CCI paper 2023

1-NCOF Headquarter- Ghaziabad

2- IIPR Center- Kanpur

3- IISugarcane research- Lucknow

PAGE 14: ACE AGRICULTURE (GENERAL AGRICULTURE)

IIPR	Indian Institute of Pulse Research, Kanpur (UP)	1983
IISS	Indian Institute of Soil Science, Bhopal (MP)	1988
IISR	Indian Institute of Sugarcane Research, Lucknow (UP)	1912
ILRI	Indian Lac Research Institute, Ranchi, Jharkhand	1924
IIVR	Indian Institute of Vegetable Research, Varanasi (UP)	1999
NIRJAFT	National Institute of Research on Jute and Allied Fibre Technology, Calcutta (WB)	1938
SBI	Sugarcane Breeding Institute, Coimbatore (TN)	1932
VPKAS	Vivekananda Parvatiya Krishi AnusandhanSansthan, Almora (UP)	1974
CARI	Central Avian Research Institute, Izatnagar (UP)	1979
CIFRI	Central Inland Fisheries Research Institute, Barrackpore (WB)	1947
CIFT	Central Institute of Fisheries Technology, Cochin (Kerala)	1957
CIRG	Central Institute of Research on Goats, Mathura (UP)	1979
CSWRI	Central Sheep and Wool Research Institute, Avikanagar (Raj)	1962
NIANP	National Institute of Animal Nutrition and Physiology, Bangalore (Karnataka)	1995
NFDB	National Fisheries Development Board, Hyderabad (AP)	2006
National Bureaus		
Name		**Year of establishment**
NBPGR	National Bureau of Plant Genetic Resource, New Delhi	1976
NBSSLUP	National Bureau of Soil Survey and Land Use Planning, Nagpur (MH)	1956
NBAGR	National Bureau of Animal Genetics Resources, Karnal, Haryana	1984
NBFGR	National Bureau of Fish Genetic Resources, Lucknow (UP)	1983
NBAIM	National Bureau of Agriculturally Important Microorganisms, Mau (UP)	2001
NBAIR	National Bureau of Agricultural Insects Resources, Bangalore (Formerly known as, Project Directorate of Biological Control)	1957
International institutes		
Name		**Year of establishment**

4-Agmark Headquarter- Faridabad

5- National Institute of Agri Marketing - Jair

6- Depth of Medium tillage according to CRIDA-01

7- Worker bee - Sterile Female

PAGE 111: ACE AGRICULTURE (ENTOMOLOGY)

C. The Worker

- The workers are the smallest inhabitants of the beehive.
- They form the bulk of the population.
- The number of workers in a colony varies from 1,500 to 50,000.
- They are imperfect females incapable of laying eggs.
- On certain occasions when the colony is in need of a queen, some of the workers start laying eggs from which only drones are produced. These workers, called *laying workers*, are killed as soon as a new queen is introduced or produced in the colony.
- Their range of flight varies from 1,000 to 1,500 m. The division of work within a colony among the worker bees is based on the age of the individual and on the needs of the colony.
- Normally, the young bees, immediately after their emergence, do the work of cleaning cells and feeding older larvae.
- When they are grown and their hypopharyngeal glands have developed, they secrete the royal jelly with which they feed the younger larvae. These bees are called *nurse bees*.
- For the first 2 to 18 days of their life, the bees perform indoor duty inside the hive, including comb construction when some young bees start secreting wax.
- Later on, they become foragers, collect water, pollen, nectar and propolis (bee-blue).
- Pollen is a nitrogenous food and is essential for brood - rearing and young bees.
- Bees wax, of which the comb is made, is a secretion of the wax glands located in the abdomen of the worker bees.

PESTS AND DISEASES OF HONEYBEE

A. PESTS OF HONEY BEES

1. Wax moths
The greater wax moth; *Galleria mellonella L.* (Gallerilidae)

8- Anar Butterfly Sc name- Virachola isocrate.

