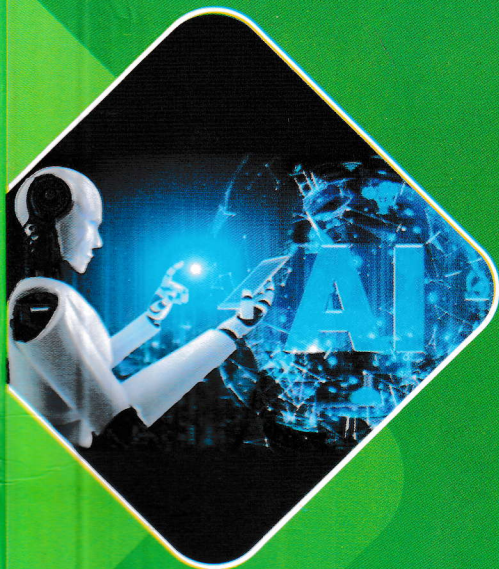


Training Manual
on
**Fourth Industrial Revolution
in Smart Agriculture**



Duration: 05 Days



National Agriculture Training Academy (NATA)
Gazipur-1701

Training Manual
on
Fourth Industrial Revolution in Smart Agriculture

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Preface



The world is witnessing 4IR revolution. Some countries have already progressed far while Bangladesh completed digital era. With the completion of the "Digital Bangladesh" ideology, the government has been starting to step towards "Smart Bangladesh". The Fourth Industrial Revolution represents a fundamental change in the way we live, work, and relate to each other. It is a new chapter in human development enabled by extraordinary technology. In this situation, smart Bangladesh would be built by integrating 4IR technologies with digital technologies. Farther more, establishing a smart Bangladesh, agriculture must be developed smartly. Hence, manpower in agriculture should be made more skilled through training on 4IR.

To fulfill the requirements of smart Bangladesh, an adequate number of trained manpower in Fourth Industrial Revolution (4IR) are required. Moreover, the components of 4IR and their implications have to reach the farming community, so that the production and post-harvest processing can be economic.

The manual on 4IR Technology has been prepared in order to help the course management team organize training courses for the personnel of different organizations under the Ministry of Agriculture. All aspects of the industry 4.0 have been included in this manual within a logical sequence and appropriate manner.

The authors hope that the contents of this manual will provide an excellent opportunity for scientist and extension personnel to explore in 4IR era. The authors are extremely grateful to all the resource persons who readily supplied their lesson sheets of the related topics; and are equally thankful to the universities for providing valuable guidance specially for preparing the lesson plans of the topics. Finally, the authors express heartfelt gratitude to Director General, Director (Training) and Director (Administration) of NATA for their valuable suggestions, continuous inspiration, and encouragement in the preparation of this training manual.

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Part-I

Introduction to National Agriculture Training Academy (NATA)

1.1. The Academy

National Agriculture Training Academy (NATA) is the apex training institute for human resource development of officers (grade-9 and above) under the Ministry of Agriculture (MoA) for providing training on diversified fields of professional interest in agriculture sector. The Academy organizes various training programmes related to agriculture throughout the year. The academy is established in Gazipur as Central Extension Resources Development Institute (CERDI) on 14 March 1975 with the financial assistance of Japan International Cooperation Agency (JICA). Afterwards, on 27 June 1984, CERDI was undertaken to the Training Wing of Department of Agricultural Extension (DAE). On 03 April 2013, Government of the People's Republic of Bangladesh abolished CERDI and established NATA as an independent organization of MoA and on 07 June 2014, NATA has been started as a training academy. Initially, the Academy started its functions with only 10 faculty members. Though Government approved strength is 184, at present NATA has 88 staff members including 29 faculty members.

1.2 . Location

The Academy is 25 km away from Dhaka city and 3 km away from Joydevpur Chandana Chowrasta towards Gazipur district head quarter. It is located adjacent to Bangladesh Rice Research Institute (BRRI) and occupied 49 acres of land. The academy provides the trainees an ample scope to have free access to the adjacent institutions like Bangladesh Agriculture Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), Seed Certification Agency (SCA), Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Telecommunication College, Gazipur Metropolitan Police Head Quarters, and other government offices in Gazipur.

1.3 . Vision

National Agriculture Training Academy becomes a center of excellence for developing competent human resources in agriculture sector.

