Course.no. AHDS - 121
Course Title - Livestock Production and Management

→ Importance of livestock in agriculture :
Livestock includes domesticated animals such as cattle, buffalo, sheep, goats, poultry, etc. They play a very important role in Indian agriculture and rural economy.

1. Population of livestock in India -
According to the 20th livestock census (2019) -
- Cattle population ~ 192.49 million
- Buffalo population ~ 109.85 million

2. Contribution of livestock to agriculture and economy -
a) Contribution to agricultural GDP -
- Livestock contributes about 25-30% of agricultural GDP.

b) Contribution of milk in India -
- India is the largest producer of milk in the world since 1998.
- Milk contributes around 70-80% of livestock sector value.

3. Contribution in various sectors -
a. Dairy sector -
- Provides milk, butter, ghee, curd, cheese, etc.
- Major income source for small and marginal farmers.

b. Meat production -
- Livestock provides beef, buffalo meat, mutton, pork, etc.
- India is a major exporter of buffalo meat.
- Prices of meat (approx. in India) -
→ Chicken : Rs. 200 - 300 per kg.
→ Mutton (goat) : Rs. 700 - 1200 per kg.
→ Buffalo meat : Rs. 400 - 600 per kg.

4. Manure and Biogas production -

a. Farmyard Manure (FYM)

- Animal dung is used as organic fertilizer.
- Improves soil fertility, structure and microbial activity.

b. Biogas

- Dung is used for biogas production for cooking and electricity.
- Slurry from biogas is used as rich organic manure.

5. Employment generation -

- Livestock sector provides employment in dairy farming, veterinary services, feed industries, milk cooperatives, etc.
- Millions of rural families depend on livestock for livelihood.

6. Source of income and insurance -

- Livestock gives regular daily income (milk, eggs).
- Act as living bank or insurance during crop failure, drought or emergencies.

7. Export and Foreign exchange -

- Dairy products, meat, leather and wool are exported.
- Provides foreign exchange earnings to the country.

8. Industrial uses -

- Livestock by-products are used in leather industry, pharmaceutical industry, bone meal and gelatin industries, etc.

9. Role in Nutrition and Food Security -

- Livestock product provide high-quality protein, vitamins (A, B12), minerals (calcium, iron, zinc), etc.
- They help in reducing malnutrition.

Livestock development programmes in India :

1. National Livestock Mission (NLM) -

- Year - re-aligned in 2021-22, revised in 2024.
- Objective - employment generation, entrepreneurship, development and increased per animal productivity (meat, goat milk, egg, wool).
- Funded by - Central Government (Centrally sponsored scheme).
- Provisions - 50% capital subsidy (upto 50 lakh) for enterpreneurs, FPOs, SHGs for rural poultry, sheep/goat, piggery and fodder development.
- Area covee - Nationwide.
- Activities - breed development, feed and fodder, innovation and extension, camel/horse/donkey breeding.

2. Rashtriya Gokul Mission (RGM) -

- Objective - conservation of indigenous breeds, genetics improvement and enhance milk production.
- Funded by - 100% central grant-in-aid for major components.
- Provisions - 35% capital subsidy for Heifer rearing centers, 3% interest subvention for High genetic merit (HGM) IVF heifers, 50% subsidy on sex-sorted semen.
- Area covee - Nationwide
- Activities - Artificial Insemination (AI) network, IVF technology, breed multiplication farms, Gokul grams.
- Year - Launched 2014, continued 2021-2026 (Revised in 2025)

3. Animal Husbandary Infrastructure Development Fund (AHIDF) :

- Year - 2020-21 (revised in 2024 to merge with DIDF)
- Objective - incentives investment for dairy/meat processing, feed plants and breed technology.
- Founded by - Central Sector Scheme (100% GOI)
- Provisions - 3% interest subvention on loans and credit guarantee upto

25% of borrowing.
- Area cover - Nationwide (no state-wise allocation).
- Activities - setting up dairy plants, fodder processing, veterinary vaccine units.

4. Livestock Health and disease control programme (LHDCP):
- Year - realigned/active 2021-26.
- Objective - Eradicate FMD and Brucellosis control animal diseases and improve veterinary infrastructure.
- Funded by - 100% Central Assistance for vaccinations (FMD, Brucellosis, PPR); 60:40 for other diseases (center : state)
- Area cover - Nationwide.
- Activities - vaccination, mobile veterinary units (MVUs) (1962), disease surveillance, Pashu Aushadhi (generic medicines).

5. National Programme for Dairy Development (NPDD):
- Year - 2021-22 to 2025-26 (Revised)
- Objective - Improve milk procurement, processing and marketing, strengthen the dairy chain.
- Funded by - Central Sector Scheme (Assistance for Infrastructure).
- Provisions - Grant-in-aid to state cooperative federations/milk unions.
- Area cover - Nationwide.
- Activities - installation of Bulk milk coolers (BMCs), automatic milk collection units, dairy laboratory strengthening.

6. Supporting Dairy Cooperatives and Farmer Producer Organizations (SDCFPO):
- Year - 2017-18, continued under IDF (2021-2026)
- Objective - assist cooperatives in providing fair prices to farmers and handle market volatility.
- Funded by - Central Government (via NDDB)
- Provisions - Interest subvention (regular 2% + additional 2% on prompt repayment) on soft working capital loans.
- Area cover - Nationwide
- Activities - marketing support, working capital for milk unions.