PAGE 18: ACE AGRICULTURE (ENTOMOLOGY)

	b. Gelechiidae	▪ Pink boll worm (*Pectinophora gossypiella*) ▪ Potato tuber moth (*Phthorimaea operculella*) ▪ Angoumois grain moth (*Sitotroga cerealella*)
	c. Plutellidae	▪ Diamond back moth (*Plutella xylostella*)
	d. Bombycidae	▪ Silk worm (*Bombyx mori*)
	e. Papilionidae *(butterflies)*	▪ Lemon butterfly (*Papilio demoleus*)
	f. Lycaenidae	▪ Anar butterfly (*Virachola isocrates*)
	g. Arctiidae (tiger moth)	▪ Red hairy caterpillar (*Amsacta moorie*)

9. White Grub Sc Name

PAGE 19: ACE AGRICULTURE (ENTOMOLOGY)

Coleoptera *(Cole=sheath; ptera=wings)*	*a. Coccinellidae* *Most members of this family are predators on soft bodies insects except Hadda beetle*	▪ Hadda beetle (*Henosepilachna vingtioctopunctata)* ▪ Lady bird beetle (*Coccinella septempunctata/Menochilus sexmaculatus).* It is a predator of aphids, jassids, mealy bugs, etc.
	b. Scarabaediae (sub family: Melalonthiniae)	▪ White grub (*Holotrichia consanguinea*)

Pullup for p

10- Key Pest - Cotton bollwarm, stem borer

CROP PEST & THEIR MANAGEMENT

PAGE: 189

a. **Spotted bollworms:** *Earias vittella & E. insulana*
Noctuidae:Lepidoptera
Nature of Damage & Symptom
- In the beginning of the season, when the crop is a few weeks old, the small caterpillar on hatching out from the egg leads a free life for a few hours.
- Then it bores into top tender shoot, the portion of the shoot above the damage withers, droops and dries up, depending upon the locality up to 50 per cent of the crop may be damaged in this manner.
- When the squares and bolls begin to develop, these caterpillars move from the shoots and start damaging bolls by making conspicuous holes into them. The squares and small bolls injured by the larvae drop away from the plants.
- The developing bolls are also damaged and some of the damaged bolls fall to the ground. The infested bolls, which are not shed, are destroyed by the larvae eating the seeds and filling them with excrement. Such affected bolls may open prematurely and badly.

b. **American bollworm:** Helicoverpa armigera
Noctuidae: Lepidoptera
Nature of Damage & Symptom
- The caterpillars feed on leaves, squares, flowers and small bolls.
- When the squares, flowers and bolls are attacked, they feed the internal content completely by thrusting their head inside leaving the rest of the body outside.
- The damaged squares and young bolls drop away from the plants. The developed bolls and open bolls are not attacked.

c. **Cotton pink bollworm:** *Pectinophora gossypiella*

11 - Storage Pest - Rhizopartha, Sitophyllus oryzae

PAGE 213,

3.7 PESTS OF STORED GRAINS

1. PRIMARY STORAGE PESTS:

Insects that damages sound grains are primary storage pests.

A. INTERNAL FEEDERS

1. Rice weevil: *Sitophilus oryzae*
Host: Serious pests of wheat, rice and barley
Mark of identification:
- First reported in rice so named rice weevil
- It prefers humid climate
- Head is protruded into snout (rostrum) is the most recognizable structure for identification
- Grub (Larva) is most injurious stage of damage
- Very difficult for this weevil to survive at low moisture
- Crawling caterpillars completely web over the surface of a heap of grains with silken threads.

2. Lesser grain borer: *Rhizopertha dominica*
Host: Wheat, rye, jowar
Mark of identification:
- Beetle is more harmful than grubs
- Pronotum is rounded at the front whereas the transfer row of teeth centrally and posterior flattened
- Lay eggs pear shaped and white later change into pinkish color
- Pupation takes place inside the grains
- Profuse powdery substances are characteristic feature of its damage

3. Pulse beetle: *Callosobruchus chinensis*
Host range : Gram, mung (Phaseolus aureus), moth (Phaseolus aconitifolius), peas, cow peas, lentil and arhar (Cajanus cajan), cotton seed, sorghum and maize.
- First discovered in China so named chinensis
- Mostly damage the pulses in storage but is also pest of pulse field

Mark of identification:
- Only eggs and adult are visible
- Antennae are serrate in female but pectinate in male
- Adults are small chocolate dark brown colored

