

Dr. Anandkumar Naorem

Scientist (Soil Science)

Division of Integrated Farming System, ICAR-CAZRI, India

Former Head (I/C), ICAR-CAZRI, RRS-Bhuj

Ministry of Agriculture and Farmers' Welfare, Government of India

Publications (2019-2023)

- **Naorem, A.**, Jayaraman, S., Sinha, et al. . (2023). Eight-year impacts of conservation agriculture on soil quality, carbon storage, and carbon emission footprint. *Soil & Tillage Research*, 232(105748), 105748. <https://doi.org/10.1016/j.still.2023.105748>
- **Naorem, A.**; Louhaichi, M.; Hassan, S.; Sarker, A.; Udayana, S.K.; Jayaraman, S.; Patel, S. Does Maturity Change the Chemical-Bromatological Makeup of Cladodes in Spineless Forage Cactus? *Sustainability* 2022, 14, 11411, doi:10.3390/su141811411. (**Open Access**)
- **Naorem, A.**; Jayaraman, S.; Dalal, R.C.; Patra, A.; Rao, C.S.; Lal, R. Soil Inorganic Carbon as a Potential Sink in Carbon Storage in Dryland Soils—A Review. *Agriculture* 2022, 12, 1256, doi:10.3390/agriculture12081256. (**Open Access**)
- **Naorem, A.**; Jayaraman, S.; Dang, Y.P.; Dalal, R.C.; Sinha, N.K.; Rao, C.S.; Patra, A.K. Soil Constraints in an Arid Environment—Challenges, Prospects, and Implications. *Agronomy* 2023, 13, 220. <https://doi.org/10.3390/agronomy13010220> (**Open Access**)
- Manjunatha, B.L.; **Naorem, A.**; Hajong, D.; Tewari, P. Dynamics of Household and Regional Economy in Banni Grasslands, India: A Cross-Sectional Study. *Sustainability* 2022, 14, 11236, doi:10.3390/su141811236. (**Open Access**)
- Jayaraman, S.; Dang, Y.P.; **Naorem, A.**; Page, K.L.; Dalal, R.C. Conservation Agriculture as a System to Enhance Ecosystem Services. *Agriculture* 2021, 11, 718, doi:10.3390/agriculture11080718. (**Open Access**)
- Jayaraman, S.; **Naorem, A.K.**; Lal, R.; Dalal, R.C.; Sinha, N.K.; Patra, A.K.; Chaudhari, S.K. Disease-Suppressive Soils-beyond Food Production: A Critical Review. *J. soil sci. plant nutr.* 2021, 21, 1437–1465, doi:10.1007/s42729-021-00451-x. (**Open Access**)
- Kumar, N.; Chhokar, R.S.; Meena, R.P.; Kharub, A.S.; Gill, S.C.; Tripathi, S.C.; Gupta, O.P.; Ajita; Naorem, A.; Kumar, M.; et al. Challenges and Opportunities in Productivity and Sustainability of Rice Cultivation System: A Critical Review in Indian Perspective. *Cereal Res. Commun.* 2021, 1–29, doi:10.1007/s42976-021-00214-5. (**Open Access**)
- **Naorem, A.**; Patel, A.; Udayana, S.K. Exploitation of Soil Amendments to Remediate Heavy Metal Toxicity for Safe Cultivation of Crops. *Microbial Biotechnology* 2022, 175–188.
- **Naorem, A.**; Patel, S.; Hassan, S.; Louhaichi, M.; Sarker, A. Response of Cactus Pear (*Opuntia Ficus-Indica* Mill.) to Boron and Farmyard Manure Application under Arid Soils Conditions in Kutch, Gujarat. *Acta Hortic.* 2022, 187–196, doi:10.17660/actahortic.2022.1343.26



Contact

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Personal details

Date of Birth

01 March 1992

Nationality

Indian

Education

2009-2013

Bachelor of Science (Agriculture)

Assam Agricultural University, Assam, India

2013-2015

MSc. (Soil Science & Agricultural Chemistry)

CPGS, Central Agricultural University, Meghalaya, India

2015-19

Ph.D (Soil Science & Agricultural Chemistry)