7. Livestock Census and Integrated Sample Survey (LC and ISS):
- Year - Quinquennial (every 5 years), 21st Census in progress.
- Objective - generative of accurate statistics on livestock population and production of milk, meat, egg and wool.
- Funded by - centrally sponsored scheme.
- Provisions - funding for enumerators and state data processing.
- Area cover - all states / UTs.
- Activities - collecting data on species, breed, sex and livestock products.

8. Kisan Credit Card (KCC) for Animal husbandary and fisheries:
- Year - extended to AH / Fisheries in 2018-19, expanded subsequently.
- Objective - meet working capital requirements for feeding, veterinary care and marketing.
- Funded by - Banking system with Interest sub-vention from central Government.
- Provisions - upto 3 lakh loan at 7% interest (4% on prompt repayment).
- Area cover - Nationwide.
- Activities - purchase of fodder, health service for cattle, poultry, piggery.

9. Breed Multiplication Farm :

- Year - 2021 - 26 (part of 2021 RGM/NLM guidelines).
- Objective - ensure availability of high-yielding disease free heifers/cows to farmers.
- Funded by - 50% capital subsidy from central government (upto 2 cr.)
- Provisions - subsidised loan/investment for enterpreneurs.
- Area cover - Nationwide.
- Activities - setting up farms with a minimum of 200 (for cattle) or higher for other species using sex-sorted semen.

10. National Animal Diseases Control Programme (NADCP):

- Year - 2019 (target : Eradication by 2030).
- Objective - 100% vaccination of cattle, buffalo, sheep, goat and pig population for FMD and female calves for Brucellosis.
- Funded by - 100% central funding.
- Provisions - free vaccination at the doorstep.
- Area cover - Nationwide.
- Activities - Ear tagging (Pashu Aadhar), vaccination, data entry on Information Network for Animal Productivity and Health (INAPH).

Livestock Census :

1. Cattle -

- The cattle population decreased from 199.08 to 190.90 million during the period of 2007 - 2012 showing a negative growth rate of 4 - 10 %. on the contrary from 2012 to 2019, the production increased to 193.46 million showing an increase of 1.3 % over the previous census.
- The 2012 Livestock census revealed that the female cattle (cows) population had increased by 6.49 % over the previous census of 2007 and again significant increases of 18.06 % in population was reported during the period from 2012 - 2019.
- At the same time, population of male cattle have been remarkably reduced with by 18.76 % during 2007 to 2012 and then again 29.99 % during 2012 to 2019.
- This trend clearly indicates that the livestock owners have clear inclination for female cattle rearing.
- The population of exotic / crossbreed cattle increased to tune of 20.18 % and 29.27 % during the periods from 2007 - 2012 and 2012 - 2019 respectively.
- Nevertheless, there was a decline of 8.94 % and 5.99 % in the total Indigenous cattle population during same periods.
- There was sharp decline in indigenous native animals during the period from 2007 - 2012.
- However, the decline has been seen to be much lesser from 2012 onwards. Among major states, foremost decreases in cattle population has been noted in Odisha (~15.01 %) and highest growth of cattle population has been in Jharkhand (28.16 %) in 2019 as compared to previous census of 2012.

2. Buffalo -

- Buffalo population has been seen to be growing since 1950, however if we look towards previous three census scenario, during the period from 2007-2012, the buffalo population increases from 105.34 million to 108.70 million showing a growth of 3.19 %.
- While, according to 20th Livestock Census, 2019, the total buffaloes in the country were 109.85 million after increase of about 1.1 % over 2012 census.
- India stands first in terms of buffalo population with an astonishing share of 59.29 % of the world population.
- The female buffalo population has increased by 7.93 % during the inter censual period from 2007 to 2012 and by 8.72 % during the period from 2012 - 2019.
- However, a decrease of 42.35 % has also been noticed in male buffalo population in the period between last two censuses.
- The total buffalo population of India showed a raised trend in last decade. This raising trend has also been observed in buffalo population over last five censuses.
- Among the major states of buffalo population 25.88 % increase has been seen in Madhya Pradesh and Haryana have shown decrease of 28.22 % in buffalo population compared to last census of 2012.

Classification of Indigenous cow breeds

1. Milch purpose -

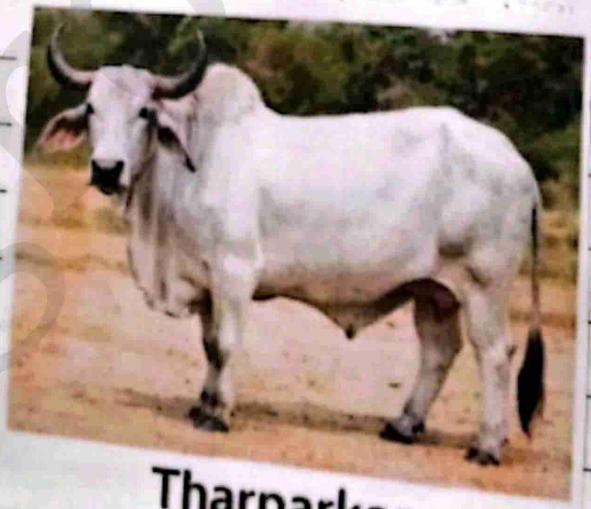
a. Sahiwal or Lola -

- Origin - Montgomery district of Pakistan.
- Habitat - Ferozpur, Punjab, Haryana, Maharashtra
- Body - heavy, short legs, loose skin and sometimes folded
- Head - broad
- Horns - stumpy, in females loose horns are common.
- Eyes - bulgy and big.
- Ears - long
- Udder - Capacious.
- AFC - 41 months
- Fat - approx. 4.8 - 5.1 %
- Colour - red brown, with or without white patches.

