

## CURRICULAM VITAE

**Name** : MD. MANIRUZZAMAN

**Father's name** : Late Md. Abdul Ghani

**Permanent address** : Village: Rasulpur, P.O.: Sadekpur  
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**Present address** : Principal Scientific Officer  
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**Date of birth** : November 22, 1964

**Date of joining** : November 21, 1994

**Nationality** : Bangladeshi

**Marital status** : Married

### Educational qualifications:

Certificate	Class/ Division	Board/University	Year of passing	Marks obtained	
				Total	(%)
S.S.C	1 <sup>st</sup> Division	Dhaka Board	1980	700	70.0
H.S.C	1 <sup>st</sup> Division	Dhaka Board	1982	637	63.7
B.Sc. Agril. Engg. (Irrigation & Water Management)	1 <sup>st</sup> Class (3 <sup>rd</sup> position)	Bangladesh Agricultural University, Mymensingh	1986 (held in 1989)	2827	64.25
MS in Irrigation & Water Management	1 <sup>st</sup> Class ("A" Grade)	Bangladesh Agricultural University, Mymensingh	1999	1141	71.31
PhD in Irrigation and Water Management	Satisfactory	Bangladesh Agricultural University, Mymensingh	2014	-	-

**MS Thesis:** Technical and Economical Performance of Flexible Hose Pipe Method of Water Distribution System. Bangladesh Agricultural University, Mymensingh-2202

**PhD Thesis:** Development of Cost-effective Water-saving Technologies for Rice Production in Bangladesh

**Training:****In-country:**

Title	Organized by/Venue	Duration
Comprehensive Training in Agril. Engg. & Tech.	Faculty of Agril. Engg. & Tech., BAU, Mymensingh	June 17-23, 1989
Research Planning and Evaluation	BARC, Dhaka & BARI, Gazipur	June 06-20, 1991
Rice Production, Applied Research, Communication & Administration	BRRI, Gazipur	Dec. 03, 1994 – Jan. 31, 1995
EIA Course-2000	EGIS II Office, Dhaka	June 06-20, 2000
Irrigation Management and Land Use Development Planning	BARD, Comilla	March 20-April 01, 2004
Groundwater Management	BUET, Dhaka & DUT, The Netherlands	August 21-24, 2005
AWhere-ACT and GIS based BCA	BRRI and CIMMYT	May 08-09, 2006
Capacity Development for farm Management Strategies to Improve Crop Water Productivity using AquaCrop Model	FAO, Bioforsk, Norway and BRRI	October 08-12, 2012
Decision Support System for Agro-technology Transfer (DSSAT) Model Training Course	BRRI, Gazipur	February 09-13, 2013
Effects of Climate Change on Food Security	IWM, Dhaka	April 24-25, 2013
Climate Scenario, Water Resources Availability Assessment and Crop Modelling	CEGIS, Dhaka	June 09-15, 2013
Modeling Climate Change Impact on Bangladesh Agriculture	BRAC-CDM, Rajendrapur, Gazipur	July 27- August 03, 2013
Climate Change Adaptation	CDMP, Dhaka	September 15-16, 2013
Application of GIS and Remote Sensing in Crop Production and Natural Resource Management	BRAC-CDM, Savar, Dhaka	November 02-07, 2013
1 <sup>st</sup> JAXA Training for ALOS-2 Data Applications using ALOS Archive Data	SPARRSO, Dhaka	February 17-19, 2014
Modeling Climate Change Impact on Bangladesh Agriculture using DSSAT	BRAC-CDM, Savar, Dhaka	June 07-19, 2014
Modeling Crop Growth using InfoCrop and WOFOST	BRAC-CDM, Savar, Dhaka	August 19-23, 2014
Crop Growth Modeling of Chickpea, Maize, Jute and Sugarcane using DSSAT	BRAC-CDM, Savar, Dhaka	August 26-28, 2014
Hands-on Training on IDRISI and GIS	BRAC-CDM, Savar, Dhaka	August 30 – Sept. 02, 2014
JAXA SAR-Data Training preparing for ALOS-2 Satellite Data Use	SPARRSO, Dhaka	February 24-26, 2015
Administrative and Financial Management	NATP-2, PIU-BARC, Dhaka & BARD, Cumilla	November 06-18, 2018
Good Governance	NATA, Gazipur	January 20-24, 2019