Bidhan Chandra Krishi Viswavidyala, West Bengal, India

Language

English

Hindi

Meiteilon

Hobbies

Singing

Cooking

Video Editing

Dancing

- **Naorem, A.** Carbon Sequestration: A Climate Change Solution under Your Feet. *Reson.* 2022, 27, 1237–1245, doi:10.1007/s12045-022-1416-0.
- **Naorem, A.;** Udayana, S.K.; Jayaraman, S. Potential Options and Applications of Machine Learning in Soil Science. *The Digital Agricultural Revolution 2022*, 447–459.
- **Naorem, A.;** Udayana, S.K. Exploring Toxic Heavy Metals Using Engineered Nanomaterials via Immobilization. In *Bioremediation And Phytoremediation Technologies in Sustainable Soil Management*; Apple Academic Press: Boca Raton, 2022; pp. 119–154 ISBN 9781003281177.
- **Naorem, A.;** Udayana, S.K.; Patel, A. Unravelling the Significance of ACC-Deaminase in Sustainable Arid Soil Management. In *Ecosystem Services, Types, Management and Benefit*; Jatav, H., Ed.; NOVA, 2022.
- **Naorem, A.;** Udayana, S.K.; Jayaraman, S. Does Conservation Agriculture Work for Small-Scale Farmers in Developing Nations? A Mini-Review. In *Innovation in Small-Farm Agriculture*; CRC Press: Boca Raton, 2022; pp. 151–158 ISBN 9781003164968.
- **Naorem, A.** Will Climate Change Alter the Efficiency of Bioremediation? In *Advances in Bioremediation and Phytoremediation for Sustainable Soil Management*; Springer International Publishing: Cham, 2022; pp. 429– 435 ISBN 9783030899837.
- **Naorem, A.;** Huirem, B.; Udayana, S.K. Ecological and Health Risk Assessment in Sewage Irrigated Heavy Metal Contaminated Soils. In *Sustainable Management and Utilization of Sewage Sludge*; Springer International Publishing: Cham, 2022; pp. 29–50 ISBN 9783030852252.
- **Naorem, A.;** Jayaraman, S.; Udayana, S.K.; Singh, N.A.K. Can Conservation Agriculture Deliver Its Benefits in Arid Soils?: An Overview. In *Conservation Agriculture: A Sustainable Approach for Soil Health and Food Security*; Springer Singapore: Singapore, 2021; pp. 267–287 ISBN 9789811608261.
- **Naorem, A.;** Maverick, J.; Singh, P.; Udayana, S.K. Microbial Community Structure in Organic Farming and Their Management. In *Advances in Organic Farming*; Elsevier, 2021; pp. 47–58 ISBN 9780128223581.
- **Naorem, A.;** Udayana, S.K. Remediation of Salt Affected Soils through Microbes to Promote Organic Farming. In *Advances in Organic Farming*; Elsevier, 2021; pp. 75–92 ISBN 9780128223581.
- **Naorem, A.** Spineless Cactus (*Opuntia-Ficus Indica*): Exploring an Unconventional Fodder Resource in Arid Soils; *Krishi Jagran*, 2021;
- **Naorem, A.K.** Spineless Cactus – Promising Potential for Arid Regions. *Science Reporter* 2021.
- **Naorem, A.** Is Asia’s Largest Grassland Degrading Due to *Prosopis Juliflora* Invasion? *Agri-Cos* 2021.
- **Naorem, A.;** Udayana, S.K.; Patel, S. Potassium Solubilizing Bacteria: An Insight. In *Advances in Environmental Engineering and Green Technologies*; IGI Global, 2021; pp. 299–313 ISBN 9781799870623.
- **Naorem, A.;** Alka Rani, D.R. *Frontier Soil Technologies for Sustainable Development Goals (SDGs)*. 2019.
- **Naorem, A.;** Udayana, S.K. Intervention Of Multitasking PGPR In Pulse Production Under Stress Conditions. *Innovative Farming* 2017, 2, 41–44.
- **Naorem A..** “Editorial-Managing Arid Soils in a Changing Climate: Addressing Technology Gaps and Urging Research for Sustainable Land Use”. *Acta Scientific Agriculture* 7.5 (2023): 01-02.
- Jayaraman, S.; **Naorem, A.K.;** Hati, K.M.; Sinha, N.K.; Mohanty, M.; Patra, A.K.; Chaudhari, S.K.; Lal, R.; Dalal, R.C. Conclusions: Perspectives on Conservation Agriculture. In *Conservation Agriculture: A Sustainable Approach for Soil Health and Food Security*; Springer Singapore: Singapore, 2021; pp. 623–632 ISBN 9789811608261.
- **Naorem, A.;** Kumar Udayana, S.; Maverick, J.; Patel, S. Soil Microbe-Mediated Bioremediation: Mechanisms and Applications in Soil Science. In *Industrial Applications of Soil Microbes*; Bentham Science Publishers, 2022; pp. 133–150.