Sahiwal

b. Tharparkar or Thari-

- Origin - Tharparkar dist. of Pakistan
- Habitat - Indo-Pak borders, Rajasthan
- Body - medium sized, straight and short limbs.
- Head - medium and moderately long.
- Horns - thick, medium sized well apart.
- Ears - some what long, broad and slightly pendulous
- Colour - white grey
- Udder - moderately developed.
- AFC - 43 to 48 months.
- Fat - 4.2 to 5.0 %



Tharparkar

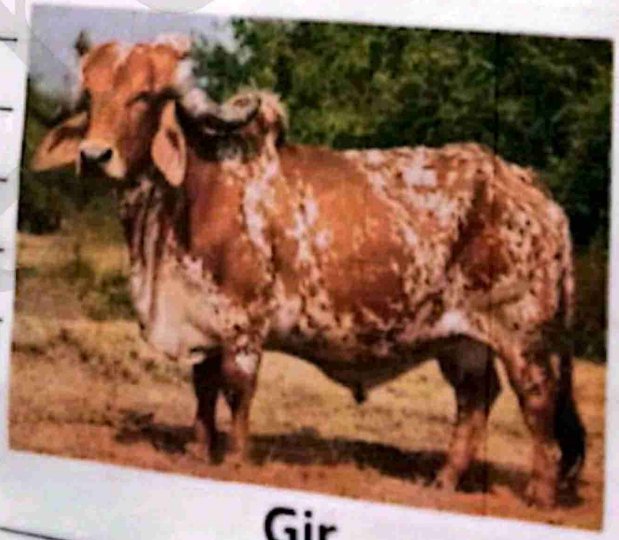
c. Red Sindhi or Red Karachi -

- Origin - Karachi and Hydrabad dist. in Pakistan.
- Habitat - Orisa, Bihar, Kerala, Assam.
- Body - medium sized, compact and wedge shaped.
- Head - moderate size with broad and flat forehead
- Horns - thick and stumpy with blunt point.
- Ears - medium sized.
- Colour - deep dark red.
- Udder - large and capacious.
- AFC - 41 months.
- Fat - ~4.6 %.

Red Sindhi

d. Gir -

- Origin - Gir hills and forest of Kathiawar
- Habitat - Maharashtra, Madhya Pradesh
- Body - medium sized
- Head - moderately long, bulging forehead.
- Horns - big, trying backwards
- Eyes - almond shaped and look sleepy.
- Ears - long, pendulous, curved with notch at the tip.
- Colour - varies from entire red with patches of white and red.
- AFC - 38 to 40 months.
- Fat - approx. 4.5 %
- Highest disease resistant.



Gir

2. Dual purpose - eg: Deoni, Gaolao, Hariana, Ongole, Kankrej, Krishna valley

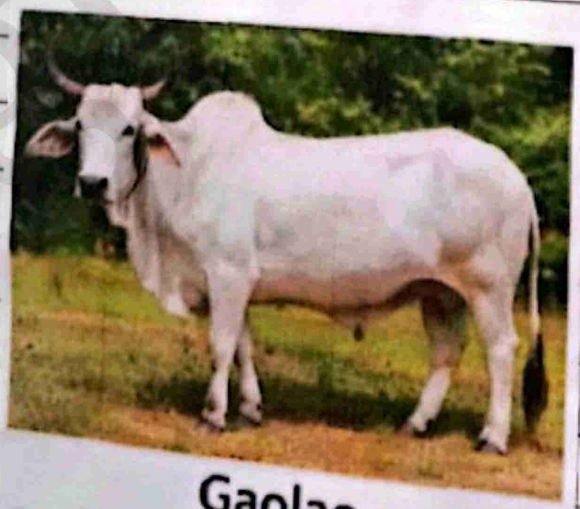
a. Deoni -

- Origin - Udgir, Nilanga, Deoni, Ahmedpur of Latur Dist.
- Habitat - Parbhani, Hingoli, Nanded and Osmanabad Dist.
- Body - medium size and strongly built.
- Head - medium, slightly prominent forehead.
- Horns - thick, medium upwards and backwards.
- Eyes - small, prominant and active eyes.
- Ears - pendulous, short without notch at tip.
- Colour - white with black patches or black with white patches.
- AFC - 48 to 53 months
- Fat - 4.4 %.
- This cow is also called as Deoni.

Deoni

b. Gaolao -

- Origin - Wardha Dist. of Maharashtra
- Habitat - Balaghat, Durg of M.P, Chhindwara
- Body - medium in height, lightly build with narrow frame.
- Head - long and narrow with straight profile towards muzzle.
- Horns - short and stumpy.
- Ears - medium in size giving alert appearance.
- Colour - white or grey
- AFC - 44 to 46 months
- Fat - 5.5%.



