



Bangladesh Open University

SARD SCHOOL OF AGRICULTURE AND RURAL DEVELOPMENT কৃষি ও পল্লী উন্নয়ন স্কুল	School of Agriculture and Rural Development (SARD)
	Master of Science (MS) in Agronomy

Curriculum layout for the degree of Master of Science (MS) in Agronomy

- Requirement for registration:** Bachelor of Science in Agriculture (BSc Ag) or related disciplines from any recognized University or Institute
- Duration:** One and a half ($1\frac{1}{2}$) years (Registration valid for consecutive four and a half years)
- Semester:** Three Semesters (Valid up to consecutive nine semesters), two semesters in a year each of six (6) months
- No. of courses = 12
- No. of credits = 40
- Total Marks = 2000

Distribution of courses, credits and marks

M.S. in Agronomy shall be offered with 40 credits in 3 semesters each of six months duration. The courses worth 24 credits of which 12 credits shall be offered during the first semester and the other 12 credits during the 2nd semester respectively for the students. Another 16 credits shall be reserved for the research (thesis and thesis defense). The students have to start their research work for thesis (equivalent to 6 courses) under the guidance and supervision of his/her Research Supervisors after the completion of one semester and the same shall be carried through to the last semester when it will be evaluated. After the evaluation of thesis the students have to face thesis defense (equivalent to 2 courses). The distribution of courses, credits and marks are shown below:

Course Type		No. of Courses	Credits	Marks
Course (compulsory)		12	24	1200
Research	a) Thesis	equivalent to 6 courses	12	600
	b) Thesis defense	equivalent to 2 courses	4	200
Total			40	2000

N.B. 1 course = 2 credits = 100 marks; Thesis = 12 credits = 600 marks, Thesis defense (4 credits) = 200 marks: Each course will carry 80 marks for theoretical examination and 10 marks for one course assignment and 10 marks for class attendance.


Course layout for MS in Agronomy

1st Semester

Sl.	Courses Title	Course code	Credit hrs.	Marks
1	Advanced Production Technology of Field Crops	MSAGN 1201	2	100
2	Crop Yield Processes	MSAGN 1202	2	100
3	Seed Technology	MSAGN 1203	2	100
4	Weed Science	MSAGN 1204	2	100
5	Soil Fertility Management in Crop Production	MSAGN 1205	2	100
6	Water Management in Crop Production	MSAGN 1206	2	100
Total 6 courses			12	600



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2nd Semester

Sl.	Courses Title	Course code	Credit hrs.	Marks
1	Crop Production in Changing Environment	MSAGN 2201	2	100
2	Framing Systems	MSAGN 2202	2	100
3	Agronomic Research Methodology	MSAGN 2203	2	100
4	Field Crop Agroforestry	MSAGN 2204	2	100
5	Fodder and Pasture Management	MSAGN 2205	2	100
6	Postharvest Technology of Field Crops	MSAGN 2206	2	100
Total 6 courses			12	600

3rd Semester

Title	Credit	Mark
a. Thesis (equivalent to 6 courses)	12	600
b. Thesis defense (equivalent to 2 courses)	4	200
Thesis + Thesis defense	16	800
Grand Total	(12×2)+16 = 40 (Forty)	2000

Syllabus for MS in Agronomy

Course Title: Advanced Production Technology of Field Crops


Credit Hrs: 2

Course Code: MSAGN 1201

Unit	Title	Lesson
1	Yield and Quality of Crops	Yield and yield components Concept of yield improvement Agronomic management for improvement of yield and quality of crops Introduction and selection as a mean of crop improvement
2	Production Technology of Field Crops (Importance, origin, distribution, climatic & edaphic requirements, cultivation technology)	Cereal crops: rice, wheat, maize Millets: cheena, kaon Fibre crops: jute, cotton Sugar crops: sugarcane, sugar beet Beverage crops: tea, coffee Pulse crops: lentil, grass pea, mung bean, black gram, chickpea, pea Oilseed crops: mustard, sesame, groundnut, sunflower, soybean, linseed



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Recommended Textbooks

1. Pia, M. Deia, J. and Rai, R.KI. 1996. Fundamentals of Cereal crop Production. Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Martin, J.H. Waldren, R.P. and Stamp, D.L. 2006. Principles of Field Crop Production 4th Ed. The McMillan Co., New York.
3. Reddy, S.R. 2004 Principles of Crop Production. 2nd Ed. Kalyani Publishers New Delhi.