**Overseas:**

Title	Organized by	Duration
On Farm Irrigation and Water Management	DTEC & AETC, Thailand	March 26-May 23, 1997
Advance in Agricultural Water Productivity Assessment and Improvement in Irrigation Scheme	Copenhagen University and AIT, Thailand	October 03-09, 2009

## Experiences:

### a) Research Experiences

Designation	Duration	Division & Organization
Principal Scientific Officer	April, 2014 to date	IWM Division, BRRRI
Senior Scientific Officer	April, 1999 to April, 2014	IWM Division, BRRRI
Scientific Officer	June, 1995 to April, 1999	BRRRI R/S, Barishal
Scientific Officer	Nov., 1994 to June, 1995	IWM Division, BRRRI
Scientific Officer (Project)	Dec. 1989 to Oct., 1994	IWM Division, BARI

### Working responsibilities:

- To plan and design of research experiments related to field level water productivity, distribution system improvement and groundwater utilization;
- To execute the research program;
- To collect data and analyze;
- To write report(s) based on research findings; and
- To prepare concept note, research proposal and project related different reports as and when necessary basis

### b) Project Work Experiences

Project Title	Duration	Funding Source	Working as
Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta	Nov., 2020 to date	ACIAR, Australia & KGF	Coordinator and PI, BRRRI Part
Modeling Climate Change Impact on Agriculture and developing mitigation and adaptation strategies for sustaining agricultural production in Bangladesh (CRP-II, Phase-II)	Dec, 2020 to date	KGF	Objective Leader-I & Deputy Coordinator, BRRRI Part
Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India (LWR/2014/73)	Nov., 2015 to Oct. 2020	ACIAR, Australia & KGF	Principal Investigator, BRRRI Part
Improving water use for dry season agriculture by marginal and tenant farmers in the Eastern Gangetic Plains (LWR/2012/079)	Aug., 2014- June, 2019	ACIAR, Australia	Principal Investigator, BRRRI Part
Modeling Climate Change Impact on Agriculture and developing mitigation and adaptation strategies for sustaining agricultural production in Bangladesh (CRP-II, Phase-I)	July, 2015 to June, 2018	KGF	Objective Leader-I & Deputy Coordinator, BRRRI Part
Climate Change Impacts, Vulnerabilities and Adaptation: Sustaining Rice Production in Bangladesh	Dec., 2011 to June, 2014	Norway	Working Scientist
Development and Dissemination of Water Saving Rice Technologies in South Asia” (Phase-II)	July, 2010 to June, 2014	IRRI	Working Scientist
Development and Dissemination of Water Saving Rice Technologies in South Asia” (Phase-I)	July, 2006 to June, 2010	IRRI	Working Scientist
Adoptive Crop Agriculture Including Innovative Farming Practices in Coastal Region of Bangladesh	Oct., 2006 to June, 2008	DFID	Working Scientist
Integrated Crop Management (ICM) sub-project	Oct., 2001- June, 2004	PETRRRA, IRRI	Working Scientist
Rice-Wheat System Research project	July, 2000 to June, 2001	IRRI	Working Scientist
A Study on Recharge and Depletion Characteristics of Aquifers in Cumilla Region	Dec., 1989 to June, 1992	DFID	Working Scientist (Project)