Gaolao

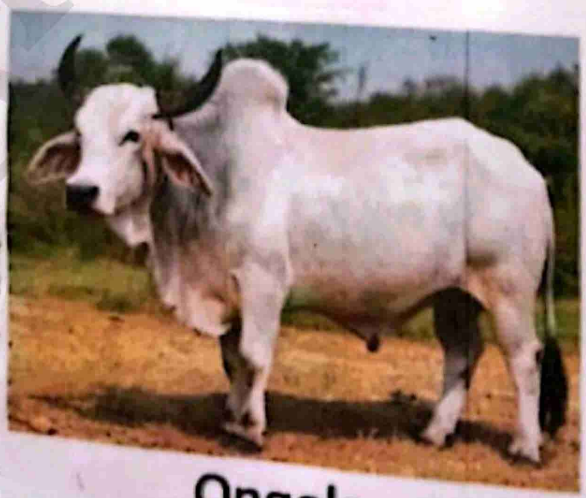
c. Haryana -

- Origin - Rohatk , Hissar , Jind
- Habitat - Jodhpur , Bharatpur of Rajasthan
- Body - proportionately , compact and moderately long.
- Head - light, clean and well set , slightly convex.
- Horns - thin and short carrying upward and inward
- Face - long and narrow.
- Ears - small , slightly pendulous and active.
- Colour - white and light grey.
- AFC - 46 to 58 months.
- Fat - 4.5 to 4.6 %

Hariana

d. Ongole -

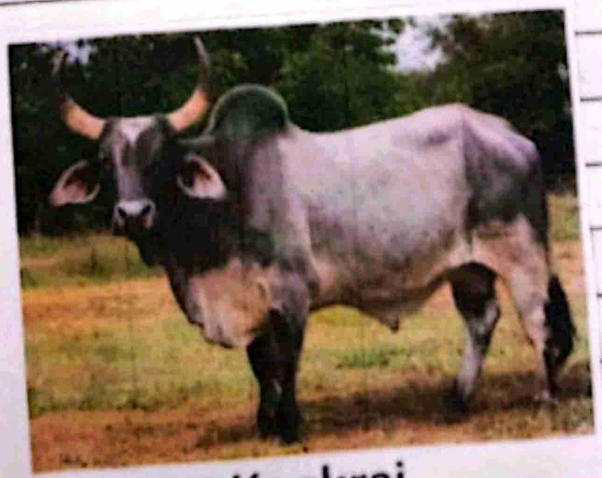
- Origin - Ongole taluka
- Habitat -
- Body - large, heavy with massive and long limbs.
- Head - forehead broad and slightly prominent.
- Ears - moderately long, slightly drooping.
- Horns - short and stumpy.
- Neck - short, stout
- Hump - prominent and well developed.
- AFC - 39 months
- Dry period - 120 days
- Fat - 3.5 - 4.5 %
- Lactation period - 200 - 300 days.



Ongole

e. Kankrej -

- Origin - Kankrej taluka of Banaskantha district, Gujarat.
- Habitat - Maharashtra, Ahmedabad, Kheda, Jodhpur in Rajasthan
- Colour - silver grey to iron grey or steel black.
- Body - massive, heavy build
- Forehead - brood, prominent, slightly bulging.
- Neck crest - well developed in bull.
- Horn - long (strongly curved outwards)
- Ears - large, pendulous, open.
- Dewlap - hanging in folds.
- Eyes - prominent, with dark pigmentation around, alert and expressive.
- Shoulder - strong, well muscled.
- Hump - well developed.
- AFC - 36 - 48 months.
- Dry period - 144 - 134 days
- Fat - 4 - 4.8 %.
- Lactation period - 300 - 305 days.

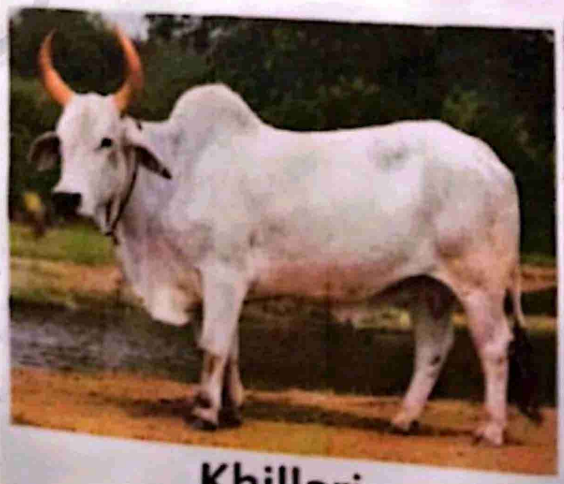


Kankrej

3. Draft purpose - eg: Khillari, Dangi, Red Kandhari, Kangayam, Amrit Mahal, Bachaur, Bargur, Hallikar, Vechur, etc.

a. Khillari -

- Origin - Sangli, Satara dist., Solapur
- Habitat - Jalgaon, Dhule, Beed, dist.
- Colour - grey-white.
- Body - compact, tight skin, muscular.
- Forehead - prominent, swollen
- Neck crest - well developed and muscular in bulls.
- Horn - long, pointed
- Eyes - alert
- Ears - moderately sized
- Dewlap - moderately developed, not very large.
- AFC - 36-40 months.
- Dry period - 150 days
- Fat - 4.2 %
- Lactation period - 210-285 days.



