007.
8. Perry, R.W. and Lindell, M.K.: Preparedness for Emergency Response: Guidelines for the Emergency Planning. Blackwell Publishing, Oxford, UK., 2003. Disasters, vol. 27, no 4.
9. Prizzia, R.: Climate change and disaster management. Sentia Publishing Co. Ltd., University of Hawai. 2015.
10. Solomon, I., Compensating for Climate Change: Principles and Lessons for Equitable Adaptation Funding. 2007. Washington D.C, Action Aid USA.

Course Title: Research Methodology**Course Code: MSARL 2305****Credit Hrs: 3**

Fundamentals of Research: Research: Basic Concept, Objectives, Steps and Importance; Major Areas of Research: Agriculture; Social Sciences; Business; Health and Population; Types and Approaches of Research: Pure and Applied; Quantitative and Qualitative; Research Hypothesis; Research Questions and Research Objectives; Ethics in Research

Review of Literature, Theoretical and Conceptual Framework: Review of Literature: Purposes and Key Features; Developing Theoretical and Conceptual Framework and their Usefulness; Sustainable Rural Livelihood Framework **Research Design:** Concepts, Types and Steps

Conducting and Formulating Research Proposal: Identification of Research Problem; Steps in Developing of Research Proposal; Setting Research Questions: Objectives and Hypotheses, formulation of Research problem

Sampling Methods: Basic Concept on Population, Sample, Sampling, Sampling framework, Parameter, Statistics, Sample Survey; Types of Sampling Techniques and Tools; Determination of Sample Size

Data Collection Tools and Methods: Data and Information; Different Types of Data; Quantitative and Qualitative; Different Tools, Techniques and Methods of Quantitative Research; Differences between Quantitative and Qualitative Research Methods; Different Tools, Techniques and Methods of Qualitative Data Collection : Case Study, Ethnography; Content Analysis; Focus Group Discussion (FGD); Key Informants Interview (KII); Field Observation, DND etc; preparation of Research questionnaire

Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA): Concept of Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA); Principles of RRA and PRA; Differences between RRA and PRA; Differences between Survey and PRA; Essential Attitude for Conducting PRA; Tools of PRA: Transact Walk, Social and Resource Mapping, Seasonal Calendar, Venn Diagram, Timeline, Wealth Ranking, Problem Identification and Prioritization; Application and Implementation of RRA and PRA tools

Level of Measurement and Techniques of Data Analysis: Different Levels of Measurement; Reliability and Validity of Measurement; Different Scaling Techniques; Data Analysis Techniques: Data Editing, Coding, Classification, Tabulation and Analysis; Measures of Central Tendency, Measures of Dispersion, Correlation and Regression analysis; Experimental Design and analysis of Variance

Test of Hypothesis: Test of Hypothesis, Parametric and Non-parametric Tests, Normal (Z) –test; t-test; F-test; Chi-square test and Sin-test

Report Writing: Report and Thesis Writing; Data analysis Software; Rules for Preparing References, Bibliography and Annotated Bibliography

Recommended / Supplementary Textbooks

1. Zahid, S.J.A. and Biswas, T.K. (2016). Research Methodology, Samannoy Prokashani; Bangla Bazar, Dhaka.
2. Gomez, K.A. and Gomez, A. A. (2015). Statistical Procedure for Agricultural Research, International Rice Research Institute; New York, Chichester, Brisbane, Toronto and Singapore.
3. Sufian, A.B.U.J. M. (1998). Methods and Techniques of Social Research, The University Press Limited: Dhaka.
4. Gujarati, D. N. (2003). Basic Econometrics, McGraw-Hill Companies: New York.