12- One buyer market- Monopsony

13-Speculation Market

14- Hedging - Market prediction

15- Angular Arm disease- Bacterial

PAGE 38: ACE AGRICULTURE (PLANT PATHOLOGY)

Grow the resistant varieties like Sujatha and Varalakshmi

7. Angular leaf spot / Black arm

Causal organism: *Xanthomonas axonopodis pv. malvacearum*

Symptoms:

Angular leaf spot

16- Antibiotic originated from- Fungi

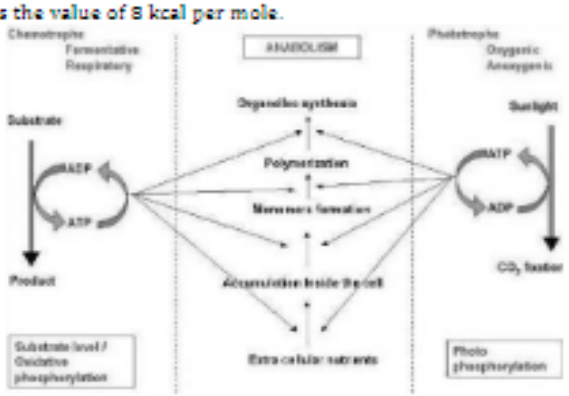
PAGE 17: AGRICULTURAL MICROBIOLOGY

			legionella, mycoplasma	
Polypeptides	Polymyxin	Bacillus polymyxa	Gram negative Bacteria	Damages cytoplasmic membranes.
Polyenes	amphotericin	Streptomyces Nodous.	Fungi	Inactivate membranes containing sterols
Tetracyclines	Tetracycline	Streptomyces sp	Gram positive and gram negative bacteria, rickettsia's	Inhibit translation (Protein synthesis)
Chloramphenicol	Chloramphenicol	Streptomyces Venezuela	Gram positive and gram negative bacteria	Inhibit translation (Protein synthesis)

4.4 MICROBIAL METABOLISM (METABOLISM IN BACTERIA)

❖ **Microbial Metabolism**

- Metabolism refers the sum of biochemical reactions required for energy generation and the use of energy to synthesize cellular materials.
- The energy generation component is referred as catabolism and the buildup of macromolecules and cell organelles are referred as anabolism.
- During catabolism, the energy is changed from one compound to another and finally conserved as high energy bonds of ATP.
- ATP is the universal currency for energy. When energy is required for anabolism, it may be sent as high energy bonds of ATP which has the value of 8 kcal per mole.



17- father of organic farming- Albert howard

18- Market word- Latin word (LM).

19- marketing mix - Product, place, promotion & Price

20- Nitrite- nitrate- Nitrobactor

PAGE 15: SOIL MICROBIOLOGY

NITROGEN CYCLE

A	Ammonium	E	Immobilization
B	Mineralization	F	Denitrification
C	Nitrification	G	N2 Fixation (Non-symbiotic)
D	Nitrate Reduction	H	N2 fixation (Symbiotic)

- Proteins and waste products Microbial decomposition > Amino acids.
- Amino acids (.NH_2) Microbial ammonification > Ammonia (NH_3).
- Ammonium ion (NH_4^+) Nitrosomonas > Nitrite ion (NO_2).
- Nitrite ion (NO_2^-) Nitrobacter > Nitrate ion (NO_3^-).
- Nitrate ion (NO_3) Pseudomonas > N_2.
- N_2 Nitrogen fixation > Ammonia (NH_3).

I. Nitrogen mineralization – The conversion of organic N to the more mobile, inorganic state is known as nitrogen mineralization. As a consequence of mineralization, ammonium and nitrate are generated and organic N disappears. This takes place in two distinct microbiological steps.

1. Ammonification

→ It is the process of mineralization in which proteins, nucleic acids and other organic components are degraded by micro-organism with the eventual liberation of ammonia.

→ This is called ammonification. A part of the liberated ammonia is assimilated by the micro-organism themselves.

→ The first step in ammonification process is the hydrolysis of proteins, nucleic acids and other organic nitrogenous compounds into amino acids (proteolysis).

→ The amino compounds are then deaminated to yield ammonia.