**Publications:****A. Research Articles:**

- B.R. Khan, M. Mainuddin, M.A.A. Miah, M.N. Molla & **M. Maniruzzaman**. 1992. Evapotranspiration from lentil. *J. Agric. Engg.*, Vol. 6 (1&2): pp.63-68.
- B.R. Khan, M. Mainuddin, M.N. Molla & **M. Maniruzzaman**. 1994. Characteristics of border irrigation for wheat in a clayey soil. *J. Agric. Science*, Vol.21 (2): pp.278-295.
- M. Maniruzzaman**, M.S.U. Talukder, B.R. Khan and M.M.U. Ahmed. 1995. Development of an orifice meter and its use for estimating annual groundwater abstraction rate of Muktagacha Thana. *J. Agric. Science*, Vol.22 (1): pp.73-82.
- M. Maniruzzaman**, M.S.U. Talukder, M.A. Sattar and M.T. Islam. 2000. Economic performance of flexible hose pipe for irrigation water distribution from shallow tubewell. *J. Agric. Engg.*, Vol.11 (1&2): pp.23-37.
- M. Maniruzzaman**, M.M.Alam, F.I.M. Golam Wahed Sarker, M.T. Islam and M.N. Islam. 2001. Alternative water distribution system in a Deep Tubewell site: An economic evaluation. *Bangladesh Rice J.* 10(1&2): 67-73.
- M T Islam, L R Khan and **M Maniruzzaman**. 2001. Changes of drought in transplanted aman rice cultivation in Barind area. *Bangladesh Rice J.* 10(1&2): 75-81.
- M. Maniruzzaman**, M.M.Alam, F.I.M. Golam Wahed Sarker, M.T. Islam and M.N. Islam. 2002. Water saving technique through improved water distribution system in Deep Tubewell area of Bangladesh. *OnLine J. of Biological Science*, Faisalabad, Pakistan, Vol. 2 (3): pp.178-182.
- M. Maniruzzaman**, M.S.U. Talukder, M.A. Sattar and M.T. Islam. 2002. Performance of flexible hosepipe for water distribution from shallow tubewells. *J. of the Institution of Engineers*, Bangladesh. *Agric. Engg. Division*, Vol. 29/AE (1): pp.11-19.
- M.M. Alam, M.K. Mondal, **M. Maniruzzaman**, and M.N. Islam. 2002. Water savings techniques in minor irrigation: A review work. *J. of Agric. Engg.*, Vol.13 (1&2): pp.27-35.
- M.T. Islam, L.R. Khan and **M. Maniruzzaman**. 2002. Relationship of rainfall and drought in rainfed rice cultivation in Barind area. *J. of Agric. Engg.*, Vol.13 (1&2): pp.43-53.
- M. Maniruzzaman**, M.M.Alam, F.I.M. Golam Wahed Sarker and M.N. Islam. 2002. Alternative improved distribution system for minimizing irrigation water loss and cost in Deep Tubewell areas. *J. of Progressive Agriculture*. Vol. 13 (1&2): pp.143-153.
- M A Sattar, **M Maniruzzaman**, F I M Golam Wahed Sarker and K K Sarker. 2002. Technical and economical performance of alternative irrigation distribution systems for promoting development through GO–NGO partnership. *J. of Agricultural Economist Association*. Vol. XII.
- M. Maniruzzaman** and M M Alam. 2005. Suitable joint and length of Hose pipe for efficient water distribution in Shallow Tubewell Irrigation. *J. of Progressive Agriculture*. Vol. 16(2): pp.211-218.
- M.S. Kabir, **M. Maniruzzaman**, M.A. Saleque, J.C. Biswas and M.A. Sattar. 2007. Soil fertility mapping at micro level: A case of Jotgobardhan village in Kurigram district. *Intl. J. BioRes.* 3(1): 22-29.
- J.C. Biswas, **M. Maniruzzaman**, M.S. Kabir, M.A. Sattar and M.A. Saleque. 2007. Development of soil fertility map at village level for rice production. *Bangladesh Rice J.* 12(1&2): 9-15.
- M. Maniruzzaman**, J.C. Biswas, M.S. Kabir, M.A. Saleque, and M.A. Sattar. 2008. Soil fertility mapping at micro level for rice production: Proshadkalua village. *Bangladesh Rice J.* 13(1): 23-29.
- J.C. Biswas, **M Maniruzzaman** M.A. Sattar and M G Neogi. 2008. Improvement of existing rice yield through recommended fertilizer and cultural management at farmers' field. *Bangladesh Rice J.* 13(1): 9-14.
- M. Maniruzzaman** and J.C. Biswas. 2013. Water and fertilizer productivity in dry season irrigated rice at farmer's field. *Bangladesh Rice J.* 17(1&2): 55-62.
- M Maniruzzaman**, Dr M S U Talukder, Dr K M Hassanuzzaman, Dr Jatish C Biswas and Dr Attila Nemes, 2015. Validation of the AquaCrop Model for Irrigated Rice Production under Varied Water Regimes in Bangladesh. *Agric. Water Mgt.* 159 (2015) 331–340.