Supplementary Textbooks

4. Leonard, W.H. and Martin, J.H. 1963. Cereal Crops. McMillan Pub. Co. Inc. New York.
5. Singh, C; Singh P. and Singh, R. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
6. Gowda, C.L.L. and Kaul, A.K. 1982. Pulses in Bangladesh. BARI and FAO.
7. Maiti, S., Hedge, M.R. and Chhattopadhyay, S.B. 1988. Handbook of Annual Oil Seed Crops. Oxford & IBH Publishing Co., New Delhi.
8. Ninan, K.N. 1989. Edible Oilseeds. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
9. Rathore, P.S. 1999-2000. Techniques and Management of Field Crop Production. Agrobios (India), Jodhpur.
10. Reddy, S.R. 2004. Agronomy of Field Crops. Kalyani Publishers, New Delhi.
11. Maiti, S. Hedge, M.R. and Chhattopadhyay, S.B. 1988. Handbook of Annual Oilseed Crops. Oxford & IBH Publishing Co. New Delhi.

Course Title: Crop Yield Processes

Credit Hrs: 2

Course code: MSAGN 1202

Unit	Title	Lesson
1	Concept of Yield	Growth and yield analysis, yield components, biological yields, economic yield and harvest index
2	Plant Characteristics in Relation to Yielding Ability	Plant heights, leaf characteristics, stem characteristics, canopy architecture and photosynthetic machinery
3	Production of Dry Matter	Root growth, shoot growth, leaf area index, source and sink, nitrogen and carbon assimilation, Photosynthetic rate and efficiency and respiratory losses
4	Partitioning of Dry Matter	Assimilate distribution within the plant and partitioning of dry matter between grain and non-grain parts
5	Crop Growth and Yield Capacity	Growth phases and stages, crop growth rate, determination of yield capacity, reproductive development and development of yield components
6	Effect of Growth Factors on Growth and Yield	Light, water, temperature, humidity, nutrients, growth regulators, cultivar, site and season
7	Seed/Grain Filling	Seed/grain growth, linear and exponential phases, sources of assimilates in the grain, contribution of different plant parts to grain filling, current photosynthesis, stored carbohydrates, green area duration, rate and duration of grain filling

Recommended Textbooks


1. American Society of Agronomy. 1976. Advances in Agronomy. Vol. 28. Academic Press, New York.
2. Charles-Edwards, D.A. 1987. Physiological determinants of crop growth. Academic Press. New York, London.
3. Estin, J.D. Parkins, F.A. Sullivan, C.Y. and Bavel, C.H.M. Van. 1969. Physiological Aspects of Crop Yield. ASA and CSSA.

Supplementary Textbooks

4. Evans, L.T. and Peacock, W.J. 1981. Wheat Science- Today and Tomorrow. Cambridge University Press, Cambridge.
5. Hawkins, A.F. and Jeffcoat, B. 1982. Opportunities for Manipulation of Cereals Productivity. British Plant Growth Regulators Group,



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- Hard, R.G. Biscoe, P.V. and Dennis, C. 1980. Opportunities for increasing crop yields. Pitman, London.

Course Title: Seed Technology

Credit Hrs: 2

Course Code: MSAGN 1203

Unit	Title	Lesson
1	Introduction of Seed Technology	Concept of seed . importance of seed in agriculture Concept of seed technology , present status of seed research in Bangladesh
2	Principles and Methods of Quality Seed Production	Concept of quality seed, principles of seed production, factors influencing during seed production, processing and storage, distribution and marketing of quality seeds in Bangladesh
3	Varietal Development	Plant breeding system (including OP + Hybrid + recomb.); definition of a variety, importance of varietal development and variety; variety evaluation-DUS; variety release, registration maintenance, breeder seed production
4	Seed Multiplication	Factors influencing seed multiplication; techniques of seed multiplication
5	Seed Processing	Drying, cleaning, preservation, seed treatment, seed packaging
6	Quality Control and Certification of Seed	National seed policy, role of national seed board (NSB), concept and objectives of seed certification, procedure of seed certification, seed certification agency(SCA), seed quarantine in Bangladesh

Recommended Textbooks

- Agawal, R.L.1991. Seed Technology, Oxford & IBH Publishing Co. Delhi
- Agawal, P.K. 1999. Seed Technology, ICAR, New Delhi.
- Copeland, L.O. 1976. Principles of Seed Science and Technology . Burgas Pub. Co. USA.