Course Name: Agro processing**Course Code: MSARL 3301****Credit Hour: 3**

Harvesting, Handling and Preparation for Marketing: Introduction of major foods (crops, animal and fish) in Bangladesh; chemical composition and nutrient content of selected foods (crops, animal and fish); maturity and maturity indices; harvesting and postharvest handling system for various commodity groups; curing, washing, sorting and grading

Packaging, Transportation and Storage of Agricultural Commodities: Post-harvest factors influencing quality of Agricultural Commodities; packaging and packaging materials, transportation system; waxing and irradiation; refrigeration and cold storage; blanching and drying; quality deterioration of stored foods and methods for protection

Processing and Preservation of Horticultural Crop: Principles and methods of food preservation; effect of process parameters on quality of end products; manufacturing of fruit and vegetable drinks; manufacturing of jam, jelly and chutney; manufacturing of pickles, sauces and chips; processing of spices; postharvest management of flowers

Processing and Preservation of Cereal Crops: Modern parboiling, drying and milling of rice; storage of paddy and milled rice and cooking quality of rice; processing of sugar crops; formulation and manufacturing of baked products; milling and processing of pulses; fermented and traditional products

Processing of Fish and Fish Products: Introduction to fish processing; general principles of fish preservation, storage and transportation; fish processing at low temperature (deep freezing/icing); fish curing (drying and dehydration, salting, smoking); fish canning

Processing of Egg, Meat and Milk & Their Products: Quality identification of shell eggs; functional properties of eggs in foods; steps of poultry processing; essential of slaughtering and slaughtering methods; postmortem changes and aging of meat; preservation of meat and meat products by smoking, drying, canning and freezing; different milk processing methods (filtration, clarification, standardization, pasteurization, homogenization); different processed milk (sterilized, UHT, flavored, standardization, reconstitution, recombined, condensed and low fat milk); egg, meat and dairy products manufacturing procedure (Mayonnaise, sausage, nugget, meat balls, cheese, dahi and ghee)

Food Safety Practices: Food safety; quality control; food regulation and compliance; good manufacturing practices (GMP); food adulteration and contamination; sanitary and phytosanitary (SPS) measures; hazard analysis and critical control point (HACCP)

Recommended / Supplementary Textbooks

1. Post Harvest Technology of Horticultural Crops, Dr. K.P. Sudheer, Dr. V. Indira
2. Food Chemistry, Edited by: Lillian Hoagland Meyer
3. Food Science, Fifth Edition: Norman N. Potter, Joseph H. Hotchkiss
4. Food Preservation and Processing, Edited by: Manoranjan Kalia, Sangita Sood
5. Text Book on Food Storage and Preservation, Edited by: Vijaya Khader
6. Food Hygiene and Sanitation in Food Industry, Edited by: S. Roday
7. Egg Science and Technology; (4th Edition); W.J. Stadelman and O.J. Cotterill; CBS Publishers and Distributors, New Delhi-110002, India; 2002.
8. Advanced Technologies for Meat Processing. Edited by Leo M. L. Nollet and Fidel Toldra. Published by CRC, Taylor & Francis Group. New York, USA; 2006.
9. Dairy Science and Technology; P.Walstra, T. M. Wouters & T.J. Geurts; 2nd ed.;CRC press;2006
10. Modern Dairy Technology; Vol.-1 & 2. Advances in Milk Processing. R. K. Robinson; Blackie Academic & Professional; 1996.

Course Title: Agricultural Extension Education**Course Code: MSARL 3302****Credit Hrs: 3**

Concept of Agricultural Extension: Definition, objectives and principles of agricultural Extension; Genesis of agricultural extension; Approaches of agricultural Extension; System approaches of agricultural extension.

Education and Learning: Concept and types of education; Definition of learning and learning process; Theories of learning; Laws of learning and their implication in agricultural extension.

Extension Teaching Methods and Aids: Concept of extension teaching; teaching methods and teaching aids; Classification of extension teaching methods and aids; Criteria of choice of extension teaching methods, Participatory extension teaching methods.

Communication in Agricultural Extension: Concept and importance of communication in agricultural extension; Elements of Communication process; Models of communication process; Credibility of communication in agricultural extension; Feedback in communication process; Barriers in communication and effective solution; Communication and social change

Group Dynamics and Leadership: Meaning of group and group dynamics; Type of group dynamics; Principles of working with groups and their mobilization; Group formation and why group fails; Concept, types and importance of leadership in agricultural extension; Theories of leadership; Determinants of effectiveness of leadership function; Duties and responsibilities of professional and local leader; Selection and recognition of local leaders.