- FIMGW Sarker, J. C. Biswas and **M. Maniruzzaman**, 2014. Climate change adaptation and economic probability: Crop land shifting to mango orchard in Rajshahi region. *Bangladesh Rice J.* 18(1&2): 8-17.
- M. Maniruzzaman**, M. A. Muttaleb, A. K. Choudhury, S. Akhter, F. Ahmed, M. A. Aziz, M. M. Rahman, M. M. Miah, J. C. Biswas, M. A. Hamid, N. Kalra. 2017. Characterization of Inter-Seasonal Climatic Variability through Dry-season Rice productivity in the North-west Region of Bangladesh. *Italian J. Agrometeorology* 1/2017, DOI:10.19199/2017.1.2038-5625.005.
- Biswas, J. C., **M. Maniruzzaman**, U. A. Naher, M. M. Haque, M. B. Hossain, M. M. Rahman, M. M. U. Miah, A. K. Choudhury, S. Akhter, F. Ahmed, M. A. Hamid, N. Kalra and J. Furuya. 2017. Future climate change scenarios and anticipated performance of major cereals in Bangladesh. *Intl. J. Agric. Environ. Res.* 3(6): 4123-4148.
- M. M. Haque, J. C. Biswas, **M. Maniruzzaman**, A. K. Choudhury, U. A. Naher, M. B. Hossain, S. Akhter, F. Ahmed and N. Kalra. 2017. Greenhouse gas emissions from selected cropping patterns and adaptation strategies in Bangladesh. *Intl. J. Dev. Res.* 07 (11): 6832-16838.
- M. B. Hossain, M. M. Rahman, J. C. Biswas, M. M. U. Miah, S. Akhter, **M. Maniruzzaman**, A. K. Choudhury, F. Ahmed, M. H. K. Shiragi and N. Kalra. 2017. Carbon mineralization and carbon dioxide emission from organic matter added soil under different temperature regimes. *Intl. J. Recycl Organic Waste Agric.* DOI 10.1007/s40093-017-0179-1
- Biswas, J. C., M.B. Hossain, A.K. Choudhury, N. Kalra and **M. Maniruzzaman**. 2017. Climatic Variability and Wet Season Rice (*Oryza sativa* L.) Production in North-West Bangladesh. *The Agriculturists* 15(1): 68-80.
- M. M. Rahman, J. C. Biswas, **M. Maniruzzaman**, A. K. Choudhury and F. Ahmed. 2017. Effect of Tillage Practices and Rice Straw Management on Soil Environment and Carbon Dioxide Emission. *The Agriculturists* 15(1):127-142
- M. Maniruzzaman**, J. C. Biswas, M. B. Hossain, M. M. Haque, U. A. Naher, A. Biswas, A. K. Choudhury, S. Akhter, F. Ahmed, M. M. Rahman and N. Kalra. 2017. Evaluating the CERES-Rice model under dry season irrigated rice in Bangladesh: Calibration and validation. *J. Agril. Crop Res.*, 5(6): 96-107
- N. Kalra, J. C. Biswas, **M. Maniruzzaman**, A. K. Choudhury, S. Akhter, F. Ahmed, M. A. Aziz, M. M. Rahman and M. M. Miah. 2017. Advanced computational procedures for the understanding of agricultural processes. *Current Sci.*, 113(2): 208-209
- F. Ahmed, A. K. Choudhury, S. Akhter, M. A. Aziz, J. C. Biswas, **M. Maniruzzaman**, M. M. U. Miah, M. M. Rahman, M. A. H. S. Jahan, I. M. Ahmed, R. Sen, S. Ishtiaque, A. F. M. T. Islam, M. M. Haque, M. B. Hossain, N. Kalra and M. H. Rahman. 2017. Calibration and Validation of Decision Support System for Agro-Technology Transfer Model for Simulating Growth and Yield of Maize in Bangladesh. *American J. Plant Sci.*, 8, 1632-1645 (DOI: 10.4236/ajps.2017.87113)
- R. Sen, A. K. Choudhury, S. Akhter, S. Ishtiaque, M. A. H. S. Jahan, F. Ahmed, J. C. Biswas, **M. Maniruzzaman**, M. M. U. Miah, M. M. Rahman, N. Kalra, M. A. Aziz and A. S. M. M. R. Khan. 2017. Simulating nitrogen and irrigation effect on wheat production in Bangladesh under changing climate. *American J. Plant Sci.*, 8: 1593-1606 (DOI: 10.4236/ajps.2017.87110)
- Hossain, M. B., Yesmin, S., **Maniruzzaman, M.**, & Biswas, J. C. 2017. Irrigation scheduling of rice (*Oryza sativa* L.) using CROPWAT model in the western region of Bangladesh. *The Agriculturists*, 15(1), 19-27.
- M. Maniruzzaman**, J. C. Biswas, M. B. Hossain, M. M. Haque, U. A. Naher & N. Kalra. 2018. Extreme temperature events and rice production in Bangladesh. *Environ. Natural Resour. Res.*, 8 (4): 62-74. doi:10.5539/enrr.v8n4p62
- Biswas J. C., N. Kalra, **M. Maniruzzaman**, A.K. Choudhury, M.A.H.S. Jahan, M.B. Hossain, S. Ishtiaque, M.M. Haque, W. Kabir. 2018. Development of mungbean model (*MungGro*) and its application for climate change impact analysis in Bangladesh. *Ecological Modelling* 384 (2018) 1–9. <https://doi.org/10.1016/j.ecolmodel.2018.05.024>

