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Agricultural Engineering- Scope and Significance

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ABSTRACT: Agricultural engineering, also known as agricultural and biosystems engineering, is the field of study and application of engineering science and designs principles for agriculture purposes, combining the various disciplines of mechanical, civil, electrical, food science, environmental, software, and chemical engineering to improve the efficiency of farms and agribusiness enterprises[1] as well as to ensure sustainability of natural and renewable resources.[2]

An agricultural engineer is an engineer with an agriculture background. Agricultural engineers make the engineering designs and plans in an agricultural project, usually in partnership with an agriculturist who is more proficient in farming and agricultural science.

KEYWORDS: agricultural engineering, biosystems, agribusiness, projects, science, designs, enterprises

I. INTRODUCTION

The first use of agricultural engineering was the introduction of irrigation in large scale agriculture in the Nile and the Euphrates rivers before 2000 B.C. Large irrigation structures were also present in Baluchistan and India before Christian era. In South America irrigation was practiced in Peru by the Incas and in North America by the Aztecs.[3] The earliest plough was the ard or scratch-plough[4]

Settlers practiced irrigation in the vicinity of San Antonio in 1715, the Mormons practiced irrigation in Salt Lake Valley in 1847.[3]

With growing mechanization and steam power in the industrial revolution, a new age in agricultural engineering began. Over the course of the industrial revolution, mechanical harvesters and planters would replace field hands in most of the food and cash crop industries. Mechanical threshing was introduced in 1761 by John Lloyd, Magnus Strindberg and Dietrich Beater bar threshing machine was built by Andrew Meikle in 1786.[5] A cast iron plow was first made by Charles Newbold between 17960 and 1796.[3]

In the 20th century, with the rise in reliable engines in airplanes, cropdusters were implemented to disperse pesticides. Benjamin Holt built a combine harvester powered by petrol in 1911. Erwin Peucker constructed bulldog tractors 1936. Deutz-Fahr produced the rotary hay tedder in 1961.[5]

In the late 20th century, genetically modified foods (GMOs) were created, giving another large boost to crop yields and resistance to pests.[7]

Agricultural engineers may perform tasks such as planning, supervising and managing the building of dairy effluent schemes, irrigation, drainage, flood water control systems, performing environmental impact assessments, agricultural product processing and interpret research results and implement relevant practices. A large percentage of agricultural engineers work in academia or for government agencies. Some are consultants, employed by private engineering firms, while others work in industry, for manufacturers of agricultural machinery, equipment, processing technology, and structures for housing livestock and storing crops. Agricultural engineers work in production, sales, management, research and development, or applied science.

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In the Philippines, the professional designation is registered agricultural and biosystems engineer. They are licensed and accredited after successfully passing the Agriculturist and Biosystems Engineering Licensure Examination. A prospective agricultural and biosystems engineer is required to have a four-year Bachelor of Science in Agricultural and Biosystems Engineering.[1]

The practice of agricultural and biosystems engineering also includes the following:

- Consultation, valuation, investigation and management services on agricultural and biosystems engineering;
- Management or supervision and the preparation of engineering designs, plans, specifications, project studies and estimates for agricultural and biosystems, aquaculture and fishery, and forest product machinery, agricultural and biosystems buildings and structures, farm electrification and energy systems, agricultural and biosystems processing equipment, irrigation and soils conservation systems and facilities, agricultural and biosystems waste utilization systems and facilities;
- Conducting research and development, training and extension work, and consultancy services on agricultural and biosystems engineering facilities/services, system and technologies;[2]
- Testing, evaluation and inspection of agricultural and biosystems, fishery and forest product machinery and other related agricultural and biosystems engineering facilities and equipment.
- Management, manufacturing and/or marketing of agricultural and biosystems machinery and other related agricultural and biosystems engineering facilities and equipment;
- Teaching, agricultural and biosystems engineering subjects in institution of learning in the Philippines;
- Employment with the government provided such item or position requires the knowledge and expertise of an agricultural and biosystems engineer.[3]

II. DISCUSSION

Agricultural science (or agriscience for short[1]) is a broad multidisciplinary field of biology that encompasses the parts of exact, natural, economic and social sciences that are used in the practice and understanding of agriculture. Professionals of the agricultural science are called agricultural scientists or agriculturists. Agricultural sciences include research and development on:[10][11]