21- Free living nitrogen fixing bac- Azatobacter

PAGE 22: SOIL MICROBIOLOGY

I. Biological nitrogen fixation

➢ **Free living nitrogen fixers**
- → Azotobacter – Aerobic
- → Beijerinckia
- → Clostridium – Anaerobic
- → Cyanobacteria (Blue green algae) etc.,

II. Associative symbiotic nitrogen fixer
- → Azospirillum
- → Herbaspirillum

III. Endophytic nitrogen fixer
- → Gluconacetobacter diazotrophicus

IV. Symbiotic nitrogen fixers
- → Rhizobium (Rhizobium - legume association).
- → Bradyrhizobium (Bradyrhizobium - soybean association).
- → Azorhizobium (Azorhizobium- Sesbania rostrata association).
- → Anabaena azollae (Azolla - Anabaena association).
- → Frankia (Frankia - Casuarina association).

❖ **Species of *Azospirillum***
- → *lipoferum*
- → *brasilense*
- → *amazonense*
- → *halopraeferans*
- → *irkense*
- → *A.largomobilis*

❖ **Species of Azotobacter**
- → *chroococcum*
- → *vinelandii*
- → *beijerinkii*
- → *paspali*
- → *agilis*
- → *insignis*
- → *macrocytogens*

22- P & S- Microorganism involved - VAM & Thiobacillus

PAGE 17: SOIL MICROBIOLOGY

❖ **MICROBIAL TRANSFORMATION OF PHOSPHORUS AND SULPHUR**

I. Phosphorus Cycle

→ Phosphorus is only second to N2 as an inorganic nutrient required by both plants and microorganisms.
→ Phosphate constitutes nearly 0.1% of the earth's crust.
→ They occur in soil in inorganic and organic forms.
→ The inorganic forms are derived from parent rocks or through fertilizers application and manuring with bone meal.
→ They are soluble in water when present as phosphates of Na, K, Ca, Mg etc.

23- Soil Flora- Earthworm, nematoda, actinomycetes, protozoa

PAGE 2, 5: SOIL MICROBIOLOGY

ROD SHAPED BACTERIA

SPHERICAL BACTERIA

→ **Actinomycetes** - Intermediate group between bacteria and fungi. Numerous and widely distributed in soil.

→ Abundance is next to bacteria. 104-108/g soil. 70% of soil actinomycetes are Streptomyces.
→ Many of them are known to produce antibiotics.
→ Population increases with depth of soil.

❖ **Intermediary between bacteria and fungi - have some characteristics similar to bacteria; others similar to fungi.**
→ Are filamentous, but mycelial threads are much smaller than those of fungi (rarely >1μ).
→ Are unicellular like bacteria & similar in size; are prokaryotic; often break up into spores – segmentation.
→ Cell wall composition - no chitin or cellulose.

❖ **Occurrence**
→ 2nd to bacteria - 104 to 10 per gram of soil

❖ **Requirements**
→ pH-intolerant to acidity (pH: 6.5 to 8.0)

❖ **Protozoa**

→ Unicellular - population ranges from 10,000 to 100,000 per g of soil.
→ Most of the soil forms are flagellates, amoebae or ciliates.
→ Derive their nutrition by devouring soil bacteria.
→ Abundant in upper larger of the soil. They are regulating the biological equilibrium in soil.

❖ **Importance**

→ Involved in nutrient transformation process
→ Decomposition of resistant components of plant and animal tissue
→ Role in microbial antagonism
→ Participate in humus formation
→ Predator of nematodes
→ Surface blooming reduces erosion losses
→ Improve soil structure
→ Involved soil structure
→ Maintenance of biological equilibrium

❖ **Factors influencing activities of soil microorganisms:** Soil microorganisms are influenced by various factors. Chief factors are fertility level Soil moisture Soil air soil temperature Organic matter H ion concentration Cultural factors.

24- Integrated farming involved- Shifting, Organic, extensive, all

DIMENSIONS OF AGRICULTURAL FARMING

PAGE: 4, 7

SUBSISTENCE FARMING

I. Practised to meet the needs of the farmer's family. Nothing is left for sale.
II. Traditionally, low levels of technology and household labour are used.
III. Very small output.

