

Career in agricultural engineering: A prologue

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■ **ABSTRACT** : The future of agriculture depends on the next generation of problem solvers. Creative and skilled individuals, like we, can use their knowledge of agriculture and life sciences, along with the problem solving skills of engineering, to create new systems and solutions for the 21st century. Agriculture is changing faster than any time in history. That's why, if we are interested in helping direct the future of agriculture, a degree in agricultural engineering is what we need. In this paper, agricultural engineers are people who like hands-on problem solving and design implementation. They like to work in teams to solve societal problems related to agriculture. Agricultural engineers solve problems related to agricultural equipment, water quality and water management, biological products, livestock facilities, food processing and many other agricultural areas.

■ **KEY WORDS** : Agriculture, Agricultural engineers, Food processing, Water management, Agricultural equipment

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Agricultural engineering, like all other branches of engineering uses scientific principles and technology to solve problems relating to sustainable agricultural production. Agricultural Engineers may perform tasks such as planning, supervising and managing the building of dairy effluent schemes, irrigation, drainage, flood and water control systems, perform environmental impact assessments and interpret research results and implement relevant practices.

Agricultural engineers design, install and service agricultural, horticultural and forestry machinery and equipment. They also advise farmers, landowners and government departments on countryside issues. These could range from crop diversity through to sustainable land use. It involves disciplines like mechanical engineering (agricultural machinery and automated machine systems), soil science (crop nutrient and fertilization, etc.), environmental sciences (drainage and irrigation), plant biology (seeding and plant growth

management), animal science (farm animals and housing) and much more. These are engineering professionals who develop and design new procedures, tools and systems for agricultural products and environments. Also, engineers in this field may work to solve environmental issues pertaining to agriculture or they may specialize in bioprocess technology. Agricultural engineers must have a wealth of knowledge and skills to function effectively in the diverse agricultural and agribusiness industries. They must also have skills in computers, communication, teamwork and instrumentation. The feature distinguishing agricultural engineers from other engineers is their interest and commitment to solving agricultural problems.

Main branches of agricultural engineering :

- Farm machinery
- Irrigation and drainage engineering
- Processing and food engineering
- Farm power and renewable energy

- Soil and water conservation engineering.

Scope and importance :

There are government, private and some consultancy services one can opt for job as per his/ her qualification and experience. Among government services there are posts of Lecturer/Assistant Professor in the SAUs, Scientist in the ICAR/CSIR Institutes, etc. Training Associates (TA) in Krishi Vigyan Kendra's (KVKs) run by selected ICAR Institutes, SAUs and State Departments etc. Besides, temporary job as a JRF/ SRF Research Associate/ Project Associates etc. in various ICAR, CSIR and DRDO sponsored research projects under ICAR, CSIR institutes, AICRPs and Network Projects ICAR, SAUs etc. are also available. A large number of national and international NGOs engaged in rural development and related Research and Development activities recruit extension personnel in different positions depending on the educational qualifications and experiences. KVKs run by several NGOs employ Agricultural engineers as Subject Matter Specialist (SMS), Farm manager, Sr. Scientist, Head, SMS and Programme Assistant Posts. Presently, opportunity to work as a counselor or consultant is limited.

Course available :

- B.Tech in Agricultural Engg.
- M.Tech in Agricultural Engg.
- Ph.D. degree in Agricultural Engg.

Qualification required :

- For pursuing B.Tech in agricultural engineering, 10+2, with Physics, Chemistry, Mathematics or Agriculture (in some states) is required.
- For M.Tech admit candidates to these programmes through graduate aptitude test in engineering (GATE), B.tech in agriculture is required.
- For diploma courses in agricultural engineering, 10+2 and these courses can be done through polytechnics.

Courses taught :

These are the following courses which are continued to teach in 4 years B.Tech programme and also in further P.G. and Ph.D. degree.

- Environmental Science
- Agri. Extension Education

- Communication Development
 - Agricultural Statistics
 - Computer Application
 - Water Science and Technology
 - Food Science and Technology
 - Agri Business Management
 - Agri. Marketing and Co-operation
 - Rural Marketing Management
 - Rural Banking and Finance Management
 - Soil and Water Cons Engg.
 - Water Resource Engg.
 - Irrigation and Drainage Engg.
 - Post-Harvest Engg. / Food Engg. / Agri. Processing and Structure
 - Farm Implements and Machinery/ Farm Power and Machinery/ FP and Equip
 - Bio-energy including Renewable Energy Mgt., Agri/ Irrigation Water management
- (According to ICAR's Vth Dean Committee Course Curriculum 2016).