- M. Maniruzzaman**, J. C. Biswas, M. B. Hossain, M. M. Haque, U. A. Naher, A. K. Choudhury, S. Akhter, F. Ahmed, R. Sen, S. Ishtiaque, M. M. Rahman and N. Kalra. 2018. Effect of elevated air temperature and carbon dioxide levels on dry season irrigated rice productivity in Bangladesh. *Am. J. Plant Sci.*, 9: 1557-1576. DOI: 10.4236/ajps.2018.97114
- Biswas, J. C., **M. Maniruzzaman**, M. B. Hossain, H. Ali, W. Kabir and N. Kalra. 2018. Model Development for Life Cycle Assessment of Rice Yellow Stem Borer under Rising Temperature Scenarios. *Curr. Inves. Agri. Curr Res* 2(4): 1-7.
- A. K. Choudhury, S. Ishtiaque, R. Sen, M.A.H.S. Jahan, S. Akhter, F. Ahmed, J. C. Biswas, **M. Maniruzzaman**, M. B. Hossain, M. M. Miah, M. M. Rahman, T.Zahan, A.S.M.M.R. Khan and N. Kalra. 2018. Calibration and Validation of DSSAT Model for Simulating Wheat Yield in Bangladesh. *Haya: The Saudi J. Life Sci.*, 3 (4):356-364 (DOI: 10.21276/haya.2018.3.4.3)
- Biswas, J. C., A. K. Choudhury, M. M. U. Miah, **M. Maniruzzaman**, F. Ahmed, S. Akhter, M. M. Rahman, M. A. Aziz, M. A. Hamid, Wais Kabir, N. Kalra. 2018. Climatic Change Concerns in Bangladesh Agriculture. *Haya: The Saudi J. Life Sci.*, 3: 329-338 (DOI: 10.21276/haya.2018.3.3.18)
- S. Ishtiaque, R. Sen, M. A. H. S. Jahan, A. K. Choudhury, S. Akhter, F. Ahmed, J. C. Biswas, **M. Maniruzzaman**, M. Muinnuddin Miah, M. M. Rahman, A. S. M. M. R. Khan, Naveen Kalra & M. B. Hossain. 2018. Simulating wheat yield under changing temperature, carbon dioxide and solar radiation levels in Bangladesh. *Global J. Sci. Frontier Res. D: Agric Veterinary*, 18 (2): 27-36.
- M.A.H.S. Jahan, R. Sen, S. Ishtiaque, A. K. Choudhury, S. Akhter, F. Ahmed, J. C. Biswas, **M. Maniruzzaman**, M. M. Miah, M.M. Rahman, N. Kalra. 2018. Optimizing sowing window for wheat cultivation in Bangladesh using CERES-wheat crop simulation model. *Agric. Ecosys Environ*, 258: 23-39.
- Biswas, J. C., M. M. Haque, **M. Maniruzzaman**, M. H. Ali, W. Kabir and N. Kalra. 2019. Natural hazards and livestock damage in Bangladesh. *Natural Hazards*, DOI: [10.1007/s11069-019-03768-0](https://doi.org/10.1007/s11069-019-03768-0)
- Biswas, J. C., N. Kalra, **M. Maniruzzaman**, M. M. Haque, U. A. Naher, M. H. Ali, W. Kabir and S. Rahnamayan. 2019. Soil Fertility Levels in Bangladesh for Rice Cultivation. *Asian J. Soil Sci. Plant Nutr.*, 4(4): 1-11.
- Yesmin, M. S., **Maniruzzaman, M.**, Hossain, M. B., Gaydon, D., Mostafizur, A. B. M., Kabir, M. J., ... & Bell, R. (2019). Selection of suitable sowing window for boro rice in coastal regions of Bangladesh. *Journal of the Indian Society of Coastal Agricultural Research*, 37(2), 134-143.
- Hossain, M. B., **Maniruzzaman, M.**, Yesmin, M. S., Mostafizur, A. B. M., Kundu, P. K., Kabir, M. J., ... & Mainuddin, M. (2019). Water and soil salinity dynamics and dry season crop cultivation in coastal region of Bangladesh. *Journal of the Indian Society of Coastal Agricultural Research*, 37(2), 24-31.
- Mainuddin, M., Bell, R. W., Gaydon, D. S., Kirby, J. M., Barrett-Lennard, E. G., Glover, M., Akand, M. A. R., Maji, B., Ali, A. A., Brahmachari, K., **Maniruzzaman, M.**, Aziz, M. A., Burman, D., Biswas, J. C., Rahman, M. M & Sarangi, S. K. (2019). An overview of the Ganges coastal zone: climate, hydrology, land use, and vulnerability. *Journal of the Indian Society of Coastal Agricultural Research*, 37(2), 1-11.
- Bell, R. W., Mainuddin, M., Barrett-Lennard, E. G., Sarangi, S. K., **Maniruzzaman, M.**, Brahmachari, K., ... & Hossain, M. B. (2019). Cropping systems intensification in the coastal zone of the Ganges delta: opportunities and risks. *J. Indian Soc. Coast. Agric. Res*, 37, 153-161.
- Mainuddin, M., Rahman, M. A., **Maniruzzaman, M.**, Sarker, K. K., Mandal, U. K., Nanda, M. K., ... & Kirby, M. (2019). The water and salt balance of Polders/Islands in the Ganges Delta. *J. Indian Soc. Coast. Agric. Res*, 37, 45-50.
- Biswas, J. C., A. F. M. T. Islam, M. M. Haque, **M. Maniruzzaman**, M. B. Hossain, A. K. Choudhury, U.A. Naher, M. H. Ali, W. Kabir, N. Kalra and S. Rahnamayan. 2019. Socio-Ecological Vulnerabilities and Major Cereal Crops Production in Bangladesh. *J. Food Sci. Eng.*, 9: 231-243, doi: 10.17265/2159-5828/2019.06.006