Supplementary Textbooks

- Rhomson, H.C. and Kelley, W.C. 1957. Vegetable Crops. McGraw-Hill Book Co. Inc., New York. Toronto, London.
- Thomson, J.R. 1979. An Introduction to Seed Technology, Leonard Hill Pub.
- Kent, N.L. 1976. Technology of Cereals. Pergamon Press Ltd. Oxford, London.
- Nema, N.P. 1989. Principles of Seed Certification and Testing. Allied Pub. Ltd. Ahmedabad, Bangalore, Bombay, Calcutta.
- SCA and BARC. 1987. Proceedings of National Seed Technology, Workshop, January 27-28, 1985.
- Subir Sen and Nabinanda Ghosh.1999. Seed Science and Technology, Kalyani Publishers. New Delhi.
- Dhirenra Khare and Mohan S. Bhale.2000. Seed Technology. Scientific Publishers (India), Jodhpur.
- A.K. Joshi and B.D. Singh.2005. Seed Technology. Kalyani Publishers, New Delhi.

Course Title: Weed Science

Credit Hrs: 2


Course Code: MSAGN 1204

Part 1: Weed Management

Unit	Title	Lesson
1	Concept and Approach of Weed Management	Evolution of weed control methods, concept of prevention, control and eradication of weed, complementary relationships between prevention and control, concept of integrated weed management
2	Crop Production Practices in Weed Management	Impact of time of land preparation, number and depth of ploughing, puddling, planting method, seeding rate, plant spacing, age of seedling soil moisture regime, soil fertility



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		management, crop rotation and cropping pattern in weed management
3	Herbicide in Weed Management	Application of herbicides in weed management, herbicide selectivity, absorption, movement and translocation of herbicides in plant, fate of herbicide in plants and soil
4	Allelopathy in Weed Management	Concept of allelopathy and its historical background, significance of allelopathy in weed-crop ecology, allelopathic weeds and crops, potential of allelopathy in weed management
5	Weed Management in Major Crops in Bangladesh	Present status and future strategy of weed management in rice, jute, wheat, sugarcane, pulses, mustard and tea

Part 2: Weed Biology and Ecology

Unit	Title	Lesson
6	Crop-Weed Completion	Concept, mechanism, measurement and elements of crop-weed competition, factors affecting crop-weed completion, critical period of weed crop completion, competitive ability of crops and weeds and factors affecting it.
7	Survival Mechanism of Weed	Reproduction of weed by means of seed and vegetative part, factors affecting weed seed production, germination of weed seed and factors affecting it, periodicity of weed seed germination, dormancy of weed seeds, dynamics of a soil seed bank and factors affecting the longevity of weed seed.
8	Biology of Weeds	<i>Cyperus rotundus</i> , <i>Echinochloa crusgalli</i> , <i>Echinochloa colonum</i> , <i>Cyperus iria</i> , <i>Eichhomia crasipes</i> and <i>Striga densiflora</i> .

Recommended Textbooks


1. Aldrich, R.J. and Kramer, R.J. 1997. Principles in Weed Management. Panama Pub, New Delhi.
2. Aldrich, R.J. 1984. Weed-crop Ecology. In: Principles in Weed Management. Bretion Publishers, Wardsworth Inc. Belmont, California.
3. Naylor, R.E.L. 2002. Weed Management, Principles and Practices. Blackwell Science, UK.
4. Tanveer, A. 2008. Biology and Ecology of Weed. HEC, Pakistan.
5. Ziska, L.H. and J. S. Duke. 2011. Weed Biology and Climate Change. Wiley Backward.

Supplementary Textbooks

6. Allieri, M.A. and Liebman, M. 1988. Weed Management in Agroecosystems: Ecological Approaches. CRC Press, Inc. Boca Raton, Florida
7. Ashton, P.M. and Crafts, A.S. 1981. Mode of action of herbicides, 2nd Edition. Wiley-Inter Science.
8. Gupta, O.P. 2000. Weed Management - Principles and Practices. Agrobios, India Pub.
9. Huddus, L.J. 1976. Herbicides. Vol. I and II, Academic Press, London, New York, Sanfrancisco.
10. Mandal, R.C. 1990. Weed, Weedicides and Weed Control- Principles and Practices. Agro-Botanical Pub, Bikaner.
11. Rao, VS. 2000. Principles of Weed Science. Oxford and IBH. Pub., New Delhi.
12. Subramanian, S. Ali, A.M. and Kumar, R.J. 1997. All About Weed Control, Kalyani Pub. New Delhi.
13. Walia, U.S. 2003. Weed Management. Kalyani Publishers, New Delhi – 110 002.
14. Zimdahl, R. 2013. Fundamentals of Weed Science 4th Edition. Academic Press. New York.