After B.Tech:

In most of the universities, students gets placed on campus as many companies (mostly farm machinery and Irrigation related) are visiting the campus. Tractor related companies generally recruit students as graduate engineer trainee in sales and marketing department, others gives jobs in Research and Development sector. One can become an Agricultural officer in any recognized bank after clearing the concerned examination conducted by IBPS or respective banks. Some banks also recruit students on campus. Obviously on campus placement is much easier than off campus. One can have opportunity for higher studies M.Tech or ABM (Agri business management). For pursuing M.Tech in India one has to qualify GATE while students have to score a good GRE, IELTS or Toefl score for doing M.Tech (M.S.) in foreign countries. One has to score a good percentile in various MBA entrance examinations (CAT, IRMA) for pursuing a career in ABM. One can apply for JRF examination in ICAR and become Agricultural scientist. There are govt. jobs for Agricultural engineers like IFS (Indian Forest Services), state PCS, FCI etc. One can join NGOs and work in rural sectors.

After M.tech :

- Campus recruitment (R and D sector)
- After clearing NET one can apply for assistant

professor in any agricultural university.

- Opportunity for Ph.D. in respective specialization.
- Various government jobs like ARS, PCS etc.

Areas of interest to agricultural engineers :

Design of agricultural machinery, equipment and structures, machine testing new equipment, such as harvesters, crop sprayers, storage facilities and logging machinery

- Protecting surface and ground water quality
- Developing and managing bioprocessing systems
- Environmental control systems, cooling and ventilation environmental remediation
- Energy conservation
- Crop production-seeding, tillage and irrigation practices, designing natural resource management systems
- Soil and water conservation
- Animal production and care, designing animal production facilities and environmental control systems
- Biofuel production and utilization on the farm
- Post-harvest processing, handling and storage
- Precision farming technologies, machine vision, GPS testing, installing and analyzing and weather data and using computer modelling to advise farmers and businesses on land use, for instance how to increase crop yields or crop with changing climate conditions
- Farm operations and management, designing off-road vehicles and agricultural equipment
- Farm safety, security and ergonomics
- Natural resources management
- Consulting
- Assessing the environmental impact of intensive agricultural production methods
- Supervising agricultural construction projects, like land drainage, reclamation and irrigation
- Planning service and repair programmes for machinery.

Sectors where agricultural engineers find employment :

Public sector :

- Department of Agriculture (State as well as central government)
- Development organizations
- Universities/Institutions/Labs

Private sector :

- Agricultural co-operatives
- Manufacturers of agricultural equipment
- Fertilizer and irrigation companies
- Farming companies
- Industry service organizations such as the sugar industry
- NGOs

To be an agricultural engineer, one should have :

- The ability to analyses data
- A creative approach to problem solving
- Excellent technical, scientific, math and IT skills
- The ability to priorities and plan work effectively
- Good budgeting skills
- The ability to take responsibility and lead a team
- The ability to meet deadlines
- Excellent communication and presentation skills
- A willingness to work flexibly
- A commitment to keep up to date with new developments in technology and production methods.

Jobroles for agricultural engineering

An AE degree will open doors around the world in large corporations and small businesses, including careers in water quality, food processing, environmental systems, structural design, erosion control, materials handling, agricultural power and equipment design and more.

Agricultural engineer :

- Application engineer
- Administrative officer (UIIC)
- Agriculture extension officer
- Agricultural crop engineer
- Agricultural inspector
- Agricultural specialist
- Bio resource engineer
- Chief engineer
- Cane supervisor
- Consulting engineer
- Design engineer
- Design team manager
- Developmental engineer
- Environmental engineer
- Extension specialists
- Environmental controls engineer

- Environmental controls engineer
- Farm shop manager
- Food supervisor
- Food engineer
- Land development engineer manufacturing engineer
- Operations manager
- Precision agriculture applications engineer
- Process engineer
- Product engineer
- Production engineer
- Product safety engineer
- Professor
- Project engineer
- Remediation engineer
- Research engineer
- Researchers
- Researcher
- Survey research agricultural engineer
- Sales engineer
- Self employed
- Structure designers
- Staff engineer
- Test engineer
- Waste specialists
- Water management specialist engineer
- Machinery designers.

