AgroTech Nexus

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AGRICULTURAL ENGINEERING

NANDHA ENGINEERING COLLEGE
(Autonomous)
Affiliated to Anna University, Chennai & Accredited by NAAC A+ Grade
Perundurai - Erode Main Road, Erode - 638 052, Tamil Nadu.

Department Vision and Mission

VISION

- To foster academic excellence by imparting knowledge in Agricultural Engineering to meet the ever-growing needs of the society.

MISSION

- To provide quality education to produce agricultural engineers with social responsibility.
- To excel in the thrust areas of agricultural engineering to identify and solve the real-world problems.
- To create a learner-centric environment by upgrading knowledge and skills to cater the needs and challenges of the society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The graduates of Agricultural Engineering will be

- **PEO1: Core Competency:** Successful professional with core competency and inter-disciplinary skills to satisfy the Industrial needs.
- **PEO2: Research, Innovation and Life-long Learning:** Capable of identifying technological requirements for the society and providing innovative solutions to real time problems.
- **PEO3: Ethics, Human values and Entrepreneurship**: Able to demonstrate ethical practices and managerial skills through continuous learning

PROGRAMME SPECIFIC OUTCOMES (PSO)

The students of Agricultural Engineering will be able to

- **PSO1:** Design, analyze and apply the knowledge gained on agricultural machinery, tools, implements and production technologies to increase crop production, improve land use, soil nutrient and conserve resources like water, fertilizer and energy.
- **PSO2:** Apply the comprehensive knowledge of engineering properties of agricultural products for upgrading the unit operation and developing innovative process, value-added products, and advanced engineering technologies to meet the challenges in agriculture.

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MAGAZINE

Transplanting in agriculture

N. Bhavadharani, 3rd Year, Agri, NEC

In agriculture and gardening, transplanting or replanting is the technique of moving a plant from one location to another. Most often this takes the form of starting a plant from seed in optimal conditions, such as in a greenhouse or protected nursery bed, then replanting it in another, usually outdoor, growing location. The agricultural machine that does this is called a transplanter. This is common in market gardening and truck farming, where setting out or planting out are synonymous with transplanting. In the horticulture of some ornamental plants, transplants are used infrequently and carefully because they carry with them a significant risk of killing the plant

Different species and varieties react differently to transplanting; for some, it is not recommended. In all cases, avoiding transplant shockthe stress or damage received in the processis the principal concern. Plants raised in protected conditions usually need a period of acclimatization, known as hardening off (see also frost hardiness). Also, root disturbance should be minimized. The stage of growth at which transplanting takes place, the weather conditions during transplanting, and treatment immediately after transplanting are other important factors.

Irrigate the beds during transplanting and level the bed if it is not levelled. 3 to 4 weeks seedlings should be transplanted in the field. Transplant 2 to 3 seedlings per hill in normal planting and 4 to 6 seedlings in delayed planting.For early kharif and Rabi season, plant 21 – 25 days old seedlings at a spacing of 25 cm x 10 cm. For Late Kharif season, plant 25-28 days old seedlings at a spacing of 30 x 10 cm. Plant the seedlings at a depth of 2 to 3 cm. Deeper planting delays tillering and root regeneration, increases duration and flowering at different times.

Transplant in lines at proper spacing to maintain the correct level of panicles per metre. This also eases subsequent operations. Random planting leads to uneven growth of tillers and reduce panicles per metre.Prepare slurry with 5 packets (1000g) per hectare of Azospirillum inoculant in 40 litres of water and dip the root portion of the seedlings in the solution for 15 to 30 minutes and transplant.Dip the leafy portion of the seedlings in 0.1% carbendazim solution before planting to arrest the transfer of blast to main field.The beds

should be irrigated on the third day after transplantationReplace the dead hills with new seedlings from the same nursery within one week.

Commercial agriculture

Ms. P. Sandhiyadevi, Assistant professor, Agri, NEC

Commercial agriculture, or otherwise known as agribusiness, is a cropping method in which crops are raised and livestock are raised in order to sell the products on the market in order to make money.In this type of agriculture, a lot of capital is invested and large-scale crops are grown in huge farms, using modern technologies, machinery, irrigation methods and chemical fertilizers. The basic characteristic of commercial agriculture is that high doses of modern inputs are used for higher productivity, such as high yielding varieties, fertilizers, insecticides, pesticides, weed killers, and so on. In commercial agriculture, crops that are in high demand, i.e. crops that need to be exported to other countries or are used as raw materials in industries are produced mainly. In addition, the extent of agricultural marketing differs from region to region.