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Course Title: Soil Fertility Management in Crop Production **Credit Hrs: 2**

Course Code: MSAGN 1205

Unit	Title	Lesson
1	Soil Fertility Management	Maintenance and improvement of soil fertility in different agro-ecological zones of Bangladesh
2	Organic Matter and Manures	Organic matter as a means of soil amendment, maintenance of soil organic matter through crops and cropping
3	Fertilizer Management	Characteristics of different kinds of fertilizers, preparation of different grades of mixed fertilizers for crops and soils, nutrient recycling in soil by natural and artificial means, maximization of crop production through efficient use of fertilizers, factors affecting efficient fertilizer management, management of fertilizer efficiency under wet land, upland and irrigated conditions, fertilizer management in relation to development of crops at different environmental stimuli
4	Bio-fertilizers	Roles in crop production and maintenance of soil fertility and method of application, effects on soil, crops and environment
5	Micronutrients	Role of micronutrients in the maintenance of soil productivity, crop yield and quality; economy of crop production through micronutrient fertilization in Bangladesh

Recommended Textbooks

- Alexander, M. 1968. Fertilizers and Fertilizing. McGraw Hill Book Co. Ltd. N.Y (USA).
- Mengel, K., Kirby, E.A. 1987. Principles of Plant Nutrition. 4th Ed. International Potash Institute, Berne.
- Russel, E.W. 1960. Soil Condition and Plant Growth. Oxford Univ. Press, London.
- Tisdale, S.L. and Nelson, W.L. 1990. Soil Fertility and fertilizers, McMillan Pub. Co. N.Y.

Supplementary Textbooks

- Davis, R.T. 1984. Potentials and Limitations of Biological Nitrogen Fixation. Proc. Int. Sym. BARC. Dhaka.
- IRRI. 1967. Mineral Nutrients of rice. Los Banos, Laguna, Philippines.
- Katyal, J.C. and Randhawa, N.S. 1983. Micronutrients., FAO Fertilizer and Plant Nutrition Bulletin No. 7, Rome.
- Tandon, H.L.S. 1991. Secondary and Micronutrients in Agriculture. F.D.C.O. New Delhi 110048, India.
- Tandon, H.L.S. 1992. Fertilizers, Organic manures. Recyclable Wastes and Biofertilizers. G.D.C.O. Bhanet Bhavan, New Delhi 10048, India.
- Venkataraman, G.S. 1981. Blue-green algae for rice production a manual for its promotion. FAO Soils Bull., 46, 102.
- Brady, N.C. and Weil, R.R. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
- Fageria, N.K. Baligar, V.C. and Jones, C.A. 1991. Growth and Mineral Nutrition of Field Crops. Marcel Dekker.
- Havlin, J.L. Beaton, J.D. Tisdale, S.L. and Nelson, W.L. 2006. Soil Fertility and Fertilizers. 7th Ed. Prentice Hall.
- Prasad, R. and Power, J.F. 1997. Soil Fertility Management for Sustainable Agriculture. CRC Press.
- Yawalkar, K.S. Agrawal, J.P. and Bokde, S. 2000. Manures and Fertilizers. Agri-Horti Publ.

Course Title: Water Management in Crop Production


Credit Hrs: 2

Course Code: MSAGN 1206

Unit	Title	Lesson
1	Soil Moisture	Sources, relation and movement, soil-plant-water relationship, measurement of soil moisture.
2	Water Management	Water management of crops in different ecosystems, dry land, rainfed and irrigated farming.
3	Water Resources	Water availability, quality and uses, agronomic management for efficient



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		water use in drought and flooded conditions
4	Water Requirement of Crops	Requirement and determination of water for different crops, guidelines for predicting crop water requirements.
5	Irrigation Efficiency and Scheduling	Efficiency of irrigation practices, Irrigation scheduling and water budgets for important field crops.

Recommended Textbooks

1. Brady, N.C. 1974. The nature and properties of soil. MacMillan Pub. Co. Inc. New York.
2. Singh, S.S. 1998. Crop Management: Under irrigated and rainfed conditions.
3. Panda, S.C. 2003. Principles and Practices of Water Management. Agrobios.
4. FAO. 1984. Irrigation Practice and Water Management. Oxford & IBH.