Khillari

b. Red Kandhari -

- Origin - Kandhar , Mukhod , Biloli , Tal. Nanded
- Habitat - Hingoli , Latur , Parbhani , Beed dist.
- Colour - uniform deep dark red.
- Body - medium sized , compact , not massive.
- Forehead - broad and prominent
- Neck crust - moderately to well developed in bulk.
- Horn - medium sized , evenly curved
- Eyes - bright , alert.
- Ears - long and drooping
- Dewlap - moderate in size
- AFC - 45 months
- Dry period - 150 to 200 days.
- Fat - 4.5 - 4.6 %
- Lactation period - 120 - 280 days.

Red Kandhari

c. Kangayam -

- Origin - Karnataka
- Habitat -
- Colour - grey / white
- Body - compact, strong, muscular
- Forehead - broad, level
- Neck crest - short and thick neck, well set on body.
- Horn - stout and thick
- Eyes - prominent, bright, elliptical
- Ears - short and erect
- Dewlap - thin and short
- AFC - 36 - 48 months
- Dry period - 150 - 200 days
- Fat - 3.9 %
- Lactation period - 264 - 285 days.

Kangayam

d. Dangi -

- Origin - Nashik , Ahmednagar Dist.
- Habitat -
- Colour - white coat as base with red / black spots or patches.
- Body - medium to large , tight skin
- Forehead - slightly protruding or bulging
- Neck crust - moderately developed in bulls.
- Horn - short and thick
- Eyes - alert
- Ears - medium - sized
- Dewlap - not very large.
- AFC - 45 months
- Dry period - 150 days
- Fat - 4.3 %
- Lactation period - 210 - 300 days.

Livestock development programmes in India :

Pre - Independence livestock development programmes in India :

Before 1947; livestock development received limited attention, but several steps were taken by the British government to improve cattle breeds, animal health and veterinary education.

1. Establishment of Cattle Breeding Farms -

During the pre-independence period, the government established cattle breeding farms to improve indigenous cattle breeds.

- These farms focused on selective breeding of superior animals.
- The aim was to increase milk production and draught power of bullocks used in agriculture.
- Important breeding farms were established at places like Hosur, Hisar and Allahabad.

2. Establishment of Veterinary Hospitals and Dispensaries -

To control animal diseases and provide treatment, veterinary hospitals and dispensaries were opened in many regions.

- These institutions helped in diagnosis, treatment and vaccination of livestock.
- They reduced mortality of animals and improved the overall health of livestock.

3. Development of Veterinary Education -

The British Government introduced veterinary education to train professionals in animal health care.

- The first veterinary college in Mumbai was established in 1886.

- Later, move veterinary institutions were opened to produce trained veterinarians and improve livestock management.

4. Introduction of Exotic Breeds -

Some exotic breeds of cattle were introduced from foreign countries.

- These breeds were crossed with indigenous breeds to improve milk yield and productivity.
- The aim was to produce animals with better production capacity and adaptability.

5. Disease Control Measures -

Efforts were made to control major livestock diseases such as rinderpest, and foot-and-mouth disease.

- Vaccination and preventive measures were introduced to reduce outbreaks.

Post-Independence livestock development programmes in India :

1. Rashtriya Gokul Mission (RGM) -

- The Rashtriya Gokul Mission (RGM) is being implemented for development and conservation of indigenous bovine breed since December 2014.
- The Scheme is important in enhancing milk production and productivity of bovines to meet growing demands of milk and making dairying more remunerative to the rural farmers of the country.
- The scheme is also continued under umbrella scheme Rashtriya Pashudhan Vikas Yojana from 2021 to 2026 with budget outlay of Rs. 2400 Cr.
- The RGM will result in enhanced productivity and benefit of the programme, percolating to all cattle and buffaloes of India especially with small and marginal farmers.

- This programme will also benefit women in particular since over 70% of the work involved in livestock farming is undertaken by women.

Objectives -

a. To enhanced productivity of bovines and increasing milk production in a sustainable manner using advance technologies.
b. To propagate use of high genetic merit bulls for breeding purpose.
c. To enhance Artificial insemination coverage through strengthening breeding network and delivery of artificial insemination services at farmers' doorstep.
d. To promote indigenous cattle and buffalo rearing and conservation in a scientific and holistic manner.

Funding Pattern -

All the components of scheme will be implemented on 100% grant-in-aid basis except the components of :

i. Accelerated breed improvement programme under the component subsidy of Rs. 5000 per IVF pregnancy will be made available to participating farmers as GoI share.
ii. Promoting sex sorted semen under the components subsidy upto 50% of the cost of sex sorted semen will made available to participating farmer.
iii. Establishment of breed multiplication farm under the component subsidy upto 50% of the capital cost maximum upto Rs. 2 Cr. of the project will be made available to entrepreneur.

Components of RGM -

→ Availability of high genetic merit germplasm :

a. Bull production
   - Progeny testing.
   - Pedigree selection
   - Genomic selection
   - Import of germplasm.

b. Support to semen station - strengthening of existing semen stations.

c. Implementation of IVF Technology
   - IVF laboratories.
   - Implementation of IVF technology for getting assured pregnancy.
   - Implementation of In-vitro embryo production technology.

d. Breed Multiplication Farms.