Sugarcane extraction

Mr. R. M. Subramanian, Assistant professor, Agri, NEC

Cane sugar mills produce sugar (raw, white, or refined) from sugarcane. Sugarcane contains about 70% water. In the milling process, the harvested sugarcane brought to the mill is chopped and passed through crushers to extract juice. This juice is then clarified and sent to evaporators, where the juice is concentrated by evaporating the water that is present in the juice. This water vapor leaves the evaporation process in the form of condensate, which is commonly referred to as the vapor or process condensate. Most of the water coming with the sugarcane is thus removed during the sugar production process, resulting in the generation of a water by-product stream. Therefore, it is rather straightforward to understand that the sugar mills have surplus water. By reusing the vapor condensate, fresh water consumption by the mills can be reduced, thereby improving the water efficiency of the mill.

During the sugar milling process, sugar juice can contaminate the water system. For example, a part of the sugar manufacturing process is the concentration of sugarcane clarified (or thin) juice using multiple effect evaporators (MEEs). In an MEE, the vapor from the first effect is used to heat the juice in the second effect, the vapor from the second is used to heat the juice in the third effect, and so forth. The first effect of the MEE is usually driven by steam,

and the condensate from this effect is normally returned to the boiler feed water stream, because it is essentially steam condensate and would normally have no contamination.

Micro irrigation system

T. Lokeshwaran, 4th Year, Agri, NEC

Micro irrigation is a modern method of irrigation; by this method water is irrigated through drippers, sprinklers, foggers and by other emitters on surface or subsurface of the land. Major components of a micro irrigation system is as follows.Water source, pumping devices (motor and pump), ball valves, fertigation equipments, filters, control valves, PVC joining accessories (Main and sub main) and emitters.In this system water is applied drop by drop nearer the root zone area of the crop.The drippers are fixed based on the spacing of crop. Many different types of emitters are available in the market. They are classified as Inline drippers, on line drippers, Micro tubes, Pressed compensated drippers.

Drip irrigation is most suitable for wider spacing crops. Micro sprinkler irrigation system is mostly followed in sandy or loamy soils. This system is most suitable to horticultural crops and small grasses. In this method water is sprinkled in a lower height at various directions.Portable micro sprinklers are also available. They distribute slightly more water than drippers and micro sprinklers. They spray water in not more than one meter. It is used for preparing nursery and lawns in soils with low water holding capacity.

Croppingsystem

K. Ruban, *4th Year, Agri, NEC*

Demonstrations of zero till drill sown wheat in farmers' fields were undertaken in several NICRAvillages. The zero till drill not only saves tillage costs and energy but also eliminates the need for seedbed preparation. Zero till drilled wheat yields were on par with conventionally sown wheat. The machine operated with a 35 hp tractor can cover sowing of wheat in 4-5 ha/day. Zero till sowing of wheat could save 68% in time and 85% on the cost of operation compared to the conventional practice. Zero till drill was more efficient as the crop could be sown in large areas within a limited time of moisture availability. The cost of zero till drill is Rs.45,000 to 60,000. The main advantages include: Saves irrigation water up to 10-15% during first irrigation. Two days early and uniform germination and better plant stand

than traditional. No crust formation after rains, hence no effect of rains on germination. Improvement in crop yield. Improvement in soil structure and fertility. No lodging of crops at the time of maturity in case of heavy rains. Now the farmers are convinced about the performance and benefits of zero till drill in NICRA villages. Demonstrations covered 851 ha and 1227 farmers using the zero till drill from the custom hiring centers established under NICRA. On an average yield advantage was in the range of 16 to 64% and benefit cost ratio was in the range of 2 to 3.2. 66.Technology Description: There is a need for in-situ soil and water conservation and proper drainage technology in deep black soils. Broad bed and furrow (BBF) system involves preparation of a broad bed of 90 cm, furrow of 45 cm and sowing of crop at a row spacing of 30 cm. The cost of BBF implement is Rs. 45,000. The BBF technology has many advantages including in-situ conservation of rainwater in furrows, better drainage of excess water and proper aeration in the seedbed and root zone. More than 200 farmers in Sanora and Barodi village adopted the technology. Similarly, furrow irrigated raised bed (FIRB) planting was promoted for cultivation of different crops in Uttar Pradesh, West Bengal, Punjab, Maharashtra, Karnataka, Rajasthan and Tamil Nadu. Ridge and furrow method of vegetable cultivation was promoted in Gunia village of Gumla district and in cotton at Amravati and Aurangabad, Maharashtra. Advantage of BBF planting method: Increase in water use efficiency,Increase in crop productivity (5-10%) Less moisture stress during non-rainy days, Time saving (25-30%) in irrigation, Requires 20-25% lower seed rate, Water saving up to 25-30%, Better weed management, Reduces crop lodging.