Motivation: Concept of need and motivation; importance of motivation in agriculture extension, Theories of motivation and their implications.

Transfer of Technology: Concept of transfer of technology and technology generation; Diffusion process and innovation-decision process; Models of technology transfer process; Innovativeness and adopter categories; Measurement of adoption of innovation; Opinion leadership and diffusion network.

Extension Program Planning & Development: Concept and importance of program planning; Principles and steps of program planning; Peoples' participation in program Planning.

Program Monitoring and Evaluation: Meaning, types and purpose of monitoring and evaluation of a Program; Procedure for monitoring of demonstrations and field days; farmer's training & So on; Steps of evaluation of extension Program.

Extension Training: Meaning and types of training; Training schedule for training of extension agents and farmers. **Organization:** Meaning and concept of extension organization; Duties and responsibilities of different categories of personnel in DAE (Department of Agricultural Extension).

Decision Making: Concept & steps in decision making, factors affecting decision making process.

Recommended / Supplementary Textbooks

1. Adams, M.E., 1982. Agricultural Extension in Developing Countries. Longman Group Limited, Longman House, Essex, UK.
2. Bhuiyan, M.H., M.A.M. Mia, M.G.R. Akanda and M.A. Bashar, 2014. Agricultural Extension Education. G-Science Implementation and Publication, Dhaka.
3. Bhuiyan, M.H., 2012. Generation and Diffusion of Agricultural Innovation. Gurpukur Research Institute, Dhaka.
4. Bhuiyan, M.H. and M.A.M. Mia, 1999. Extension Psychology (in Bengali). Krishi Lekhok Forum, Krishibid Somoby Society Ltd. Khamarbari, Dhaka.
5. Berlo, D.K., 1960. The Communication Process. Holt, Rinehart and Winston, New York, London.
6. Dahama, O.P., and O.P. Bhatnagar, 1985. Education and Communication for Development (second Edition). Oxford and IBH Publishing Company, New Delhi, India.
7. Department of Agricultural Extension, 1999. Agricultural Extension Manual. Ministry of Agriculture, Govt. of the People's Republic of Bangladesh.
8. Kashem, M.A., 2004. Fundamentals of Extension Education. Published by Mrs. Sultana Kashem, Staff Quarter, BAU, Mymensingh.
9. Rogers, E.M., 1983. Diffusion of Innovation (Third edition). The Free Press, Collier, Macmillan Publishers, London.
10. Wilson, M.C. and G. Gallup, 1969. Extension Teaching Methods (Reprint). Federal Extension Service, USDA.

Course Title: Food and Nutrition Security**Course Code: MSARL 3303****Credit Hrs: 3**

Key Concepts of Food and Nutrition Security: Concept of food and nutrition security, importance & outlines; Framework and dimensions of food and nutrition security; Factors affecting food and nutrition security, food chain and food entitlements, role of production and trade in food and nutrition security; Food security in Bangladesh: Present status and future challenges

Food Systems: Food systems- Food types, production, distribution and uses, food value chain and market linkages, dynamics in food system and food security; Drivers of food system-Factors affecting food availability, access and utilization at household, community and national levels

Food Security Measurements: Measurement of food security and nutritional status; Role of crop, livestock and fisheries sectors for food and nutrition security of the people of Bangladesh

Food Policy Options: Food as basic right, access to food and public policies, citizen participation and the governance of food system, social inclusion, representation and civil society organizations. Different food safety net programs at government and non-government levels in Bangladesh

Food and Nutrition Situations in Bangladesh: Concept of nutrition and nutrients; classification of nutrients and their physiological role in human health, dietary requirement of macro and micro nutrients at different ages, pregnancy and among professional groups. Present status and situation analysis, stakeholder analysis of food and nutrition of the people of Bangladesh. Common hazards and diseases related to foods-causes of food contamination and adulteration; Public awareness and control of food and nutrition related diseases in Bangladesh