- Improving agricultural productivity in terms of quantity and quality (e.g., selection of drought-resistant crops and animals, development of new pesticides, yield-sensing technologies, simulation models of crop growth, in-vitro cell culture techniques)
- Minimizing the effects of pests (weeds, insects, pathogens, mollusks, nematodes) on crop or animal production systems.[4]
- Transformation of primary products into end-consumer products (e.g., production, preservation, and packaging of dairy products)
- Prevention and correction of adverse environmental effects (e.g., soil degradation, waste management, bioremediation)
- Theoretical production ecology, relating to crop production modeling
- Traditional agricultural systems, sometimes termed subsistence agriculture, which feed most of the poorest people in the world. These systems are of interest as they sometimes retain a level of integration with natural ecological systems greater than that of industrial agriculture, which may be more sustainable than some modern agricultural systems.
- Food production and demand on a global basis, with special attention paid to the major producers, such as China, India, Brazil, the US and the EU.

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- Various sciences relating to agricultural resources and the environment (e.g. soil science, agroclimatology); biology of agricultural crops and animals (e.g. crop science, animal science and their included sciences, e.g. ruminant nutrition, farm animal welfare); such fields as agricultural economics and rural sociology; various disciplines encompassed in agricultural engineering.[5]

III. RESULTS

Agroecology is defined by the OECD as "the study of the relation of agricultural crops and environment."[2] Dalgaard *et al*. refer to agroecology as the study of the interactions between plants, animals, humans and the environment within agricultural systems.[3] Francis *et al*. also use the definition in the same way, but thought it should be restricted to growing food.[4]

Agroecology is a holistic approach that seeks to reconcile agriculture and local communities with natural processes for the common benefit of nature and livelihoods.[6]

Agroecology is inherently multidisciplinary, including sciences such as agronomy, ecology, environmental science, sociology, economics, history and others.[3] Agroecology uses different sciences to understand elements of ecosystems such as soil properties and plant-insect interactions, as well as using social sciences to understand the effects of farming practices on rural communities, economic constraints to developing new production methods, or cultural factors determining farming practices. The system properties of agroecosystems studied may include: productivity, stability, sustainability and equitability.[5] Agroecology is not limited to any one scale; it can range from an individual gene to an entire population, or from a single field in a given farm to global systems.[3]

Wojtkowski differentiates the ecology of natural ecosystems from agroecology inasmuch as in natural ecosystems there is no role for economics, whereas in agroecology, focusing as it does on organisms within planned and managed environments, it is human activities, and hence economics, that are the primary governing forces that ultimately control the field.[6][7] Wojtkowski discusses the application of agroecology in agriculture, forestry and agroforestry in his 2002 book.[6]

Agroecosystems are the ecosystems supporting the food production systems in our farms and gardens. As the name implies, at the core of an agroecosystem lies the human activity of agriculture. As such they are the basic unit of study in Agroecology, and Regenerative Agriculture using ecological approaches.[7]

Like other ecosystems, agroecosystems form partially closed systems in which animals, plants, microbes, and other living organisms and their environment are interdependent and regularly interact. They are somewhat arbitrarily defined as a spatially and functionally coherent unit of agricultural activity.[1]

An agroecosystem can be seen as not restricted to the immediate site of agricultural activity (e.g. the farm). That is, it includes the region that is impacted by this activity, usually by changes to the complexity of species assemblages and energy flows, as well as to the net nutrient balance. Agroecosystems, particularly those managed intensively, are characterized as having simpler species composition, energy and nutrient flows than "natural" ecosystems.[8] Likewise, agroecosystems are often associated with elevated nutrient input, much of which exits the farm leading to eutrophication of connected ecosystems not directly engaged in agriculture.[3]

Forest gardens are probably the world's oldest and most resilient agroecosystem.[4] Forest gardens originated in prehistoric times along jungle-clad river banks and in the wet foothills of monsoon regions. In the gradual process of a family improving their immediate environment, useful tree and vine species were identified, protected and improved whilst undesirable species were eliminated. Eventually superior foreign species were selected and incorporated into the family's garden.[5]

Some major organizations are hailing farming within agroecosystems as the way forward for mainstream agriculture. Current farming methods have resulted in over-stretched water resources, high levels

