INTEGRATION OF LIVESTOCK IN NATURAL FARMING

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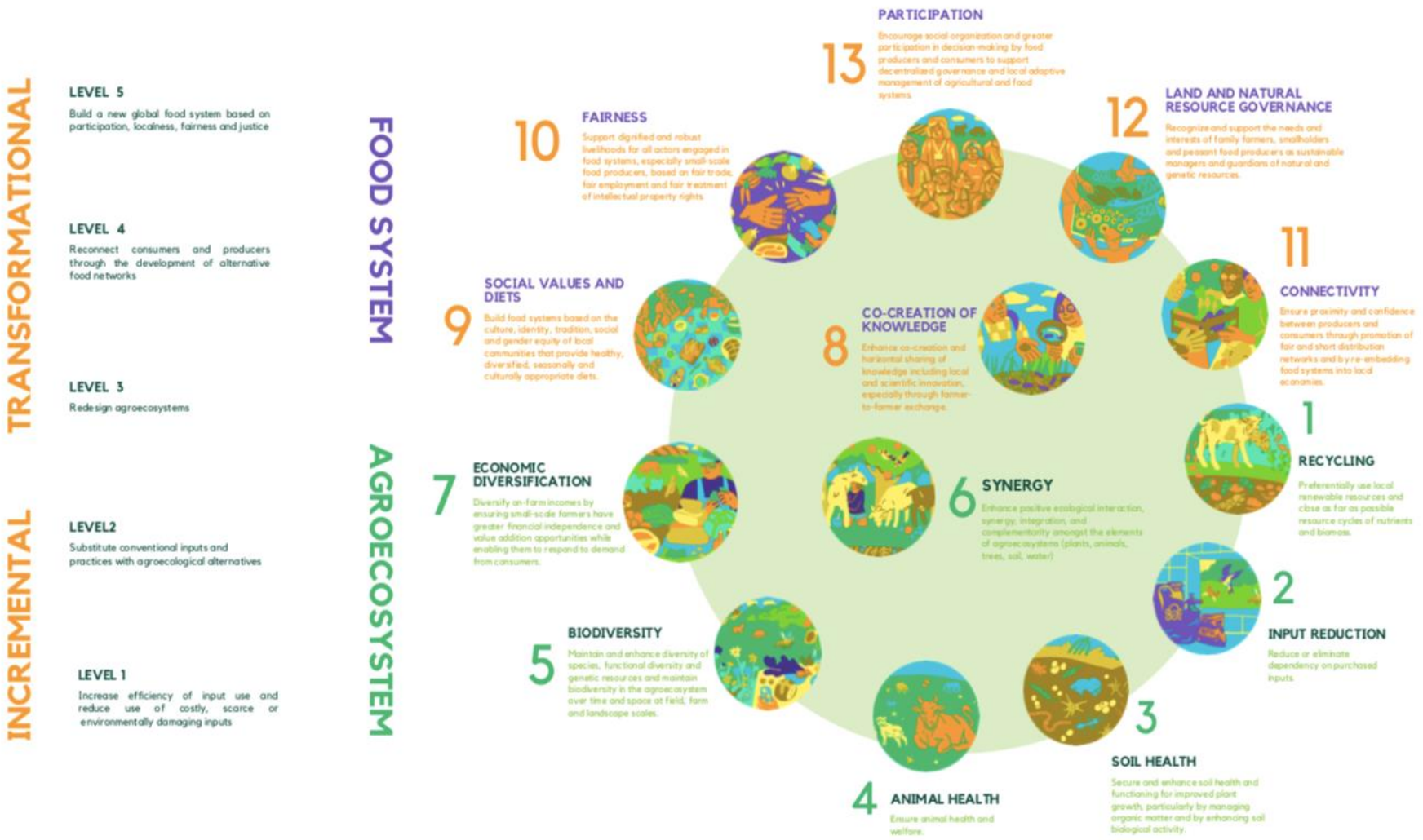
Principles of Agroecology