Nutrition Sensitive Agriculture: Nutrition specific and sensitive interventions for food production and manufacturing; Measures to reduce post-harvest losses of foods of plant, animal and other origins, Food fortification and eradication of malnutrition, Food fortification at growers' and factory level

Food Safety and Quality Issues: Concepts of food safety and quality; Factors affecting food safety and quality: raw materials, water, sanitations, malpractices, adulteration during food preparation; Food processing, preservation and value added products preparation from crops, animals, fishes, and other products; Food borne diseases and their control measures, Hazard Analysis and Critical Control Points (HACCP), Good Agricultural Practices (GAP) for production of crops, livestock and fish and post-harvest management, Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), International organization for Standardization (ISO), Codex Alimentarius, Food safety act-2013 of Bangladesh and related rules & regulations

Field and Industry Visit (Practical): Field and industry visit for practical exposure about GAP, GMP, GHP and HACCP implementation in food processing, preservation and value added products preparation; Case study, assignments and presentation on GAP, GMP, GHP and HACCP implementation by the food processing industries

Recommended / Supplementary Text Books and Journals

1. Bansal V., Siddiqui M.W., Rahman M.S. (2015) Minimally Processed Foods: (eds) Food Engineering Series. Springer, Cham
2. Badu, S., Shailendra, N., Gajanan and Sanyal, P. 2009. Food Security, Poverty and Nutrition policy Analysis: Statistical methods and application. Academic press, Burlington : Elsevier.
3. Craig S. Tucker, John A. Hargreaves Editors(s): 2009. Environmental Best Management Practices for Aquaculture. John Wiley & Sons, Inc
4. Lawrence, G, T. Wallington and K. Lyons. 2013. Food Security, Nutrition and Sustainability.
5. Magdoff F 2012: Food as Commodity. <http://monthlyreview.org/2012/01/01/food-as-a-commodity/> Monthly Review
6. McDonald, B.L.2010. Food Security (1st Edition). Polity press, Cambridge, UK
7. Morrison FB 1954: Food and Feeding. The Morrison Publishing Co. Ithaca, N. Y.
8. Quasem MA 1997: Intervention towards attaining food security in Bangladesh. A keynote paper presented in the seminar on World Food Day October 1997.
9. Van Esterik P 1999: Right to food; right to feed; right to be fed. The intersection of women's rights and the right to food. Agriculture and Human Values, 16: 225–232.

Course Title: Entrepreneurship and Agribusiness

Course Code: MSARL 3304

Credit Hrs: 3

Basic of Entrepreneurship: Evolution of concept of entrepreneur, Characteristics of entrepreneur, Distinction between entrepreneur and manager; Types of entrepreneur, Functions of entrepreneur; Concepts of entrepreneurship, Entrepreneur vs Entrepreneurship; Role of entrepreneurship in economic development, Intrapreneur, Entrepreneur versus investor, women entrepreneur, rural entrepreneur

Environment for Entrepreneurship: Schematic of the new venture's environment, Process of business environment analysis; Political and governmental, Stakeholder; Macroeconomic, Technological, Sociodemographic, Ecological, Competitive, and Competitor analyses

Start-Up Business: Business plan, Elements of the business plan; Creativity and the business idea, Methods of generating ideas; Flow chart for SME establishment, Obtaining trade license; Export and import flow chart; Process flow chart to be an entrepreneur, Critiquing the business plan

Financing the New Venture: Sources of capital; Informal risk capital and venture capital

Size, Scope and Forms of Agribusiness: Concept of agribusiness, Evolution of agribusiness; Role of agribusiness in economic development; Sectors of agribusiness; Trend in agricultural production, Prospects of agribusiness; Agricultural inputs market; Agricultural products markets and competition; Preparing for the new venture launch, Different forms of business entities

Business Strategy for Agribusiness: Different forms of business strategy, Blue ocean strategy; Venture capital; Angel investment; Business incubator

Fundamentals of Supply Chain and Value Chain: Concepts of supply chain and value chain; Difference of supply chain and value chain; Major supply chain agricultural commodities: Paddy/rice, Vegetables, Dairy, Aquaculture; Upgradation and governance in agricultural value chain; Porters value chain analysis; Preserving agricultural commodity in value chain; Major constrain and potential of value chain; Political economy and agribusiness.