Biodynamic agriculture

S. Srithar,2nd Year, Agri, NEC

Biodynamic agriculture is a form of alternative agriculture based on pseudo-scientific and esoteric concepts initially developed in 1924 by Rudolf Steiner (1861–1925).It was the first of the organic farming movements.It treats soil fertility, plant growth, and livestock care as ecologically interrelated tasks,emphasizing spiritual and mystical perspectives.Biodynamics has much in common with other organic approaches – it emphasizes the use of manures and composts and excludes the use of synthetic (artificial) fertilizers, pesticides and herbicides on soil and plants. Methods unique to the biodynamic approach include its treatment of animals, crops, and soil as a single system, an emphasis from its beginnings on local production and distribution systems, its use of traditional and

development of new local breeds and varieties. Some methods use an astrological sowing and planting calendar.Biodynamic agriculture uses various herbal and mineral additives for compost additives and field sprays; these are prepared using methods that are more akin to sympathetic magic than agronomy, such as burying ground quartz stuffed into the horn of a cow, which are said to harvest "cosmic forces in the soil".

No difference in beneficial outcomes has been scientifically established between certified biodynamic agricultural techniques and similar organic and integrated farming practices. Biodynamic agriculture is a pseudoscience as it lacks scientific evidence for its efficacy because of its reliance upon esoteric knowledge and mystical beliefs.As of 2020, biodynamic techniques were used on 251,842 hectares in 55 countries, led by Germany, Australia and France.Germany accounts for 41.8% of the global total;the remainder average 1,750 ha per country. Biodynamic methods of cultivating grapevines have been taken up by several notable vineyards.There are certification agencies for biodynamic products, most of which are members of the international biodynamics standards group Demeter International.

Fermentation in agriculture

Ms. K. K. Sri Mohana Priya, Assistant professor, Agri, NEC

Fermentation is a manufacturing process that uses microorganisms to produce countless products that support our lives ranging from food to pharmaceuticals to energy. The growth of microorganisms requires nutrients and carbon sources. These are provided by agriculture where specific crops are grown and processed to provide food for the microorganisms. For example, yogurt is made from milk by the bacteria Lactobacillus bulgaricus and Streptococcus thermophilus. Wine and beer are made from grapes and barley, respectively, by the yeast Saccharomyces cerevisiae. This yeast is also used to manufacture ethanol using substrates like sugar (from sugar cane or sugar beet) and starches (from corn, wheat or potatoes). Cellulosic alcohol production uses agricultural residues like switchgrass or other plant material. The pharmaceutical industry uses many microorganisms (bacteria E. coli and, again, the yeast Saccharomyces cerevisiae as well as Pichia pastoris) and even mammalian cells (like Chinese hamster ovary cells) to produce vaccines, antibodies, hormones, drug compounds, and other therapeutics. The manufacturing of these products would not be possible without the agriculture that sustains life.

Insecticide management

Dr. M. Dhananivetha, Professor, Agri, NEC

Insecticide management involves strategies to control and manage insect populations to minimize their impact on crops, public health, and the environment. This can include integrated pest management (IPM) approaches, which combine various techniques like biological controls, cultural practices, and judicious use of insecticides to reduce reliance on chemical solutions. Proper selection, application, and timing of insecticides are crucial to ensure effective pest control while minimizing negative effects on non-target organisms and the ecosystem.

Fertigation in agriculture

B. Arthi,3rdYear, Agri, NEC

Fertigationis the technique of supplying dissolved fertiliser to crops through an irrigation system.When combined with an efficient irrigation system both nutrients and water can be manipulated and managed to obtain the maximum possible yield of marketable production from a given quantity of these inputs. Often, solid fertiliser side-dressings are timed to suit management constraints rather than the horticultural requirements of the crop. Most growers will have experienced the dilemma of spreading fertiliser the day before heavy rain and then wondering how much of the fertiliser is either washed from the crop in run-off or leached below the root zone.Continuous small applications of soluble nutrients overcome these problems, save labour, reduce compaction in the field, result in the fertiliser being placed around the plant roots uniformly and allow for rapid uptake of nutrients by the plant.To capitalise on these benefits, particular care should be taken in selecting fertilisers and injection equipment as well as in the management and maintenance of the system.