Supplementary Textbooks

5. Arakani, H.R. and Donhue, R. 1988. Principles of soil conservation and water management. Oxford and IBH Pub. Co. Pvt. Ltd. Calcutta.
6. Doorenbos, P. and Pruitt, W.O. 1977. Guidelines for producing crop water requirements. FAO Irrigation and Drainage Paper 24:144pp. UN, Rome.
7. Dov, N. and Finkel, H.J. 1982. Water requirement of crops and irrigation rates. In: Handbook of Irrigation Technology. Vol. 1 (Ed. H.J. Finkel) CRC Press. Inc. Boca Raton, Florida.
8. Parihar, S.S. and Sandhu, B.S. 1987. Irrigation of Food Crops - Principles and Practices. ICAR.
9. Mishra, R.R. and Ahmad, M. 1987. Manual on Irrigation and Agronomy. Oxford & IBH.
10. Panda, S.C. 2003. Principles and Practices of Water Management. Agrobios.
11. Sankara Reddy, G.H. and Yellamananda Reddy 1995. Efficient Use of Irrigation Water. In: Gupta US. (Ed.). Production and Improvement of Crops for Drylands. Oxford & IBH.
12. Singh, S.S. 2006. Principles and Practices of Agronomy. In: Gupta US. (Ed.). Production and Improvement of Crops for Drylands. Oxford & IBH.
13. Parihar, S.S. and Sandhu, B.S. 1978. Irrigation of Field Crops- Principles and Practices, ICAR, New-Delhi.

Course Title: Crop Production in Changing Environment


Credit Hrs: 2

Course Code: MSAGN 2201

Unit	Title	Lesson
1	Deep Water Stress	Nature of deep water stress, crop response to deep water stress- characteristics of flood water, factors affecting survival, elongation of internodes and morphological change of submerged plants, development strategies, management of deep water stress, system based production technology options for flood vulnerable areas, screening of plants for drought tolerance and development of technology to reduce crop losses
2	Drought Stress	Concept, nature and causes of drought, effect of drought on growth, development and yield of crops, morphological basis of drought tolerance, screening plants for drought tolerance and development of technology to reduce crop losses
3	Temperature Stress	Nature of injury due to low and high temperature, agronomic manipulation to combat temperature stresses in crops
4	Light Stress	Nature and causes of light stress, effect of photoperiod, light intensity, cloud cover and mutual shading on nutrient uptake, growth, development and yield of crops
5	Stress due to Hailstorm, Storm and Cyclone	Occurrence, nature and extent of crop damage, agronomic means to mitigate crops losses



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6 **Salinity Stress** Occurrence, nature and extent of crop damage, agronomic means to mitigate crops losses

Recommended Textbooks

1. Acharya, M.S. and Gupta. A.P. 1990. Hydrological aspects of drought for stabilizing agricultural production in Rajasthan State. International Symposium on Natural Resources Management for Sustainable Agriculture. 6-10 February, New Delhi.
2. B. Venkateswarlu, Arun K. Shanker, Chitra Shanker, M. Maheswari, 2011. Crop Stress and its Management: Perspectives and Strategies. Springer Science & Business Media.
3. Evans, L.T. 1963. Environmental Control of Plant Growth. Academic Press, New York and London.
4. M. Ashraf, M. Ozturk, Habib-ur-Rehman Athar, 2008. Salinity and Water Stress: Improving Crop Efficiency. Springer Science & Business Media.
5. [Mohammad Pessaraki](#), 2016. Handbook of Plant and Crop Stress, CRC Press, Taylor & Francis Publishing Group.

Supplementary Textbooks

6. Alim, M.S. 1991. Technological aspects of pre-monsoon climatic effects on agricultural production. Paper presented in the National Workshop on Risk Management in Bangladesh Agriculture, BARC, Dhaka, 24-27 August.
7. Anonymous. 1985. Agroclimate study for dry farming of Bangladesh. Gujrat Agril. Univ. Res. J. 11(1):30-34.
8. Choudhury, A.M. 1991. Use of remote sensitivity techniques in risk management in agriculture. Paper presented at the National Workshop on Risk Management in Bangladesh Agriculture, BARC, Dhaka. 24-27 August.
9. De Datta, S.K. and Banerji, B. 1972. Performance of flood resistant and deep water rice in relation to growth and yield under different cultural practices. Indian J. Agric. Sci. 12:664-670.
10. Eunus, M., Vergara, B.S., Peralta, J.A. and Ikehashi, H. 1980. Methods for screening rice seedling for drought tolerance during rapid generation advance. IRRN 5(4):10-12.
11. IRRI. 1976. Climate and Rice. Los Banos, Laguna, Philippines.
12. IRRI. 1989. Climate and Flood Security. P.O. Box 933, 1099 Manila, Philippines.
13. Platt, R.B. and Griffith, J.F. 1965. Environmental Measurement and Interpretation. Reinhold Pub. Corporation, New York.
14. [R.K. Gaur](#), [Pradeep Shama](#), 2013. Approaches to Plant Stress and their Management, Springer Science & Business Media.
15. Rahman, M.S. 1991. Weather related conditions to crop production and technological support to avoid risk in agriculture. Paper presented at the National Workshop on Risk Management in Bangladesh Agriculture, BARC, Dhaka, 24-27 August.
16. [Shamim](#), [K.N. Singh](#), 2016. Biotic Stress Management in Rice. Apple Academic Press.
17. Zaman, S.M.H. 1986. Current Status and prospects for rainfed flood grain production in Bangladesh. BRRI, Bangladesh.