- Jayaraman, S.; Bandyopadhyay, K.K.; **Naorem, A.K.**; Sinha, N.K.; Mohanty, M.; Hati, K.M.; Patra, A.K.; Chaudhari, S.K.; Dalal, R.C.; Lal, R. Soil Carbon Sequestration through Conservation Tillage and Residue Management. In Conservation Agriculture: A Sustainable Approach for Soil Health and Food Security; Springer Singapore: Singapore, 2021; pp. 299–319 ISBN 9789811608261.
- Jayaraman, S.; **Naorem, A.K.**; Sinha, N.K.; Mohanty, M.; Hati, K.M.; Patra, A.K.; Chaudhari, S.K.; Lal, R.; Dalal, R.C. Conservation Agriculture: Issues, Prospects, and Challenges in Rainfed Regions of India. In Conservation Agriculture: A Sustainable Approach for Soil Health and Food Security; Springer Singapore: Singapore, 2021; pp. 1–21 ISBN 9789811608261.
- Jayaraman, S.; Sinha, N.K.; Mohanty, M.; Hati, K.M.; Chaudhary, R.S.; Shukla, A.K.; Shirale, A.O.; Neenu, S.; **Naorem, A.K.**; Rashmi, I.; et al. Conservation Tillage, Residue Management, and Crop Rotation Effects on Soil Major and Micro-Nutrients in Semi-Arid Vertisols of India. J. soil sci. plant nutr. 2021, 21, 523–535, doi:10.1007/s42729-020-00380-1.
- Patel, R.; **Naorem, A.**; Batabyal, K.; Murmu, S. Bioremediation Current Status, Prospects and Challenges. In Bioremediation Science From Theory to Practice; CRC Press: First edition. Boca Raton, FL : CRC Press, [2021] Includes bibliographical references and index., 2021; pp. 15–36 ISBN 9780429327643.
- Jayaraman, S.; **Naorem, A.**; Lal, R.; Dalal, R.C.; Patra, A.K. No-till Farming Systems in South Asia. In No-till Farming Systems for Sustainable Agriculture; Springer International Publishing: Cham, 2020; pp. 459–476 ISBN 9783030464080.
- Somasundaram, J.; Sinha, N.K.; Dalal, R.C.; Lal, R.; Mohanty, M.; **Naorem, A.K.**; Hati, K.M.; Chaudhary, R.S.; Biswas, A.K.; Patra, A.K.; et al. No-till Farming and Conservation Agriculture in South Asia – Issues, Challenges, Prospects and Benefits. CRC Crit. Rev. Plant Sci. 2020, 39, 236–279, doi:10.1080/07352689.2020.1782069.

Research projects (2019-2023)

As Lead Investigator

- Promoting cactus (*Opuntia-ficus indica*) as a drought resilient feed resources under different agro-ecological production systems across India (**Funded by International Centre for Agricultural Research in the Dry Areas, Lebanon**)
- Development of multifaceted plant growth promoting microbial consortium for acid soils (**Funded by Central Agricultural University, Manipur, India**)
- Remediation of heavy metal toxicity in sewage contaminated soils for safe cultivation of crops (**Funded by BCKV and University Grants Commission, India**)
- Impact of land-use and management on soil quality in arid region of Gujarat (**Funded by ICAR-CAZRI, Jodhpur**)
- Evaluation and management of palatable halophytes for enhancing fodder resources in Gujarat (**Funded by ICAR-CAZRI, Jodhpur**)
- Long term conservation agriculture in rainfed Vertisols of Central India (**Funded by ICAR-IISS, Bhopal**)
- Feasibility study of fertilizer manufactured using spent acid in plantation crops within Kutch region (**Funded by Ashapura Industries, India**)
- Soil Enzyme Responses, Carbon and Nutrient Allocation Under Elevated CO₂ and Temperature: A Microcosm study (**Funded by ICAR-CAZRI, Jodhpur**)

