



# Agriculture Engineering

- Agricultural engineering is the engineering of agricultural production and processing. Agricultural engineering combines the disciplines of mechanical, civil, electrical, Food science and chemical engineering principles with a knowledge of agricultural principles according to technological principles
- In vision 2020 of ICAR - India require total farm power 2Kw/ha and 2300 kg/ha grain production.
- In 2013-14 Farm power availability per ha was 1.84kw/ha. Which is to increase by 4.0 kw/ha by 2022

## Farm Power: Sources

### 1. Human Power:

- An average man can develop maximum power of about 0.1 hp for doing farm work
- A Strong man's power equal to 0.1 hp (75 watts).
- Average human power:
  - I. Male – 0.06Kw (60 watts)
  - II. Female – 0.048 kw (48 watts)
  - III. Children – 0.030kW (30 watts)

### 2. Animal Power:

- Average pair of bullocks = 1 hp.
- Animal power according to their body weight
  - A. Donkey – 32 % of body weight.
  - B. Camel - 18 % of body weight.
  - C. Buffaloes – 12 % of body weight.
  - D. Bullocks – 10 % of body weight.
- basis of body weight animal is classified as –
  - A. heavy - >500 kg
  - B. large – 400 – 500 kg
  - C. medium – 300 – 400 kg
  - D. small 200– 300 kg

Note – one pair of bullocks can command about 2 ha land.



### 3. Mechanical Power:

These engines are two types:

1. Spark ignition engines (Petrol or Kerosene engines)
2. Compression ignition engines (Diesel engines)
  - A power tiller (7.46kw) can command about 5 ha land.
  - A tractor (26.7kw) can command about 15 ha land.
  - The thermal efficiency of petrol engine: 25-32%.
  - The thermal efficiency of Diesel Engine: 32-38%.

### 4. Electrical power

### 5. Renewable energy

- Solar energy- Solar dryers, lantern, cooker, solar still etc
- Wind energy- Water pumping, electricity generation etc.
- Biomass energy- Gasifiers to produce producer gas, , Biogas etc.
- Tidal energy - electricity generation.
- Geothermal energy- Heat and electricity production

### Tractor

#### Tractor in World:

- 1890- The word tractor appeared first on record in a patent issued on a tractor or traction engine invented by George H. Harris of Chicago.
- 1906- Successful gasoline tractor was introduced.
- 1908- First Winnipeg tractor trails were held.
- 1911- First tractor demonstration was held at Omaha (Nebraska).
- 1915-1919- Power take off was introduced.
- 1920-1924 All-purpose was developed.
- 1936- 1937 – Diesel engine was used in tractor and pneumatic tires were introduced.
- 1950-1960- Manufacturing of diesel tractors.

#### Tractor in India:

- The first tractor to India was brought in 1914.
- Pump set were introduced in country in 1930.
- In the 1940's high horsepower crawler tractors were imported under the aegis of Central Tractor Organization (CTO) mainly for land development and to eradicate obnoxious weed kans grass.



- In 1942, the first degree programme in Agricultural Engineering was started at Allahabad Agriculture Institute.
- Tractor manufacturing started in India- First manufacturers M/S Eicher good earth-1960-61
- TAFE tractor manufacture started- 1961
- Gujarat tractor Ltd.: 1963
- Mahindra & Mahindra: 1965
- Ford tractor manufacture by escorts tractor Ltd.: 1971
- HMT tractor manufacture started: 1973
- Pitti and Kirlosker tractor manufacture started: 1974
- Harsha tractor established 1975
- Auto tractor was started: 1981
- Universal tractors were started: 1982
- GTCL tractors, M.M Tractors, Sonalika, VST, L&T, Bajaj Tractors were produced: 1983-2003
- Most popular tractor found in India 31-40 Hp. segment, which account near about 60% of total sales in our country.

#### Some Important Points:

- Pumping sets > Sprayers and dusters> Tractors> Power tillers > Combine harvester Inflation pressure of rear wheel of tractor - 0.8-1.5 kg/cm<sup>2</sup>
- Inflation pressure of front wheel of tractor - 1.5-2.5 kg/cm<sup>2</sup>
- A pneumatic tire's life - 6000 working hour for drawbar work
- Highest tractor production in India - Mahindra > TAFE> Escorts
- Mahindra and Mahindra are the largest manufacturer of tractors in the world in volume and Indian market leader in the tractor industry with share of 44% as on 1HFY18.

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