Understanding and Reaching Bottom of Pyramid Market; and Inclusive Market Development (IMD): Understanding BOP markets, Nature of BOP markets; Challenges in BOP markets'; Steps to reach BOP markets; Understanding IMD; Key guiding principles for IMD facilitation; IMD in agribusiness

Government Initiatives for Entrepreneurship Development: SME foundation, SCITI, BCSIR, BSCIC, PPE, E-entrepreneurship, E-commerce, E-business; some successful case study

Recommended / Supplementary Textbooks

1. Barringer, BR and Ireland, RD. 2009. Entrepreneurship: Successfully Launching New Venture. 3rd Edition. Prentice Hall.
2. Beierlein, JG and Woolverton, MW. 1991. Agribusiness Marketing – The Management Perspective, Prentice Hall, Englewood Cliffs, New Jersey.
3. Dollinger, MJ. 2008. Entrepreneurship: strategies and resources, 4th ed, Marsh Publications Lombard, Illinois
4. Hisrich RD, Peters, MP and Shepherd, DA. 2011. Entrepreneurship. 6th Edition. McGraw-Hill/Irwin.
5. Khan, MAS (edt.). 2013. Handbook of Entrepreneurship Development, Dhaka Chamber of Commerce and Industry (DCCI).
6. Ricketts, C and Rawlins, O. 2001. Introduction to Agribusiness, Delmar, Thomson Learning.
7. Roy, Roy, R.2013. Entrepreneurship, 2nd ed., Oxford University Press, New Delhi, India.

Course Title: Project Planning and Management

Course Code: MSARL 3305

Credit Hrs: 3

Concept and Nature of Project: Definition, characteristics, classification of project

Project Planning and Preparation: Different aspects of planning, Project feasibility study (Technical, economic, financial, social, environmental, institutional), Tools and techniques, Logical framework, Project concept paper, TPP & DPP format for project preparation

Project Cycle: The phases of project cycle; Pre-identification, Identification, Preparation, Appraisal, Approval, Implementation, Operation, Evaluation

Project Management–Monitoring and Evaluation (M&E): Basic principles, Different approaches of M&E, Different Indicators (Output, outcome & impact), Information - methods of collecting information, Designing monitoring and evaluation process, Results based information (RBM), Information analysis, Reporting

Exercise on Project Preparation: Steps involving project planning: Title selection, Introduction and Rationale of project, objective, research questions, hypothesis, project methodology, Review of literature, Theoretical and Conceptual framework, Budget, Implementation process

Recommended / Supplementary Textbooks

1. BRRI, 2001. Poverty Elimination through Rice Research Assistance (PETRRA), Project Cycle Management Training, BRRI, Training Division, Gazipur.
2. FAO, 1988. Participatory Monitoring and Evaluation – Handbook for Training Field Workers. Regional Office for Asia and Pacific (RAPA), Bangkok, Thailand.
3. Gudda, P. 2011. A Guide to Project Monitoring and Evaluation, Amazon.com
4. Kusek, J. Z. and R. C. Rist (2004): Ten Steps to a Results-Based Monitoring and Evaluation System. The World Bank, Washington D.C.
5. REFPI, 2000. Tools and Techniques. Department of Farm Power Machinery, Bangladesh Agricultural University, Mymensingh-2202.
6. Shapiro, J. (2010): *Monitoring and Evaluation*. www.civicus.org (email: nellshap@hixnet.co.za)
7. Singh, M. K. 1990. Project Evaluation and Management Discovery Publishing House, New Delhi, India.
8. Smith, P. 1984. Agricultural Project Management- Monitoring and Control of Implementation. Elsevier Applied Science Publisher, London and New York.
9. The UN ACC Task Force on Rural Development (1984): *Guiding Principles for the Design and Use of Monitoring and Evaluation in Rural Development Projects and Programmes*. Rome.