→ Extension of Artificial Insemination Network :

a. Establishment of MAITRIS

b. Nationwide AI programme.

c. Using sex sorted semen for getting assured pregnancy.

d. Implementation of National Digital Livestock Mission.

→ Development and Conservation of indigineous breeds :

a. Assitance to Goushalas, Gosadans and Pinjara poles.

b. Administrative expenditure / operation Rashtriya Kamdhenu Aayog.

2. Operation Flood -

- Launched in 1970, Operation Flood has helped dairy farmers direct their own development placing control of the resources they create in their own hands.
- National Milk Grid links milk producers throughout India with consumers in over 700 towns and cities, reducing seasonal and regional price variations while ensuring that the producer gets fair market prices in a transparent manner on a regular basis.
- The bedrock of Operation Flood has been village milk and provide inputs and services, making modern management and technology available to members.

Operation Flood's objectives included :

→ Increase milk production (a flood of milk)
→ Augment rural incomes.
→ Reasonable prices for consumers.

Programme Implementation :

Operation Flood was implemented in three phases -

Phase - I :-

Phase - I (1970 - 1980) was financed by the sale of skimmed of milk powder and butter oil gifted by the European Union the EEC through the world food programme. The NDDB planned the programme and negotiate the deals of EEC assistance. During its first phase, Operation Flood linked 18 of India's Premier milksheds with consumers in India's four major metropolitan cities: Delhi, Mumbai, Kolkata and Chennai.

Phase - II :-

Operation Flood's phase (1981 - 85) increases the milkshed from 18 to 136, 290 urban markets expanded the outlets for milk. By the end of 1985, a self - sustaining system of 43,000 village cooperatives covering 4.25 million milk producers had become a reality. Domestic milk Powder production increased from 22,000 tons in pre - project year to 1,40,000 tons by 1889, all the increase coming from dairies set up under Operation Flood. In this way EEC gifts and World Bank loan helped to promote self - reliance. Direct marketing of milk by producers' cooperatives increased by several million litres a day.

Phase - III :-

Phase - III (1985 - 1996) enable dairy cooperatives to expand and strengthen the infrastructure required to produce and market increasing volumes of milk. Veterinary first aid health care services for cooperative members were extended, along with intensified member education.

Operation Flood's Phase - III consolidate India's dairy cooperative movement, adding 30,000 new dairy cooperatives to the 42,000 existing societies organised during Phase - II. Milksheds peaked at 173 in 1988 - 89 with the number of women and Women's Dairy Cooperative societies increasing significantly. Phase - III gave emphasis to research and development in animal health and animal nutrition. Innovations like vaccine for Theileriosis, bypass protein feed and urea - molasses, mineral blocks, all contributed to the enhanced productivity of milch animals.

From the outset, Operation Flood was conceived and implemented as much more than dairy programme. Rather, dairying was seen as an instrument of development, generating employment and regular incomes for millions of rural people. Operation Flood can be view as a twenty year experiment confirming the Rural development vision.

Terminology used in livestock management

Particular	Cattle	Buffalo	Sheep	Goat	Pig
Species	Bovine	Bovine	Ovine	Caprine	Swine
Adult female	Cow	Buffalo	Ewe	Doe	Sow
Adult male	Bull	Buffalo bull	Ram	Buck	Boor
New born	Calf	Buffalo calf	Lamb	Kid	Piglet
Young male	Bull calf	Buffalo calf	male lamb	male kid	Boarling
Young female	Heifer calf	Heifer calf	Female lamb	Female kid	Female piglet
Mating	Serving	Serving	Tupping	Serving	Coupling
Parturation	Calving	Calving	Lambing	Kidding	Furrowing
Castrated male	Bullock	Bullock	Wedder	Buck	Barrow
Castrated female	Spayed	Spayed	Spayed	Spayed	
Meat	Beef	Buffin	Mutton	Chevon	Pork
Group	Herd	Herd	Flock	Flock	Drov, Herd
Gestation period	282 days	310 days	148 days 150	148 days	114 days

Species - A group of individuals which have certain common characteristics that distingwish them from other group of individual.

Breed - A group of animals related by decent and which are similar in most of the characters like general appearance, size, colours, horns is called breed.

Gestation period - The period from the date of service to the date of parturition is termed as gestation period or partweition period.

Gestation - It is the condition of female when developing foetus is present in uterus.

Conception - The successful union of male and female gametes and implementation of zygote is known as conception.

Service - The process in which mature male covers the female i.e., in heat with the object to deposite spermatozoa in female genital tract.

Parturition - The act of giving birth to young one.

Lactation period - The period after parturition in which the animal produces milk.

Dry period - The period after lactation in which the animal does not produce milk.

Calving interval - The period between two successive calving.

Sire - The male parent of calf.

Dam - The female parent of calf

Half sib - Half brothers or half sisters.

Full sib - Full brothers or full sisters.

Repeatability - It is the expression of the same trait at different t... in the life of the same individual or tendency of an individual to repeat it's performance.

Lethal (Deadly) - A gene that cause death of an individual which ... possesed by them during pregnancy or at the time of birth.

Fertility - Ability of animal to produce large no. of living young.

Sterility - Inability to produce any offspring.

Free martin - A sterile heifer born twin with male.