As Co-Investigator

- Development of a plant growth promoting rhizobacterial (PGPR) consortium for enhancement of growth and productivity in pearl millet and mung bean (**Funded by ICAR-CAZRI, Jodhpur**)
- Organic management options for assessing productivity, profitability and sustainability in hot arid regions(**Funded by ICAR-CAZRI, Jodhpur**)

Books (edited and authored)

- **A.K. Naorem** and D. Machiwal. Enhancing Resilience of Dryland Agriculture under Changing Climate: Interdisciplinary and Convergence Approaches. SpringerNature.
- A. Patel and **A.K. Naorem** (2022). One-liners on soil and water management. New India Publishing Agency, New Delhi, India

Awards and Honours

- Young Scientist Award 2022 (Society for Ecological Sustainability, Odisha, India)
- Young Scientist Award in Soil Science Research and Extension 2022 (Dr. V. Vasantharaj Foundation, Chennai, India) Best Zonal Masters Thesis Award 2016 (Indian Society of Soil Science, India)
- Recipient of University Grants Commission Fellowship, India
- Best oral and poster presentations in 9 International and 3 National conferences.

Lectures and Radio talks

- Guest lead speaker in 7 national training programmes and 2 online webinars.
- Invited Speaker on "How to crack ARS examination: Tips?" in Nature Science E-magazine. Delivered 4 radio talks in All India Radio, Manipur
- Published two newspaper articles on soil health in leading newspaper of Gujarat.

Leadership role

- As a Head-in-charge of ICAR-CAZRI, RRS-Bhuj from 20 October 2020 till 19 May 2022
- As a Head-in-charge of KVK-Bhuj from 27 October 2020 till 12.1.2022
- Nodal Officer of Scheduled Caste Sub-Plan Programme of ICAR-CAZRI, RRS-Bhuj from 24 January, 2020 till 19 May 2022
- As a chairman in organizing Cactus field day on 25 July 2019 at Bandra, Kutch, Gujarat with the participation of 150 farmers.
- As a chairman in organizing Cactus field day on 17 February 2020 at Hatdi, Kutch, Gujarat with the participation of 115 farmers.
- As a chairman in organizing Cactus field day on 12 November 2020 at Reldi, Kutch, Gujarat with the participation of 98 farmers.
- As a chairman in organizing Cactus field day on 24 February 2021 at Chakar, Kutch, Gujarat with the participation of 102 farmers.

- As a chairman in organizing Cactus field day on 28 January 2022 at Mepani Farm, Bhuj, Gujarat with the participation of 131 farmers.
- Nominated as the officer to conduct the Physical verification of the Stores of ICAR, KVK-Bhuj during 2021-22
- Assistant Returning Officer in conducting election of 1 (one) member of the Technical category in Institute Joint Staff Council on 8 October, 2021
- Regional Editor of ICAR-CAZRI, RRS-Bhuj profile and Decadal report of ICAR-CAZRI, RRS-Bhuj
- Active member in Training cum Input distribution programme under MIDH organized by ICAR-CAZRI, KVK-Bhuj on 11 March, 2022
- Chairman of local purchase committee at ICAR-CAZRI, RRS-Bhuj
- Developed an arid fodder demonstration unit including 30 unconventional arid fodder crops in ICAR-CAZRI, RRS-Bhuj during 2020.
- Nodal Officer of Soil Health Card, ICAR-CAZRI, RRS-Bhuj with effect from 18 September 2019 till 19 May 2022
- Officer-in-charge of Automatic weather station, ICAR-CAZRI, RRS-Bhuj with effect from 16 November 2019 till 19 May 2022
- Officer-in-charge of MGMGI, ICAR-CAZRI, RRS-Bhuj with effect from 16 November 2019 till 19 May 2022
- Library-in-charge, ICAR-CAZRI, RRS-Bhuj with effect from 16 November 2019 till 19 May 2022
- Editor of Annual Progress Report, ICAR-CAZRI, RRS-Bhuj with effect from 16 November 2019 till 19 May 2022
- Regional nodal officer of HYPM, ICAR-CAZRI, RRS-Bhuj with effect from 16 November 2019 till 19 May 2022
- Officer-in-charge of Computer Section, ICAR-CAZRI, RRS-Bhuj with effect from 16 November 2019 till 19 May 2022
- Nodal officer of ERP, ICAR-CAZRI, RRS-Bhuj with effect from 16 November 2019 till 19 May 2022
- Officer-in-charge of Soil and Water conservation section, ICAR-CAZRI, RRS-Bhuj with effect from 18 November 2019 till 19 May 2022
- Officer-in-charge of Genetics Department, ICAR-CAZRI, RRS-Bhuj with effect from 27 October 2020 till 19 May 2022
- Officer-in-charge of Agronomy and Agroforestry Plantation section, ICAR-CAZRI, RRS-Bhuj with effect from 27 October 2020 till 19 May 2022
- Officer-in-charge of IMC/IRC/RAC/QRT, ICAR-CAZRI, RRS-Bhuj with effect from 27 October 2020 till 19 May 2022