Course Title: Farming Systems

Credit Hrs : 2

Course Code: MSAGN 2202


Unit	Title	Lesson
1	System	Concept and properties agro ecosystem analysis, evolution of agricultural systems in Bangladesh.
2	Farming System	Concept, characteristics, resources, components and enterprises.
3	Determination of Farming System	Physical, biological, social, economic
4	Farming System Research	Concept and importance, characteristics, interdisciplinary
5	Farming System Research Methodology	Methodologies followed in national and international organization, methods of data collection-rapid rural appraisal, system identification, survey case study and monitoring.
6	Cropping Systems Research	Pattern, trail, component technology trails-research's manage, superimposed.

Recommended Textbooks

1. Beels, C.W. 1983. Multiple Cropping and Tropical Farming Systems. West view Press.



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- Edwards, 1990. Sustainable Agricultural Systems. CRC Press.

Supplementary Textbooks

- Association for Farming Systems Research/Extension. 1992. Towards New, Paradigm for Farming Systems Research/Extension. Michigan State University, USA.
- BARC, BARI and IRRI. 1990. Proc. Int. Crop-Animal Farming Systems Research, Dhaka. ARFSN, IRRI, Los Banos, Laguna, Philippines.
- Canway, G.R. and Pretty, J.N. 1991. Pollution and Farming Systems. J. Asian Fam. Syst. Assoc. 1(2): 29-63.
- Chambers, R., A. Paccoy and L.A. Thrupp. 1989. Farmer First (Farmer Innovation and Agricultural Research). Intermediate Technology Publications, London, UK.
- Chowdhury, M.K., M.A. Razzaque, A.B.M.M. Alam, R.D. William, E.H. Gibler and R.N. Mallick. 1993. Methodological Guidelines for Farming Systems Research and Development in Bangladesh. BARC, Dhaka, Bangladesh.
- Conway, G.R. 1985. Agroecosystem Analysis. Agricultural Administration. 20:31-55.
- GTI (Graduate Training Institute). 1993. Farming Systems Research – A Training Manual. GTI, Bangladesh Agricultural University, Mymensingh.
- Hans Ruthenberg, 1971. Farming System in the Tropics. Clarendon Press, Oxford
- Rattan Lal, B.A. Stewart, 2013. Principles of Sustainable Soil Management in Agroecosystems. CRC Press.

Course Title: Agronomic Research Methodology

Credit Hrs: 2

Course Code: MSAGN 2203

Unit	Title	Lesson
1	Developing Concept of Research	Concept of research, development of hypothesis, collection of facts for testing hypothesis through experimentation
2	Agronomic Research in Bangladesh	Graphical development of agronomic research in Bangladesh, its present status and future strategies
3	Steps in Experimentation	Identification of research problems, experimentation for testing hypothesis, experimental designs, determination of treatments and fixation of replications for simple and factorial experiments, factors determining selection of experimental design, experimental layout, shape and size of plots, procedure of carrying out field and laboratory experiments
4	Collection and Analysis of Data	Collection, tabulation and analysis of data, interpretation of the results in light of the hypothesis
5	Reporting of Results	Principles and procedure of writing scientific reports

Recommended Textbooks


- Ahmed, A.R., Bhuiya, M.A.A. and Hossain, M.Z. 2003. Experimental Design: Theory and Application. Rokeya Sultana Mii, Mohammadpur, Dhaka, Bangladesh.
- Alan G. Clewer and David H. Scarisbrick, 2001. Practical Statistics and Experimental Design for Plant and Crop Science. John Wiley and Sons, Ltd. Chichester, England.
- Gomez, K.A. and Gomez, A.A. 1984. Statistical Procedures for Agricultural Research. 2nd Edition, John Wiley & Sons. New York, Brisbane, Toronto, Singapore.

Supplementary Textbooks

- Ahmed, A.R., Bhuiya, M.A.A., Reza, Z.A. and Hossain, M.Z. 2004. Methods of Statistics. S. Ahmed & Associates. Manikganj, Bangladesh.
- Booth, V. 1993. Communicating in Science: writing a scientific paper and speaking at scientific meetings (2nd ed). Cambridge. Cambridge Univ. Press.
- Cox, D.R. and Reid, N. 2000. The Theory of the Design of Experiments. Chapman & Hall/CRC. Boca Raton. London. New York, Washington, D.C.