Teaser - A vasectomized (castrated) bull used to detect the heat or estrus of female (cow).

Veal - The meat of calf below age of 3 months.

Prolificacy - Ability to produce large no. of offspring.

Exotic breeds of Cattle

1. Holstein Friesian -
2. Jersey
3. Ayrshire
4. Red Den
5. Brown Swiss

1. Holstein Friesian -

- Origin - Northern lowlands of Europe, North Holland and Friesland.
- Habitat -
- Colour - black and white colour.
- Body - large and rangy.
- Forehead - broad and clean, head is long.
- Neck crest - Neck is long, thin.
- Horn - medium
- Ears - medium-sized, alert and mobile.
- Eyes - bright, alert.
- Dewlap - minimum to absent.
- Shoulder - well-set
- Udder - highly developed, capacious
- Weight - male - 640 kg, female - 400 kg.
- AFC - 15-18 months
- Dry period - 50-60 days.
- Average milk yield - 50,000 per lit.
- Fat - 3.5 - 4 %
- Lactation period - 305 days.

2. Jersey -

- Origin - Island
- Habitat - All over the world.
- Colour - Fawn (tent red)
- Body - small, compact
- Forehead - broad
- Neck crest - neck slender
- Horn - small
- Ears - medium-sized, alert.
- Dewlap - small / minimal
- Eyes - large, prominent, bright, expressive.
- Udder - well developed, capacious.
- AFC - 24-28 months.
- Dry period - 45-65 days.
- Average milk yield - 5000-7000 LPL.
- Fat - 5.5 %
- Lactation period - 325 days.

3. Ayrshire - Most beautiful cow in world.
- Origin - Scottland.
- Habitat - worldwise.
- Colour - combination of red, white and brown.
- Body - medium sized, strong.
- Forehead - broad, clean.
- Neck crest - slender neck and long.
- Horn - long.
- Ear - medium-sized, thin, mobile and alert.
- Dewlap - small and minimal
- Eyes - bright, alert, prominent and expressive
- Shoulder - strong, fine.
- Udder - excellent shape and quality.
- AFC - 24-30 months
- Dry period - 45-60 days.
- Fat - 3.9-4.1 %
- Lactation period - 280+ days.

4. Red Den - not popular for milk production.

- Origin - Europe
- Colour - deep red to cherry red
- Body - medium - heavy, deep
- Forehead - broad, clean.
- Neck crest - neck long and slender.
- Horn - medium length
- Ears - medium sized, thin, mobile
- Eyes - large
- Shoulder - strong
- AFC - 24 - 26 months
- Dry period - 45 - 60 days
- Fat - 4 %
- Lactation period - 280 + days.

5. Brown swiss -

- Origin - Swiss Alps of Switzerland.
- Colour - light to dark brown.
- Body - medium heavy, deep.
- Forehead - broad, clean-cut.
- Muzzel - white / fent black.
- Neck crest - neck long and slender blending
- Horn - short and incurving.
- Ear - medium sized, thin and alert.
- Eyes - large, prominent, bright and expressive.
- Shoulder - strond and well-muscled with prominent withers.
- Udder - well-developed, capacious.
- AFC - 24-28 months.
- Dry period - 45-60 days.
- Fat - 3.5 - 3.7 %
- Lactation period - 280+ days.

Importance of buffalo in India -

A. Dairy and Milk production -

- India is the world's largest milk producer.
- Total milk production reached ~ 248 million tonnes
- Buffaloes contribute around 43 - 45 % of this total despite being less in number than cows.
- Buffalo milk is richer in fat (7.8 to 13 %) and solids - not - fat, making it ideal for products like ghee, butter, paneer and yogurt highly valued in Indian cuisine and commanding premium prises.

B. Economic and Rural Livelihood Impact -

- India has the world's largest buffalo population.
- The sector supports millions of small holder and marginal farmers.
- It provide regular cash income through milk sales.
- Buffaloes empower women, who handle much of the management.
- Manure serves as organic fertilizer and fuel (dung) while draught power aid farming in many areas.

C. Meat and other products -

- Buffalo meat (Buffin) forms a major part of India's meat production and primary source for exports.
- India is one of the world's top buffalo meat exporters, generating billions in foreign exchange (mostly to middle East and South Asia)
- Hides, bones and other by-products support industries.

Important Breeds of Buffalo

1. Pandharpuri
2. Murrah
3. Surti
4. Nili - Ravi
5. Godhavari
6. Maisan
7. Bun
8. Marathwadi
9. Nagpuri
10. Toda
11. Jaffrabadi

1. Pandharpuri -

- Origin - Pandharpur tal. of Solapur dist.
- Habitat - Solapur, Sangli and Kolhapur.
- Body - medium - sized, long compact build.
- Face - narrow
- Forehead - narrow and comparatively flat.
- Horn - very long and distinctive.
- Ears - medium sized and alert.
- Eyes - bright and alert with typical dark pegmentation.
- Udder - compact.
- AFC - 45 - 50 months.
- Dry period - 150 - 200 days.
- Fat - 7 - 7.3 %.
- Lactation period - 255 - 350 days.

