LECTURE -1
FARM POWER IN INDIA - HUMAN, ANIMAL, MECHANICAL AND ELECTRICAL ENERGY SOURCES AND THEIR USE IN AGRICULTURE

Farm Power is an essential input in agriculture for timely field operations for increasing production and productivity of land. Farm power is used for operating different types of machinery like tillage, planting, plant protection, harvesting and threshing machinery and other stationary jobs like operating irrigation equipment, threshers/ shellers/ cleaners/ graders, etc.

SOURCES OF FARM POWER

There are different sources of farm power available in India which are classified as

(i) Human power
(ii) Animal power
(iii) Mechanical power (Tractors + Power tillers + Oil engines)
(iv) Electrical power
(v) Renewable energy (Biogas + Solar energy + Wind energy)

HUMAN POWER

Human power is the main source for operating small implements and tools at the farm. Stationary work like chaff cutting, lifting, water, threshing, winnowing etc are also done by manual labour. An average man can develop maximum power of about 0.1 hp for doing farm work.
ANIMAL POWER

Power developed by an average pair of bullocks about 1 hp for usual farm work. Bullocks are employed for all types farm work in all seasons. Besides bullocks, other animals like camels, buffaloes, horses, donkeys, mules and elephants are also used at some places. The average force a draft animal can exert is nearly one-tenth of its body weight.
MECHANICAL POWER

Broadly speaking, mechanical power includes stationary oil engines, tractors, power tillers and self-propelled combines. Internal combustion engine is a good device for converting liquid fuel into useful work (mechanical work). These engines are two types:

1. Spark ignition engines (Petrol or Kerosene engine)
2. Compression ignition engines (Diesel engines)

The thermal efficiency of diesel engine varies from 32 to 38 per cent whereas that of petrol engine varies from 25 to 32 per cent.

In modern days, almost all the tractors and power tillers are operated by diesel engines. Diesel engines are used for operating irrigation pumps, flour mills, oil ghanis, cotton gins, chaff cutter, sugarcane crusher, threshers, winnowers etc.
Eighteen cylinder two stroke engine
Four stroke Engine + Pump
Thresher
Thresher
Different types of tractors
Different types of tractors

Tractor with dozer blade

Power tiller

Power tillers

ELECTRICAL POWER

Electrical power is used mostly in the form of electrical motors on the farms. Motor is a very useful machine for farmers. It is clean, quiet and smooth running. Its maintenance and operation needs less attention and care. The operating cost remains almost constant throughout
its life. Electrical power is used for water pumping, diary industry, cold storage, farm product processing, fruit industry and many similar things.
RENEWABLE ENERGY

It is the energy mainly obtained from renewable sources of energy like sun, wind, biomass etc. Biogas energy, wind energy and solar energy are used in agriculture and domestic purposes with suitable devices. Renewable energy can be used for lighting, cooking, water heating, space heating, water distillation, food processing, water pumping, and electric generation. This type of energy is inexhaustible in nature.

Different applications of solar energy
Solar electric panel

Solar electric panel

Grid connected solar energy

Wind Farms
Biogas plants

Usage of renewable energy sources

Solar energy- Solar dryers, lantern, cooker, solar still, solar refrigeration, solar lighting etc.

Wind energy- Water pumping, electricity generation etc.

Biomass energy- Gasifiers to produce producer gas, pyrolysis to produce liquid fuels, Biogas etc.

Tidal energy – electricity generation

Geothermal energy- Heat and electricity production

MERITS AND DEMERITS DIFFERENT FARM POWER SOURCES

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<tr>
<th>Merit</th>
<th>Demerit</th>
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<tr>
<td><strong>Human Power</strong></td>
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<tr>
<td>1.  Easily available.</td>
<td>1.  Costliest power compared to all other forms of power.</td>
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<td>2.  Used for all types of work.</td>
<td>2.  Very low efficiency.</td>
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<td>3.  Requires full maintenance when not</td>
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<tr>
<td>Animal Power</td>
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<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1. Easily available.</td>
<td></td>
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<tr>
<td>2. Used for all types of work.</td>
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<td>3. Low initial investment.</td>
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<td>4. Supplies manures to the field and fuels to farmers.</td>
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<td>5. Lives on farm products.</td>
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<tr>
<td>6. Very slow in doing work.</td>
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<th>Mechanical Power</th>
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<td>1. Efficiency is high.</td>
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<td>2. Not affected by weather.</td>
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<td>3. Cannot run at a stretch.</td>
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<td>4. Requires less space.</td>
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<td>5. Cheaper form of power.</td>
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<th>Electrical Power</th>
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<tr>
<td>1. Very cheap form of power.</td>
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<td>2. High efficiency.</td>
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<td>3. Can work at a stretch.</td>
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<tr>
<td>4. Maintenance and operating cost is very low.</td>
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<td>5. Not affected by seasons.</td>
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Concept of Farm Mechanization

The main concept of farm mechanization is to apply the principles of engineering and technology to do the agricultural operations in a better way to increase crop yield. This includes
the development, application and management of all mechanical aids for field operation, water control, material handling, storage and processing. Mechanical aids include hand tools, animal drawn implements, power tillers, tractors, engines, electric motors, grain processing and hauling equipments.

**SCOPE OF FARM MECHANIZATION**

Improved irrigation facilities, introduction of high yielding varieties, use of higher doses of fertilizers and pesticides have increased the scope for greater farm mechanization. Farm mechanization helps for proper utilization of basic inputs like water, seed and fertilizer, optimum placement of the seed and fertilizer, ploughing, removal of weeds, leveling of uneven land and land reclamation. If machines are used, farmer and his animals are relieved of hard work. With the support of machines, farmer can do his job better and quicker. He will get more leisure and devote his time to other works. He can earn better living.

**BENEFITS OF FARM MECHANIZATION**

1. Timeliness of operation
2. Precision of operation
3. Improvement of work environment.
4. Enhancement of safety
5. Reduction of drudgery of labour
6. Reduction of loss of crops and food products
7. Increased productivity of land
8. Increased economic return to farmer
9. Improved dignity of farmer
10. Progress and prosperity in rural areas

**CONSTRAINTS IN FARM MECHANISATION (LIMITING FACTORS IN FARM MECHANIZATION)**

1. Small land holdings
2. Less investing capacity of farmers
3. Adequate availability of draft animals
4. Lack of suitable farm machine for different operations
5. Lack of repair and servicing facilities for machines
6. Lack of trained man power
7. Lack of coordination between research organization and manufacturer
8. High cost of machines
9. Inadequate quality control of machine

QUESTIONS

1. The cheapest source of energy is ____________________
2. Power available from a farm labour is ______________hp
3. Solar energy is a __________________________ energy
4. State the merits and demerits of different sources of energy used in farm