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7. Hamp-Lyons, L. and B. Heasley. 1987. Organizing texts: structuring texts. Study Writing. Cambridge Univ. Press.
8. Islam, M.T., Mirza, M.J.A. and Hossain, M.A. (eds.). 1993. Statistical Methods for Research: A Training Manual. Graduate Training Institute, Bangladesh Agricultural University, Mymensingh, Bangladesh.
9. Khalil, S.K. and P. Shah, 2007. Scientific Writing and Presentation. HEC, Manograph, Islamabad.
10. Little, T.M. and Hills, F.J. 1978. Agricultural Experimentation: Design and Analysis. John Wiley and Sons, New York, Chichester, Toronto, Singapore.
11. Mead, R. 2003. Statistical Methods in Agricultural & Experimental Biology. 3rd Ed. Pak Book Corp. Lahore.
12. Montgomery, D.C. 2009. Design and Analysis of Experiments. 7th Edition, International Student Version, John Wiley & Sons, Inc.
13. Steel, R.D., Torrie, J.H. Dickey, T.A. 1997. Principles and Practice of Statistics: A Biomedical Approach. McGraw Hill, USA.
14. Turk, C. and J. Kirkman. 1989. Effective writing: Improving scientific, technical and business communication (2nd ed). London: Chapman & Hall.
15. Woodford, F.P. (ed). 1968. Scientific writing for graduate students: a manual on the teaching of scientific writing, N.Y: The Rockefeller Univ. Press & London: McMillan & Co. Ltd.
16. Zaman, S.M.H., Rahim, K. and Howlader. 1982. Simple Lessons from Biometry. Bangladesh Rice Research Institute, Joydebpur, Dhaka, Bangladesh.

Course Title: Field Crop Agroforestry

Credit Hrs: 2

Course Code: MSAGN 2204

Unit	Title	Lesson
1	Concept and Potentials of Agroforestry	Definition, importance and components agroforestry system, linkage and interaction between components, agroforestry potentials in crop land
2	Agroforestry Practices in Bangladesh	Homestead agroforestry, crop land agroforestry, forest land agroforestry, khas land agroforestry
3	Nursery Management in Agroforestry	Tree establishment by seed, seedlings and cuttings, management of agroforestry nursery
4	Multipurpose Trees and Shrubs (MPT's)	Definition of MPT's, list of MPT's and their management with non-wood plants in agroforestry
5	Classification of Agroforestry	Agrosilviculture, silvopastoral and agrosilopastoral, structural analysis based on arrangement
6	Soil and Water Management in Agroforestry	Management of soil fertility, soil erosion, conservation of soil moisture, flood control and soil water relations
7	Agroforestry Environmental Linkage	Agroforestry for environmental amelioration, agroforestry farming systems linkage

Recommended Textbooks


1. Anthony Young, 1990. Agroforestry for soil Conservation. CBA International
2. ICRAF. 1987. Professional Education in Agroforestry. Edited By Eastern Zuberli.
3. Sunil Puri and Pankaj Panwar, 2007. Agroforestry: System and Practices. New India Publication
4. The Role of Agroforestry in Soil and Water Management, 2015. Lap Lambert Academic Publishing

Supplementary Textbooks

5. Alam, M.K., Siddique, N.A. and Das, S. 1985. Fodder Trees of Bangladesh. Bangladesh Forest Research Institute, Chittagong, Bangladesh.
6. Alim, M.K. and Mohiuddin, M. 1992. Some Potential Multipurpose Trees for Homestead. Published by BARC and Winrock International, Dhaka, Bangladesh.
7. BARC- Winrock International. 1991. Agroforestry Research Techniques. Bangladesh Forest Research Institute, Chittagong.
8. Dugas, J.C. Singh, A. Kumar, Arunachalam, Ayyanadar, 2014. Agroforestry Systems in India: Livelihood Security & Ecosystem Services, Springer



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 SARD SCHOOL OF AGRICULTURE AND RURAL DEVELOPMENT কৃষি ও পল্লী উন্নয়ন স্কুল	School of Agriculture and Rural Development (SARD)
	Master of Science (MS) in Agronomy