→ It can be further classified into:

I. INTENSIVE SUBSISTENCE FARMING
II. PRIMITIVE SUBSISTENCE FARMING
(a) Shifting Cultivation
(b) Nomadic Herding

INTENSIVE SUBSISTENCE FARMING

→ Small plot of land, simple tools and more labour.
→ Practise intensive methods of cultivation, like using manure and artificial irrigation and better-quality seeds to get maximum yield from the land.
→ Longer days of sunshine and fertile soils - more than one crop annually on the same plot
→ Crops- Rice, wheat, maize, pulses and Oilseeds.
→ Prevalent in thickly populated areas of the monsoon regions of south, southeast and east Asia.
→ Absence of alternate source of livelihood.
→ Huge pressure on agricultural land.

COMMERCIAL GRAIN FARMING / EXTENSIVE FARMING

→ Crops are grown for commercial purpose.
→ Mainly grown in temperate grasslands of N. America, Europe and Asia, Australia and S. America.
→ These are sparsely populated areas with large farms spreading over hundreds of hectares
→ Severe winters restrict the growing season and only single crop can be grown.

25-LEISA: Less External input sustainable agriculture

26- Wheat Production- 112 Mt

PAGE 19: FIELD CROPS

commercially cultivation in India(1965) and these varieties were responsible for green revolution in India.

Area & Production (India): -

- ✓ Area:Up>MP> Punjab
- ✓ Production:UP> Punjab > Haryana
- ✓ Productivity:Punjab (45q. /ha) > Haryana
- ✓ The highest productivity of wheat in Punjab due to nearly 100%area of wheat is under irrigated conditions and higher doses of fertilizer consumption.

Classification of Indian Wheats:

1. Emmer Wheat (Triticum dicoccum schub L.): -

- This type was reported to be grown in south i.e. Maharashtra, Tamil Nadu and Karnataka. This type is believed to be developed from T. diccoides koru., a wild form. It is also grown in Spain, Italy, Germany and Russia.

2. Macroni Wheat (T.durum Desf.): -

27- World Cotton Production areawise India

28- Leading state - Guj

29- Cotton Industry- GA], Bengal

30- four stroke engine

CHAPTER 1: FARM POWER & MACHINERY (CCI Junior Commercial executive 2023 A complete eBook of Subject Knowledge | English Medium by Adda247 (ebooks)

1.1 FARM MACHINERY AND ENERGY IN AGRICULTURE (FARM POWER AND EQUIPMENT ENGINEERING)

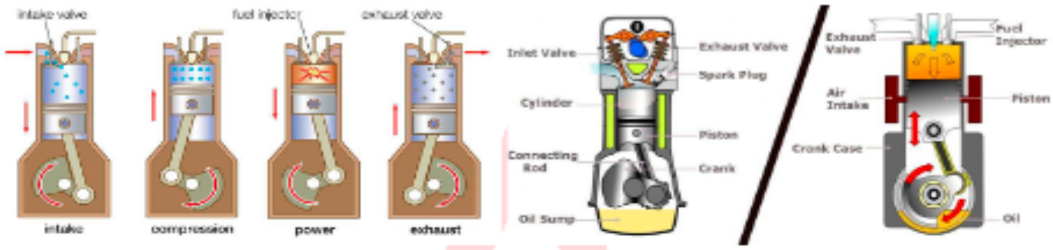
1. First time TRACTOR (1960-61) manufacturing started in India by M/s Eicher Good Earth.
2. Average man power for doing farm work -0.1 hp (74.6 watts). Average pair of bullock power for usual farm work - 1 hp (746 watts)
3. Thermal efficiency for diesel engine - 32 to 38%.
   Thermal efficiency for petrol engine - 25 to 32%
4. Out of the total energy produce in India, the percentage share of thermal power (56%), hydro electrical power (36%), nuclear power (16%) and rest comes from diesel and gas based power.
5. The farm holding in India are classified as (a) marginal <1ha, (b) small 1-2 ha, (c) semi-medium 2-4ha, (d) medium 4-10 ha and (e) large >10 ha.
6. The most popular tractor is found in 30-39 hp segments.
7. 1 H.P. =75 kg-m/sec or 4500 kg-m/minute
8. **1 H.P.= (PLAN × n) / 4500 ×2 (for 4 stroke engine)**
   = (PLAN × n) / 4500 (for 2 stroke engine)
   Where, P = Mean effective pressure (kg/cm²), L= Length of stock (meter), A = Area of cylinder (cm²), N = No. of revolution, n = no. of cylinders
9. Indicated Horse Power (IHP) = Break Horse Pover + Friction Horse Power (FHP)
10. DBHP= {Pull (kg) x Speed (m/ minute)} / 4500