2. Murrah -

- Origin - Rohtak, Hisar, Jind, Gurgaon and Bhiwani dist. of Ha
- Habitat - Punjab, U.P
- Body - broad, slightly concave in center, clean-cut
- Horn - tightly curve.
- Ears - short, thin, alert and mobile.
- Eyes - black, active, prominent.
- Shoulder - well developed, capacious.
- AFC - 45-50 months.
- Dry period - 150-250 days.
- Fat - 7-8 %.
- AMY - 1500 to 2500 kg / lactation.

3. Surti -

- Origin - Charotar tract of Gujarat, India.
- Colour - coat varies from rusty brown or silver grey to black.
- Body - medium sized, wedge-shaped barrel, straight back, small dewlap, clean-cut appearance.
- Forehead - long, prominent head
- Horn - sickle shaped horn.
- Ears - drooping, medium sized, reddish surface with white hairs on lower border.
- Eyes - bright, alert.
- Shoulder - strong, well-muscled
- Udder - well-developed
- AFC - 40-45 months.
- Dry period - 150-200 days.
- Fat - 8-10 %.
- Lactation period - 290-311 days.

4. Nili - Ravi -

- Origin - Punjab region of undivided India.
- Habitat - Firozpur, Amritsar, Gurdaspur, Tarn Taran and Fazilka in Indian Punjab and Lahore, Sheikhupura, Sahiwal, Multan, Okara, Faisalabad and Bahawalnagar in Pakistani Punjab.
- Colour - Glossy black coat.
- Body - massive, deep, broad hips.
- Forehead - broad slightly bulging.
- Horn - slightly curve.
- Ears - short, thin, alert.
- Eyes - Prominent wall eyes.
- Udder - well developed, capacious.
- AFC - 45 - 50 months.
- Dry periods - 90 - 200 days.
- Fat - 6.5 to 7 %.
- Lactation period - 270 - 320 days.

5. Jaffarabadi -

- Origin - Saurashtra region of Gujarat.
- Habitat - Junagadh, Bhavnagar, Jamnagar, Porbandar, Amreli and Rajkot.
- Body - massive, heavy, low-set frame.
- Forehead - prominent dome shaped
- Horn - downward sideway then upward and inward.
- Ear - medium sized, horizontal and alert.
- Eyes - prominent, bright and alert.
- Udder - well developed, capacious.
- AFC - 40-50 months.
- Dry period - 50-220 days.
- Fat - 7-8.5 %.
- Lactation period - 300-365 days.

Principles of maximization of livestock production

- Management - The art and science which has managerial capacity that can convert the resources into returns.

- Principles -

1. Principle of breeding.
2. Principle of heading.
3. Principle of feeding.
4. Principle of weeding.

The principle of maximization of livestock production refers to overall goal in animal husbandary and livestock farming to achieve the highest possible output (such as milk, meat, eggs, wool, etc.) per animal per unit of land or per unit of input (feed, labour, etc.) in sustainable and profitable manner. This is accomplished by optimizing genetics, nutrition, health, management practices and resource use while minimizing waste and environmental impact.

1. Principle of feeding -

- This is cornerstone of livestock productivity as nutrition directly influences growth, reproduction, milk/meat yield, health and overall performance.
- Provide balanced, high-quality feed that matches the animal's physiological stage (eg: lactation growth, pregnancy), age, breed and production goals.
- Use economic strategies like optimal ration formulation, pasture management, supplements when needed and minimizing waste to ensure animals convert feed efficiently into products.
- Poor feeding limits genetic potential, while proper feeding maximizes output and profitability.

- Green fodder is essential in feeding for economic milk production. It is cheap source of several nutrients. Proper ratio of green to dry fodder (4:1) should be maintained.
- Residues of crops like sorghum, maize and millets are long needs chopping before fed to livestock to avoid wastage and prevent selective consumption.
- Conservation of surplus green forage available during flush period of growth as silage provides same quality fodder to milk animals during scarcity period.

2. Principle of breeding -
- Selection of genetically superior animals, free from diseases, having faster growth rate after birth, lower age at first calving, better feed conversion efficiency, etc.
- In addition, timely observance of heat, mating of females and pregnancy diagnosis are important in order to get better breeding efficiency.
- Extensive use of artificial insemination technology which is most successful method for breed improvement and development.
- Breeding enhances traits like milk yield, growth rate, fertility, longevity and feed efficiency.
- Use tools such as breed selection, artificial insemination or controlled mating to build a herd that realizes higher production potential.
- Breeding decisions today shape future output, making it essential for long term maximization.

3. Principle of Heading -
- Healthy animals are vital for good milk production.
- Heading refers to close, daily observation and attentive management of the animals.
- It involves monitoring health, behaviour, early signs of illness, stress or issues; providing prompt veterinary care; ensuring comfort (housing, shade, water, low-stress handling); and maintaining welfare.

- Attentive care prevent losses, sustains high production, and supports animal well-being, which is crucial for consistent output.

4. Principle of weeding -

- Regularly identify and remove low performing, unproductive or problematic animals from the herd (eg., those with poor reproduction, low yield, chronic health issue or inefficiency).
- This 'weeds out' inferior genetics and resources are redirected to high-potential animals, improving overall herd efficiency and profitability.
- Systematic cutting ensure the herd evolves towards maximum productivity.

Once the dairy owner will practice above points in the areas of animal breeding, feeding, heading and weeding. This ultimately maximize the milk, production and dairy farming will lead to economic and profitable.