1.4 . Mission

We are pledged to achieve the shared vision through:

- a) Develop human resource of all organizations under MoA by imparting quality training, research and development and publications;
- b) Enhance linkage between education, research and extension to endow agriculture service delivery system;
- c) Network with reputed institution of home and abroad for organizational capacity building;
- d) Foster a culture of continuous learning for development of knowledge-intensive agriculture service.

1.5. Functions

The NATA has been entrusted to perform the following functions:

- a) Human resource development of the government, semi-government, autonomous organization under MoA through training of modern and sustainable agriculture technology;
- b) Transfer modern and sustainable agriculture technology developed by the research organizations for the development of socio-economic conditions of farmers;
- c) Conduct demonstration, adaptive research and research of proven technologies;
- d) Impart all sorts of in-service training with special emphasis on induction, foundation and senior staff course;
- e) Exchange publications, participants and resource persons in seminars, workshops, conferences and training among the stakeholders;
- f) Advice government and other organizations on training, achieving food and nutrition security, ICT, transfer of agriculture technology, agro-based industries and conservation environments etc.;
- g) Help government and policy makers in framing and analyzing agricultural policies;
- h) Conduct different training activities of academy in consonance with provision of the public administration training policy 2003; and
- i) Perform all kinds of duties directed by the government.

1.6. Goals

The Academy has set some goals for achieving its vision and mission successfully. These are as follows:

- a) Human resource development of officers (grade-9 and above) under the MoA through training on diversified field of professional interest in agriculture sector
- b) Conduct research and development (R&D), adaptive research, demonstration to improve training efficacy;
- c) Provide publication and library service to facilitate quality training;
- d) Impart all sorts of in-service training with special emphasis on induction, foundation and senior staff course;
- e) Help government and policy makers in framing and analyzing agricultural policies;
- f) Organize seminar, workshop, symposium and conference on various issues of national and sectoral interest

1.7. Organogram of the Academy

Director General (DG) is the chief executive officer of the academy. There are 2 Directors, 12 Deputy Directors, 1 System Analyst, 1 Programmer, 17 Senior Assistant Directors, 1 Publication Officer, 1 Medical Officer, 1 Librarian, 1 Assistant Maintenance Engineer, 1 Account Officer, 1 Administrative Officer and 45 support staffs. Two Directors assist DG in overall matters of the academy and oversee the activities of two departments namely,

- (i) Department of Administration, Planning and Publication and
- (ii) Department of Training.

Both Directors supervises Deputy Directors and other faculty members under 2 departments. Total proposed manpower of NATA is 184, but at present 74 officials are working. Different units under two departments are as follows:

a) Department of Administration, Planning and Publications

- Administration and Support Services
- Planning and Publications

b) Department of Training

- Agronomy
- Horticulture
- Plant Pathology
- Entomology
- Soil Science
- Genetics and Plant Breeding
- Agricultural Extension and Rural Economy
- Environment and Agroforestry
- Agricultural Machinery and Water Management and
- Food Processing.

1.8. Importance of training

Training brings desirable change in behavior and attitude and improves knowledge and develops skill. Skills and efficiency are two preconditions for development. Proper training can help to increase skills and efficiency of the officer. Modern technology increases the competitive ability of the organization and provides high quality services. Trained officers can properly utilize such technology. Adequate training of personnel in an organization can make the organization free from complexity and streamline simplicity. To ensure overall development of all sectors of an economy, training can play a significant role. In the era of globalization, the need of modern management tools and techniques cannot be exaggerated. In response to the current needs in the ever-changing world, government officers should serve the people with competency, sincerity and transparency. NATA attaches highest importance on moral teaching, as well as technical and technological capacity building which is the main goal and strategy of training. Participants become more motivated, responsive, efficient and competent after they go through these training. Training curricula is updated regularly to cope up with the changes in government policies and practices and as per need and demand of the stakeholders.

1.9. Training methods in the Academy

The academy is keen enough to maintain the appropriateness and effectiveness of training programs. Designs of both short and long term training courses are regularly improved and tailored to meet the beneficiary institution's needs and goals. The methods followed are practice oriented rather than the theoretical discussions. Study tours arranged for the trainees to expose them to real practice in the field and society. There are some variations in the training method based on the nature and the purpose of the training course. With some exceptions, the Academy generally follows the following methods:

- a) Lecture
- b) Participatory discussion
- c) Case study
- d) Role-play/simulation
- e) Workshop/Seminar
- f) Field visit
- g) Brain storming
- h) Individual and group assignment
- i) Presentation of assignments
- j) Games of various types.