Cleaning process: seed

Mr. K. Pradeep Kumar, Assistant professor, Agri, NEC

Some seeds require only minimal cleaning while others need more attention.If you are collecting seeds from non-fruiting plants, gather the seeds on a dry day. Spread the seeds on newspapers, in a cardboard box, or in an old telephone directory, and allow them to dry between one and three weeks.Often seeds need to be separated from the chaff (the seed casings and debris). You can do this with a pair of tweezers; not all of the chaff needs to be

removed, but just cleaned off a bit.A simple way to separate chaff from seeds is to make a deep crease down the center of a piece of paper. Place the unclean seeds in the center, tilt the paper at a slight angle and slowly tap the contents out of the folded paper (very similar to what you do when sowing seeds). The contents will separate, with the heavier items moving down the crease faster than the lighter items. If the seeds are heavier they will slide out first, and if they are lighter the chaff will fall out first.An old-fashioned way of cleaning when the chaff is lighter than the seed (which is common), is to winnow your seeds. Place the seeds in a basket and toss the contents into the air in front of a fan. The chaff will blow away and the seeds will be left to fall back in the basket. If the chaff and the seeds are close in weight the best thing to do is to find a screen that allows the seeds to fall through but traps larger pieces of debris—an old tea strainer or colander works well.

Seedpods are traditionally placed in an old pillowcase and stepped on, releasing the seeds, which are then separated from the chaff. If you are of the culinary bent, place the pods in a bag and crush the pods with a rolling pin. To clean seeds from fleshy fruits, scoop out the contents and soak them in water. Once cleaned, remove the seeds from the water and dry them on a paper towel. Many people who are serious about collecting tomato seeds ferment the seeds to clean off the fleshy coating (I'll discuss this process in a future blog entry).Before storing your seeds make sure they are dry, otherwise they will rot. But don't desiccate the seed (it is alive)you merely want to get rid of excess moisture and hold it in a dormant state until you are ready to grow it.

Seeds need moisture, warmth, and light to germinate, so give them the exact oppositea dry, cool, dark environmentwhen storing them. Place your seeds in an envelope or paper bag and seal them in plastic containers or glass jars. If you are not convinced that your seeds are dry, eliminate the airtight container step. Remember to keep the labels with the seeds.Store the seed in a cool, dry place such as a corner shelf in the garage, basement, closet, or in the back of a refrigerator. The ideal temperature for storing seeds is between 32°F and 50°F.The rule of thumb for storing seeds is that the temperature and the humidity levels should add up to less than 100%. This means that if the temperature is 50°F, the humidity has to be less than 50%. Both high humidity and high temperatures are catalysts for germination and will trigger the seeds' metabolism.

Duration of crops

S. Kavya, 2nd Year, Agri, NEC

The man-made temp control greenhouses do most of the job for us like providing adequate artificial light, provide nutrients in the form of chemical fertilizers, and timely watering of our crops so we don't have to invest our time and energy into any physical labour.But, of course, we all know how valuable, fresh and organic home-grown produce can be. It not only serves as a farm-to-table way of consuming healthy, chemical-free food but is also good for the environment because the fertilizers and the compost that we use at home are made from natural ingredients and does not release any harmful chemicals into the environment. Isn't that an amazing way to give back to nature that provides the basic fuel for our survival.

So, to make things easier for you, we've curated a vegetable seeds calendar that can help you plan growing your own winter vegetables and summer vegetables at home. We belong to such a diverse country that is home to almost every kind of topographical feature possible. From plains to mountains, mother nature resides in the most beautiful way in every corner of our country. It was definitely a challenge to give you this handy calendar but we have tried to provide you with a general sowing season with respect to North India and South India.

Dairy farming

T. Sowmiya, 4th Year, Agri, NEC

Dairy farming is a class of agriculture for long-term production of milk, which is processed (either on the farm or at a dairy plant, either of which may be called a dairy) for eventual sale of a dairy product. Dairy farming has a history that goes back to the early Neolithic era, around the seventh millennium BC, in many regions of Europe and Africa. Before the 20th century, milking was done by hand on small farms. Beginning in the early 20th century, milking was done in large scale dairy farms with innovations including rotary parlors, the milking pipeline, and automatic milking systems that were commercially developed in the early 1990s.

Milk preservation methods have improved starting with the arrival of refrigeration technology in the late 19th century, which included direct expansion refrigeration and the plate heat exchanger. These cooling methods allowed dairy farms to preserve milk by reducing spoiling due to bacterial growth and humidity.Worldwide, leading dairy industries in

many countries including India, the United States, China, and New Zealand serve as important producers, exporters, and importers of milk. Since the late 20th century, there has generally been an increase in total milk production worldwide, with around 827,884,000 tonnes of milk being produced in 2017 according to the FAO.