- Officer-in-charge of Scientific audit file, ICAR-CAZRI, RRS-Bhuj with effect from 27 October 2020 till 19 May 2022
- Officer-in-charge of station HRD, ICAR-CAZRI, RRS-Bhuj with effect from 27 October 2020 till 19 May 2022
- Officer-in-charge of station PME, ICAR-CAZRI, RRS-Bhuj with effect from 27 October 2020 till 19 May 2022
- Information officer RTI, ICAR-CAZRI, RRS-Bhuj with effect from 27 October 2020 till 19 May 2022
- Verification officer-medical reimbursement, ICAR-CAZRI, RRS-Bhuj with effect from 27 October 2020 till 19 May 2022
- Arranged vaccination services for official staff members of ICAR-CAZRI, RRS and KVK-Bhuj during the pandemic
- Member Secretary of Division Research Council, Division of Integrated Farming System, ICAR-CAZRI, Jodhpur

Works related to germplasms collection, documentation and conservation)

- 1000 trees of native mitha guggul (*Commiphora stocksiana*) which is listed in the IUCN Red List of Threatened Species are being collected from The Gujarat Medicinal Plants Board, Gujarat and conserved in ICAR-CAZRI, RRS-Bhuj station since 13 July 2021
- 64 accessions of fodder cactus are being maintained at ICAR-CAZRI, RRS-Bhuj farm both at field and nursery level since 03 September 2019

Service providing activities related to production, processing and distribution of seeds and planting material

- Took the lead in distributing 150 nopal planting materials to Cactus Live Museum, Statue of Unity, Gujarat on 24 January 2021
- Since 2017 till March 2022, a total number of 7045 cactus cladodes planting materials have been distributed to farmers belong to both Kutch and several states of India.
- Took the lead in providing 1000 grams of *Grewia flavescens* Juss (stem) to Regional Ayurveda Research Institute, Ministry of Ayush, Gwalior.
- Under SCSP, took the lead in the seed distribution to 100 SC farmers belonging to five villages of Kutch region on 23 October 2021.
- Under SCSP, took the lead in the distribution of automatic sprayers to 100 SC farmers belonging to Kutch region on 6 July 2021.

HRD programmes organized under my leadership

- Hands-on-training on cactus farming on 17 March 2020 at ICAR-CAZRI, RRS-Bhuj with the participation of 100 farmers.
- Hands-on-training on cactus farming on 27 October 2021 at ICAR-CAZRI, RRS-Bhuj with the participation of 120 farmers.
- Hands-on-training on cactus farming on 25 March 2022 at ICAR-CAZRI, RRS-Bhuj with the participation of 73 farmers.
- One day training conducted for 45 Range Forest Officers (Batch 2021-23) as a part of West India Tour at ICAR-CAZRI, RRS-Bhuj on 21 October 2021
- Presiding Officer in the Institute Joint Staff Council on 17 March,, 2020 at ICAR-CAZRI, RRS-Bhuj
- Organised the Fertilizer Awareness Day on balanced use of fertilisers on June 18 2021 at ICAR-CAZRI, KVK and RRS-Bhuj.

Editorial Board Member

- Editorial Board Member in Agri-Cos Newsletter since 2020
- Associate member in the International Society for Development and Sustainability (ISDS), Japan since 4 July, 2021
- General Body Member in the Indian Society of Soil Science, Jodhpur chapter since 21 March 2022.
- Editorial Board Member of Nature Science E-Magazine since 6 November 2021.