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of erosion and reduced soil fertility. According to a report by the International Water Management Institute and the United Nations Environment Programme,[6] there is not enough water to continue farming using current practices; therefore how critical water, land, and ecosystem resources are used to boost crop yields must be reconsidered.[9] The report suggested assigning value to ecosystems, recognizing environmental and livelihood tradeoffs, and balancing the rights of a variety of users and interests, as well addressing inequities that sometimes result when such measures are adopted, such as the reallocation of water from poor to rich, the clearing of land to make way for more productive farmland, or the preservation of a wetland system that limits fishing rights.[7]

One of the major efforts of disciplines such as agroecology is to promote management styles that blur the distinction between agroecosystems and "natural" ecosystems, both by decreasing the impact of agriculture (increasing the biological and trophic complexity of the agricultural system as well as decreasing the nutrient inputs/outflow) and by increasing awareness that "downstream" effects extend agroecosystems beyond the boundaries of the farm (e.g. the Corn Belt agroecosystem includes the hypoxic zone in the Gulf of Mexico). In the first case, polyculture or buffer strips for wildlife habitat can restore some complexity to a cropping system, while organic farming can reduce nutrient inputs. Efforts of the second type are most common at the watershed scale. An example is the National Association of Conservation Districts' Lake Mendota Watershed Project, which seeks to reduce runoff from the agricultural lands feeding into the lake with the aim of reducing algal blooms.[8]

IV. CONCLUSIONS

Agriculture or farming is the practice of cultivating plants and livestock.[1] Agriculture was the key development in the rise of sedentary human civilization, whereby farming of domesticated species created food surpluses that enabled people to live in cities.[14] The history of agriculture began thousands of years ago. After gathering wild grains beginning at least 105,000 years ago, nascent farmers began to plant them around 11,500 years ago. Sheep, goats, pigs and cattle were domesticated over 10,000 years ago. Plants were independently cultivated in at least 11 regions of the world. Industrial agriculture based on large-scale monoculture in the twentieth century came to dominate agricultural output, though about 2 billion people still depended on subsistence agriculture.[10]

The major agricultural products can be broadly grouped into foods, fibers, fuels, and raw materials (such as rubber). Food classes include cereals (grains), vegetables, fruits, cooking oils, meat, milk, eggs, and fungi. Over one-third of the world's workers are employed in agriculture, second only to the service sector, although in recent decades, the global trend of a decreasing number of agricultural workers continues, especially in developing countries, where smallholding is being overtaken by industrial agriculture and mechanization that brings an enormous crop yield increase.[11]

Modern agronomy, plant breeding, agrochemicals such as pesticides and fertilizers, and technological developments have sharply increased crop yields, but cause ecological and environmental damage. Selective breeding and modern practices in animal husbandry have similarly increased the output of meat, but have raised concerns about animal welfare and environmental damage.[13] Environmental issues include contributions to global warming, depletion of aquifers, deforestation, antibiotic resistance, and other agricultural pollution. Agriculture is both a cause of and sensitive to environmental degradation, such as biodiversity loss, desertification, soil degradation, and global warming, all of which can cause decreases in crop yield. Genetically modified organisms are widely used, although some are banned in certain countries.[12]

REFERENCES

1. *"ASABE". www.asabe.org. Retrieved 2016-04-13.*
2. ^ *"Agricultural and Biosystems Engineering | Professional Regulation Commission". www.prc.gov.ph. Retrieved 2016-05-01.*
3. ^ Davidson J.B. 1913. Agricultural engineering, Webb Publishing