There has been substantial concern over the amount of waste output created by dairy industries, seen through manure disposal and air pollution caused by methane gas. The industry's role in agricultural greenhouse gas emissions has also been noted to implicate environmental consequences. Various measures have been put in place in order to control the amount of phosphorus excreted by dairy livestock. The usage of rBST has also been controversial. Dairy farming in general has been criticized by animal welfare activists due to the health issues imposed upon dairy cows through intensive animal farming.

Soil nutrient testing

T. Nishanthi, 4th Year, Agri, NEC

Valuable information on nutrients content allows accurate fertilization to support plant needs within precision agriculture implementations. This is why the chemical test for soil nutrients is the most common.Primarily, soil tests report on the content of nitrogen (N), phosphorus (P), and potassium (K), which are the most important nutrients for crops. Secondary nutrients to examine are calcium (Ca), sulfur (S), and magnesium (Mg). An extended test also includes minor elements like iron (Fe), manganese (Mg), boron (B), molybdenum (Mo), and others.To test soil nutrient content, a sample is added to an extractant solution and mixed (typically by shaking). Then, the liquid content is filtered and analyzed for chemical elements' presence and concentrations (converted to dry matter).

Food processing in pulses

P. Naveena, 2nd Year, Agri, NEC

Pulses are defined as dried edible seeds of cultivated legumes. Pulses occupy important place in human diet. They serve as major sources of dietary protein and energy. The production of pulses in India was 13.19 million tons in 2001-02, which was 27% of the World's production. Bengal gram/Chick pea (chana), pigeon pea (tur/arhar), cow pea (lobia), black gram (urad), green gram (moong), lentils (masur), peas (matar) are some of the major pulses grown in India.

Pulses are consumed in its dehusked and split form which is termed as dal. Pulse milling (dal milling) is accomplished in three major steps namely: loosening of husk, dehusking and splitting of pulses. Pulses are generally consumed in the form of Dal. Traditional methods for processing of pulses were labour intensive, time consuming and incurred losses. Modern technologies for processing of pulses have replaced old age methods and thus avoid losses and saves time. Processing of pulses involves two basic steps (i) seed coat/husk loosening and its removal and (ii) conversion of seed grain into splits and grinding into flour depending upon its end-use. Various methods are employed for pulse/dal milling. Pulses undergo some basic unit operations during pulse milling such as cleaning and grading, drying, loosening of husk, dehusking, splitting and polishing.

Mechanization of Indian agriculture

P. Naveenkumar, 4th Year, Agri, NEC

The adoption of mechanization by the farmers depends on various factors such as socioeconomic conditions, geographical conditions, crops grown, irrigation facilities etc. The farm mechanization levels assessed by Indian Council of Agricultural Research (ICAR) for major cereals, pulses, oil-seeds, millets and cash crops indicates that the seedbed preparation operation is highly mechanized (more than 70%) for major crops whereas harvesting and threshing operation is the least mechanized (lower than 32%) for major crops except for rice and wheat crops. In seedbed preparation, mechanization level is higher in rice and wheat crops as compared to other crops. However, mechanization level for sowing operation is the highest for wheat crop (65%). The mechanization levels in planting/transplanting operation for sugarcane and rice crops are 20% and 30%, respectively. In case of harvesting and threshing, the mechanization levels in rice and wheat crops are more than 60% and very less in cotton crop.

இயற்கையின் அழகு

இயல்பான இவ்வுலகத்தில் –
இறைவன் ஈன்ற வரமே...!
மாசற்ற அன்பால் மனிதனை தாங்கிடும்
அன்னை மடி கொண்டவளே..!
எங்கும் பசுமையானவளே – நான்
கண்ட புதுமையானவளே..!
மனிதனின் வாழ்வில் உயிராய் உறவாய் வந்து –
கலந்தாடிய காற்றோவியமானவளே நீ...!
பேரழகானவளே – பெருங்குணம் படைத்தவளே !
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இயல்பான அழகால் – எங்களை இழுத்தவளே-
இயற்கையானவளே...
உன்னை நோகடிக்கும் மனிதனை
பாரமாக காணாமல் – பாலகனாக கண்டவளே –
பாசமானவளே..

வழுவாமல் , விலகாமல் – மனிதனின் வாழ்வில்

நிழலாய் நிற்கும் – நிலையானவளே...

நான் கண்ட கனவின் கதாநாயகியே –

கலையுள்ளவளே..!

என் விழித்தேடும் இயற்கையின் மடியே நீ...!

மா.சீத்தாலெட்சுமி

TO MAKE AGRICULTURE SUSTAINABLE, THE GROWER HAS GOT TO BE ABLE TO MAKE A PROFIT.

- Sam Farr

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