9. FSRDP. 1990. Searching and intervention in Two FARDP Sites. Farming Systems Research and Development Program. BAU, Mymensingh.
10. Louise E. Buck, James P. Lassoie, Erick C.M. Fernandes, 1999. Agroforestry in Sustainable Agricultural System, CRC Press, Washington USA
11. Nursery Management, Tree Propagation and Marketing. A Training manual for small holder farmers and nursery operators. World Agroforestry Center.
12. P.K. Ramachandran Nair, 1993. An Introduction to Agroforestry. International Center for Research in Agroforestry
13. Racheleau, D. Weber, F. and Juma-Fuld, A. 1988. Agroforestry in dry land Africa. ICRAF, Nairobi, Kenya

Course Title: Fodder and Pasture Management

Credit Hrs: 2

Course Code: MSAGN 2205

Unit	Title	Lesson
1	forage and Pasture Science	Concept, importance, scope, development, relationship with allied disciplines
2	Forage and Pasture Species and Their Crop Husbandry	Grass species: maize, sorghum, para grass, guinea grasses, napier grasses and other local grasses Legume species: cowpea, grass pea, chickpea, sun hemp, alfalfa, <i>sesbania</i> spp.
3	Pasture Land and Pasture Production	Agro-ecosystem distribution of forage land in Bangladesh, weather influence on forage and pasture crops, feasibility of improving area and production of forage and pasture, pasture seed production, pasture establishment, grazing management
4	Pasture Plant Nutrition and Nutrient Recycling	Essential plant nutrients, nitrogen-role, cycle, fixation, legume N versus artificial N, phosphorus, potassium, sulphur, calcium, soil acidity and liming
5	Pasture Conservation	Hay: Hay in Bangladesh, stage of cutting, field cutting, artificial drying, weather, losses effects on pasture Silage: silage in Bangladesh, fermentation, readily available carbohydrate, consolidation, decomposition, additives, quality, high moisture stage, state of cutting, losses, storages, effects on pasture

Recommended Textbooks

1. Langer, R.H.M. 1973. Pasture and Pasture plants. A.H. and A.W. Read. Wellington, Sydney, London.
2. Taylor, N.L. 1985. Clover science and Technology. Madison, Wisconsin: American Society of Agronomy.

Supplementary Textbooks

3. Donald, C.M. 1963. Competition among crops and pasture plants. *Advanced in Agronomy*. 15:1-118.
4. Heebblethwaite, P.D. 1980. Herbage seed production in New Zealand. Loughbrough University of Nottingham, School of Agriculture.
5. Sprague, R. 1953. USDA. Yearbook of Agriculture.
6. White, J.G.H. 1989. Herbage seed Production. Wellington, New Zealand.



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Master of Science (MS) in Agronomy	

Course Title: Post Harvest Technology of Field Crops

Credit Hrs: 2

Course Code: MSAGN 2206

Unit	Title	Lesson
1	Postharvest Technology	Concept, objectives and importance, classification and steps of post harvest operations
2	Postharvest Operation Technology	Cereal crops: rice, wheat, maize, barley, sorghum and millets Oil seed crops: mustard, sesame, groundnut, sunflower, soybean, safflower, coconut, castor Pulses crops: lentil, gram, black gram, grass pea, pigeon pea, and cowpea Sugar crops: sugarcane and sugar beet Beverage crops: tea and coffee Tuber crops: potato and sweet potato Fibre crops: jute, cotton, kenaf and mesta Forage crops: para grass, napier grass, cowpea silage and hay preparation Green manure crops: dhaicha, sun hemp

Recommended Textbooks

1. Multon, J. L.; Reimbert, A. M.; Marsh, D.; Eydt, A. J. 1989 (First Ed.) Preservation and storage of grains, seeds and their by-products. Cereals, oilseeds, pulses and animal feed. CBS Publishers & Distributors.
2. 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.
3. Lal, R.R. and Vema, P. 2007. Post-Harvest Management of Pulses. ICAR, Indian Institute of Pulses Research, Kanpur, India.

Supplementary Textbooks

4. Produce/Post Harvest Management, School of Science and Technology, National Open University of Nigeria, Online: www.nou.edu.ng/uploads/NOUN_OCL/pdf/pdf2/CPT514.pdf.
5. BARI, 2015. Krishi Prujukti Hatbai. Pub. Bangladesh Agricultural Research Institute, Gazipur.
6. Bakery Technology and Manufacture, By SBP board of Consultant and Engineers. Small business publications.
7. Post Harvest Processing, Sugar Processing Toolkit. FAO, USA, online: www.fao.org/3/a-au157e.pdf.
8. P.C. Das. 2012. Jute production Technology, WSIC Ebooks. Ltd.
9. John, M.M.1987. Cotton. Longman Scientific and Technical, New Delhi.

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