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- M. A. Alam, M. M. Rahman, J. C. Biswas, S. Akhter, **M. Maniruzzaman**, A. K. Choudhury, M. A. H. S. Jahan, M. M. U. Miah, R. Sen, M. Z. U. Kamal, M. A. Mannan, H. K. Shiragi, W. Kabir and N. Kalra. 2019. Nitrogen transformation and carbon sequestration in wetland paddy field of Bangladesh. *Paddy Water Environ.*, <https://doi.org/10.1007/s10333-019-00693-7>
- U. A. Naher, I. U. Sarker, A. Jahan, **M. Maniruzzaman**, A. K. Choudhury, N. Kalra and J. C. Biswas. 2019. Nutrient Mineralization and Soil Biology as Influenced by Temperature and Fertilizer Management Practices. *Sains Malay.*, 48(4): 735–744, <http://dx.doi.org/10.17576/jsm-2019-4804-05>
- Biswas, J. C., N. Kalra, **M. Maniruzzaman**, U. A. Naher and M. M. Haque. 2019. Soil Health Assessment Methods and Relationship with Wheat Yield. *Open J. Soil Sc.*, 9: 189-205. <https://doi.org/10.4236/ojss.2019.99011>
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- Naher, U. A., Hossain, M. B., Haque, M. M., **Maniruzzaman, M.**, Choudhury, A. K., & Biswas, J. C. (2020). Effect of long-term nutrient management on soil organic carbon sequestration in rice-rice-fallow rotation. *Current Science (00113891)*, 118(4).
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Date: 30.06.2021



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