NATA analyzes the training methods used by worldwide training academies and regularly updates training methods accordingly. The Academy is committed to maintain international standard.

1.10. Evaluation

Course Director and other faculty members are given responsibility to evaluate the participants. The course is evaluated during pre and post training situation within 100 marks. On the other hand the participants are also given chance to evaluate the faculties and guest speakers by using a prescribed format. The distribution of assessment marks is as follows:

Sl. No.	Parameters	Marks
a)	Individual assignment /exercise/practical test	80
b)	Class attendance and overall conduct and discipline	20
Total		100

1.11. Grading

The grade is decided on the basis of the score. The grading is as follows:

Marks Secured (%)	Grade
90-100	A ⁺
80-89	A
70-79	B ⁺
60-69	B
50-59	C

Note:

If any participant fails to obtain at least 50% marks in the final assessment he/she will be treated as 'fail' and in that case she/he will not be given the successful completion certificate of the training course.

1.12. Sessions

Everyday the session is started at 9.00 am in the morning and ends at 4:30 pm in the afternoon. There are two breaks started at 11.00 am and 12.30 pm for tea and lunch with prayer respectively. Participants are advised to attain the class in time without fail for avoiding any kinds of disciplinary action.

1.13. Norms to be followed during the training

- No casual leave is allowed during training period.
- Participants living in the dormitory are advised to follow the norms of the dormitory.
- The campus area is a “Non Smoking Zone”. Participants are advised to refrain from smoking inside the Academy.
- Participants are not allowed to enter the dormitory after 11:00 pm at night.

1.14. Facilities 1.14.1. Physical facilities

The Academy is well equipped with physical facilities in organizing training programs though it began its journey recently. Existing facilities of the academy is given below:

- Office building -3
- Training room - 7
- Laboratory (subject wise technical)
- Plant protection museum - 1
- Conference room - 2
- Auditorium -1
- Dormitory –5
- Guest House and Officers’ Dormitory- 1
- Cafeteria – 1
- Computer Lab- 1

1.14.2. Digital Computer cum Language Lab. and IT facilities

There is one Digital Computer cum Language Lab in the Academy. It is located on the 1st floor of the Administrative building. IT facilities include LAN and Wi-Fi and the whole campus under Wi-Fi coverage. To expedite foreign language learning, NATA set up a Digital Computer cum Language Lab. as part of the Academy’s drive for capacity building of government officials. Participants can avail the opportunity of learning the foreign language while they stay in NATA.

1.14.3. Recreational facilities

The Academy has a recreation room with color TV in the dormitory. The daily newspapers are available in recreation room for the participants.

Part-II Rationale

Fourth Industrial Revolution (4IR) in Smart Agriculture training course is designed to develop necessary knowledge regarding 4IR technologies, challenges, opportunities and application in Agriculture sector. 4IR is characterized by the fusion of technologies that is blurring the line among physical, digital and biological spheres. After completion of the course participants will be able to understand the concept of upcoming Industry 4.0, Agriculture 4.0 and application in their respective working areas. The manual contains eighteen lessons written by acknowledged resource persons, providing comprehensive information on all aspects of 4IR technology. The lessons are included into five modules according to their similarity and activities. The contents of the manual are mainly concept of 4IR and its components; application of IoT, AI, big data, cloud computing, 3-D printing, block chain, virtual and augmented reality, robotics and drone laws. Each lesson contains a lesson plan and a lesson sheet. The lessons have been arranged sequentially in this manual. The title of the modules and number of lessons under each module are shown in the following table.

Module No.	Title of Module	Total No. of Lesson
1	Fourth Industrial Revolution (4IR)	03
2	Smart Agriculture	06
3	Policy and Framework	03
4	Challenges and Opportunities	03
5	Visit to Field Activities	03

Objectives of the course

- To teach the participants about Fourth Industrial Revolution(4IR) technologies so that they can apply in smart agriculture
- To teach the application of 4IR technologies in agriculture so that the participants can apply knowledge for building smart agriculture.
- To teach the participants about the policy and framework of Industry 4.0 and agriculture 4.0.
- To teach the participants about opportunities, challenges and way forward of smart agriculture in Bangladesh
- To demonstrate the participants about 4IR based activities in agriculture.