Four-stroke engines are fuel-efficient and environmentally-friendly. They operate in four steps:
Intake: The intake valve is open, and fuel is drawn in with a downward stroke.
Compression: As the piston moves upward, the fuel is compressed.
Power: After the fuel is compressed, it is ignited to produce the engine's power.
Exhaust: The exhaust valve opens, and the exhaust gases exit the cylinder.
2 Stroke Engine

31- IC engine related

2. Internal combustion (I.C.) engine: heat is generated inside the cylinder by burning of fuel within cylinder.

- Two types of I. C engine (petrol engine and diesel engine)-



- Petrol engine (Otto engine, spark ignition engine): rapid explosion od air-fuel mixture within the cylinder, when it is ignited by spark is called **constant volume combustion.**
- Thermal efficiency of Petrol engine (n) is given by,

$n=1-(1/r)^{m-1}$

where, r= compression ratio = total cylinder volume/clearance volume =**v1/v2** m = air constant = **Cp/Cv** = 1.4, Cp = Sp. Heat at constant pressure. Cv = Sp. Heat at constant volume.

- **Diesel engine**: combustion take place by slow burning when the fuel is injected into highly compressed heated air contained in the cylinder. It is also called as constant pressure combustion.
- Thermal efficiency of diesel engine (n) is given by,

$n=1-(1/r)^{m-1}(\rho^m-1/m(\rho-1)$ Where ρ = cut off ratio

- When the cycle is completed in two revolutions of the crankshaft, it is called **four stroke cycle engine.**

Four stroke of the piston:
1. Suction stroke 2. Compression stroke 3. Power stroke 4. Exhaust stroke

- When the cycle is completed in one revolution of the crankshaft, it is called **two stroke cycle engine.**

SL no.	Diesel engine	Petrol Engine
1.	No carburetor, ignition coil and spark plug	Carburetor, ignition coil and spark plug are present
2.	Compression ratio ranges (14:1 to 22:1)	Compression ratio ranges (5:1 to 8:1)
3.	Only air is sucked in cylinder in suction stroke	Mixture of fuel & air is sucked in cylinder in suction stroke
4.	Engine weight per hp is high	Engine weight per hp is low
5.	Operating cost is low	Operating cost is high
6.	Compression pressure inside the cylinder varies from 35-40 kg/ cm? and temp 500°C	Compression pressure inside the cylinder varies from 10 kg/cm² and temp 260°C

32- Blast of Paddy- Fungi

PAGE 16
FIELD CROPS

Rice Blast (Magnaporthe grisea) (Pyricularia oryzae)

~ It is one of the most destructive diseases of rice.

Symptoms:

~ The fungus produces spots or lesions on leaves, nodes, and panicles and grains.
~ The spots are elongated and pointed at each end.

Damage of blast:

~ In severe infections, yields may be reduced by 50 %.
~ Upland rice is more severely damaged than lowland rice.

Control:

~ Planting resistant varieties is the most economical way of controlling this disease.
~ Avoid excess nitrogen fertilizer.
~ There are several fungicides that effectively control blast but for economic reason, these are not used in the tropics.

Leaf Blast

Neck Blast

Sheath Blight (Thanatephorus cucumeris)

~ Sheath blight causes spots on the leaf sheath. High temperature and humidity increase the severity.

Disease cycle:

~ Sclerotia develop on lesions and drop to the soil.
~ The fungus survives in sclerotia in the soil
~ The sclerotia float on the water surface during land preparation.
~ The sclerotia germinate and fungus penetrates the plant.
~ The fungus grows on the plant.

Damage of sheath blight:

~ Many of the leaves are killed during severe infections and yields may be reduced by 20-25 %.