Institutes / Universities offering degree in agricultural engineering :

India has as many as 43 agricultural universities under the status of central, state and deemed universities. These universities offer regular full time programs in agricultural engineering both at undergraduate and postgraduate level. Apart from these universities few other universities and technological institutions like the IITs also offer programmes in agricultural engineering. Here is a list of agricultural universities in various states which are offering B.Tech and M.Tech programmes in agricultural engineering:

- Indian Agricultural Research Institute, New Delhi
- Indian Institute of Technology, New Delhi
- Indian Institute of Technology, Guwahati
- Indian Institute of Technology, Mumbai
- Indian Institute of Technology, Kanpur
- Indian Institute of Technology, Kharagpur
- Indian Institute of Technology, Chennai
- Birla Institute of Technology (BITS), Pilani and

- Ranchi
 - Ch. Charan Singh Haryana Agricultural University, Hisar, Haryana
 - Punjab Agricultural University, Ludhiana, Punjab
 - Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan
 - Rajasthan Agricultural University, Bikaner, Rajasthan
 - G. B. Pant university of Agriculture and Technology, Pantnagar, Uttarakhand
 - University of Agricultural Sciences, Bangalore
 - University of Agricultural Sciences, Dharwad, Karnataka
 - Kerala Agricultural University, Thrissur, Kerala
 - Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
 - Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar
 - Brisa Agricultural University, Ranchi, Jharkhand
 - Indira Gandhi Krishi Vishwa Vidyalaya, Raipur, Madhya Pradesh
 - Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, Madhya Pradesh
 - Allahabad Agricultural Institute, Uttar Pradesh
 - Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut, UP
 - Assam Agricultural University, Jorhat, Assam
 - Central Agricultural University, Imphal, Manipur
- For more details about the SAU's, Agricultural universities go through www.icar.org.in.

Salary structure :

In the government organizations, a fresher can expect a salary between Rs. 20,000/- to Rs. 25,000/- per month or more depending on the efficiency and capability. In private organizations, MNC's and NGO's, an agriculture engineer is paid well. As for a lecturer in the field of agricultural can earn an initial amount of Rs. 15000/- per month plus other allowance.

Placement opportunities :

The students of agricultural engineering may be placed in different sectors/areas of private as well as government in India and abroad also:

- A.G. Sun seeds Pvt. Ltd.
- Advanta India Limited
- Agro Biotech

- Balaji Seed Pvt. Ltd
- Bhakti Biotech Pvt. Ltd.
- Banks (Rural Development Officers/ Agriculture officer)
- CNH America - agricultural and construction equipment manufacturing
- Century Seeds Pvt. Ltd
- Cabinet Secretariat, Government of India, New Delhi
- Caterpillar -construction equipment manufacturing
- Daftari Agro Private Limited
- Directorate of Oil Palm Research
- Food Corporation of India
- Grove Worldwide - crane and construction equipment manufacturing
- ICAR
- Indo-American Hybrid Seeds (India) Pvt. Ltd
- KVKs (SMS)
- John Deere - agricultural, construction and landscaping equipment manufacturing
- Langan Engineering and Environmental Services - environmental consulting
- McClanahan Corporation - equipment manufacturing
- Mock Roos and Associates - environmental engineering
- NASA - systems for growing food in space
- NGOs
- NDDDB (Research Scientists)
- Novartis India: Seeds Division
- Namdhari Seeds (Pvt.) Ltd
- National Dairy Development Board
- National Seeds Corporations
- Natural Resource Conservation Service (USDA) - natural resource protection service agency
- Natural Agricultural Innovative Projects
- Pro-agro Seed Company Ltd
- Sun seeds India Private Limited
- SAUs (Asst./ Assoc. Professors)
- Truss-Joist - wood structural products and systems component design
- Timber Tech Engineering - wood structures design
- United India Insurance Company Limited
- Weaver Fluid Power - machinery manufacturing.

Conclusion :

Agriculture is considered as the primary sector of

India and is the backbone of our economy. This field has given employment to more than 64 per cent of the country's population. Agriculture Engineering can secure an attractive post in any of the governmental or private organizations. They can also look for job openings in several top firms abroad. Agricultural Engineers have bright career prospects. Upon graduating or post graduating in Agriculture and allied sciences, the options and opportunities of a career are many. State Department of Agriculture recruits Agricultural Engineers as agricultural officers for the development of agriculture in a district.

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