Module - 01

Ref. No. : 22.1.1

Title : Fourth Industrial Revolution (4IR)

Objectives : To teach the participants about Fourth Industrial Revolution(4IR) so that they can apply to smart agriculture

Learning outcomes: After completion of module the participants will be able to:

- explain the concept of industry 4.0 (4IR);
- describe basic components of 4IR; and
- enlist hardware and software related to 4IR.

Reference	Lesson	Topics	Methods*
22.1.1	1	Introduction to industry 4.0 (4IR)	L and D
22.1.2	2	Basic components of 4IR	L and D
22.1.3	3	Hardware and Software for applying 4IR technologies	L and D

* L= Lecture, D= Discussion

Module - 02

Title : Smart Agriculture

Objectives : To teach the application of 4IR technologies in agriculture so that the participants can apply knowledge for building smart agriculture.

Learning outcomes : After completion of module the participants will be able to:

- define agriculture 4.0 and smart agriculture;
- describe the history of agriculture 4.0;
- compare industrial revolution 4.0 and agriculture 4.0; and
- illustrate the application of 4IR technologies in agriculture.

Reference	Lesson	Topics	Methods*
22.2.1	1	Introduction to agriculture 4.0 and smart agriculture	L and D
22.2.2	2	Comparison between agriculture 4.0 and industrial revolution 4.0	L and D
22.2.3	3	Application of sensor and Internet of Things (IoT) in agriculture	L and D
22.2.4	4	Application of machine learning and Artificial Intelligence (AI) in agriculture	L and D
22.2.5	5	Application of robotics, big data and cloud computing in agriculture	L and D
22.2.6	6	Application of virtual reality, augmented reality and 3D printing technology in agriculture	L and D

* L= Lecture, D= Discussion

Module - 03

Title
Objectives

: Policy and Framework

: To teach the participants about the policy and framework of Industry 4.0 and agriculture 4.0.

Learning outcomes

: After completion of module the participants will be able to:

- state the policy and framework on 4IR in home and abroad;
- describe the rules and regulations of drone purchase and use; and
- mention the necessity and recommendation on policy for smart agriculture.

Reference	Lesson	Topics	Methods
22.3.1	1	Policy and Framework on industry 4.0 and agriculture 4.0	L and D
22.3.2	2	Rules and regulations of drone purchase and use	L and D
22.3.3	3	Necessity and recommendation on policy for smart agriculture	L and D

L = Lecture, D = Discussion

Module :04

Title : **Challenges and Opportunities**

Objectives : To teach the participants about opportunities, challenges and way forward of smart agriculture in Bangladesh

Learning outcomes : After completion of the module the participants will be able to:

- narrate challenges in agriculture 4.0 (smart agriculture);
- describe opportunities in agriculture 4.0; and
- explain way forward to overcome the challenges.

Reference	Lesson	Topics	Methods*
22.4.1	1	Challenges of smart agriculture in Bangladesh	L and D
22.4.2	2	Opportunities of smart agriculture in Bangladesh	L and D
22.4.3	3	Way forward to overcome the challenges of smart agriculture	L and D

* L= Lecture, D= Discussion

Module - 05

Title : Visit to Field Activities

Objectives : To demonstrate the participants about 4IR technologies in agriculture

Learning outcomes : After completion of module the participants will be able to:

- illustrate experience on 4IR technologies in agriculture;
- generate idea about smart agriculture project; and
- present the learnings of visit.

Reference	Lesson	Topics	Methods
8.5.1	1	Experience sharing on application of 4IR technologies in agriculture	L and D
8.5.2	2	Demonstration the project on smart agriculture	P
8.5.3	3	Group presentation of visit	GD

* L= Lecture, D= Discussion, GE = Group exercise, P = Practical

Source of information

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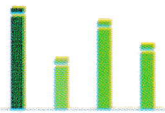
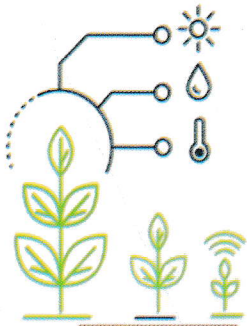
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SMART FARMING



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