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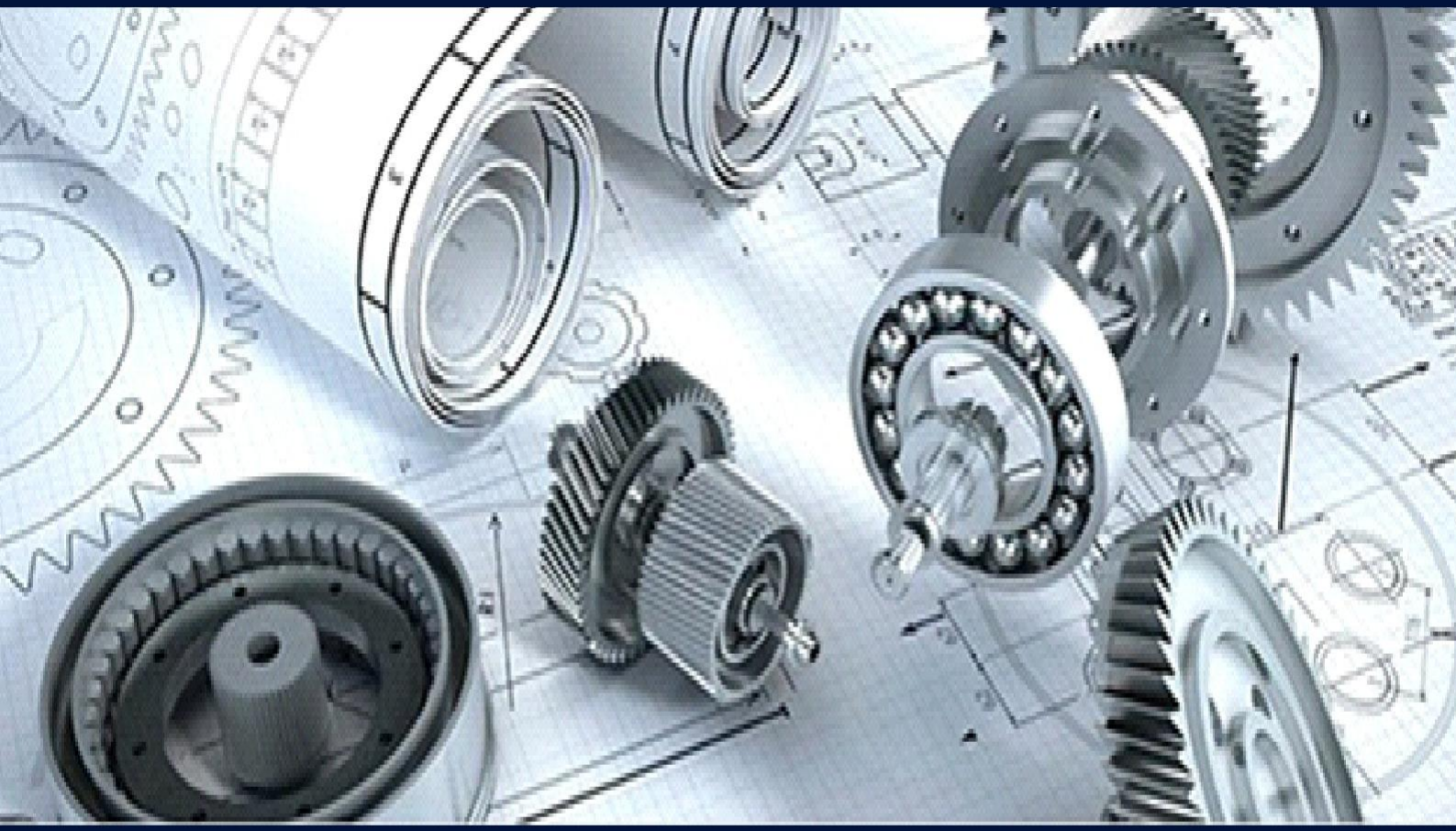
4. ^ Andersen, T.B., Jensen, P.S., Skovsgaard C.S., 2016. The Heavy Plough and the Agricultural Revolution in Medieval Europe. Journal of Development Economics
5. ^ H. Klaus, Milestones in the history of agricultural engineering, The world of agricultural engineering 2011
6. ^ F. M. L. Thompson (1968), The Second Agricultural Revolution, 1815-1880, *The Economic History Review*, Wiley
7. ^ *"ASABE 100 years of innovation" (PDF). ASABE.*
8. ^ "Kocharian Orders Tax Exemption For Armenian Farmers", Armenia Liberty (RFE/RL), August 8, 2006.
9. ^ *"GDP share of agriculture by country, around the world".*
10. ^ *"ASABE website". Archived from the original on 14 May 2009. Retrieved 15 May 2009.*
11. Brown, R.H. (ed). (1988). *CRC handbook of engineering in agriculture.* Boca Raton, FL.: CRC Press. ISBN 0-8493-3860-3.
12. Field, H. L., Solie, J. B., & Roth, L. O. (2007). *Introduction to agricultural engineering technology: a problem solving approach*. New York: Springer. ISBN 0-387-36913-9.
13. Stewart, Robert E. (1979). *Seven decades that changed America: a history of the American Society of Agricultural Engineers, 1907-1977.* St. Joseph, Mich.: ASAE. OCLC 5947727.
14. DeForest, S. S. (2007). *The vision that cut drugery from farming forever*. St. Joseph, Mich.: ASAE. ISBN 1-892769-61-1.



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