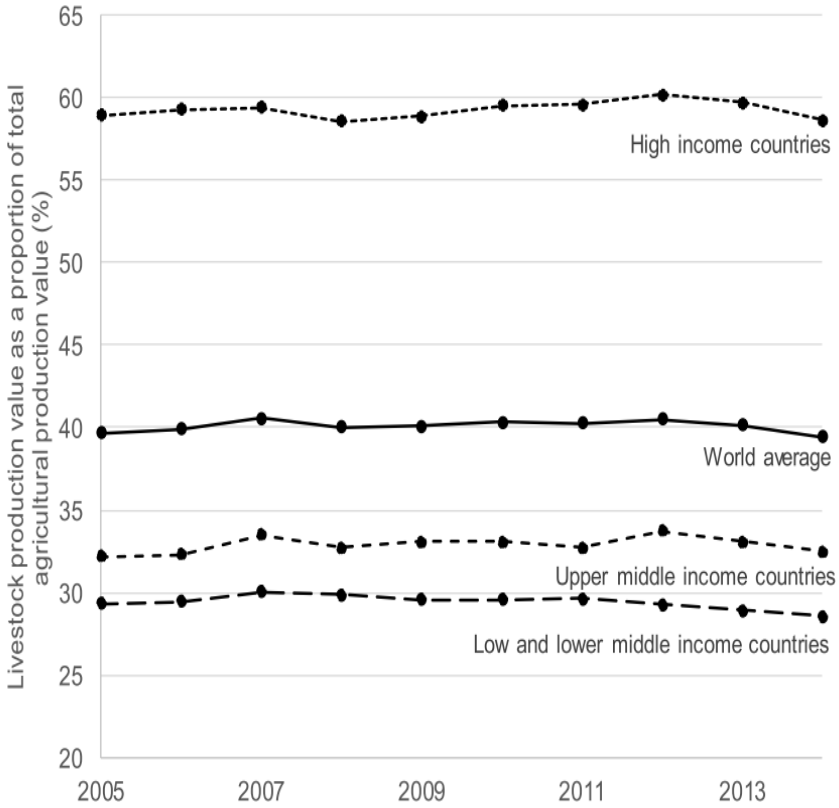


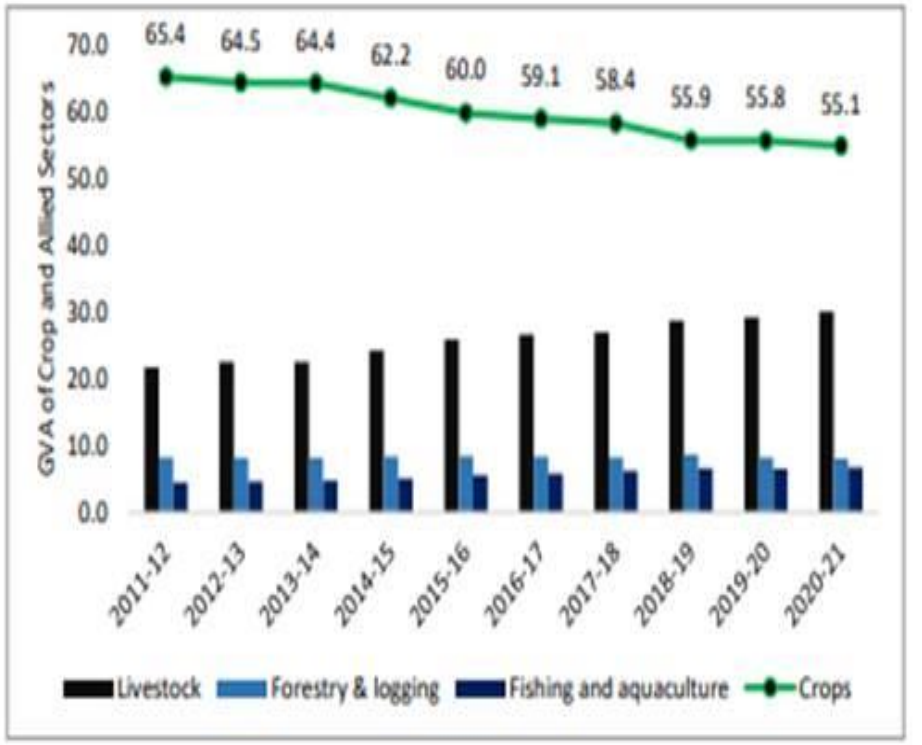
Livestock sector in India

- Characterized by Production by masses rather than mass production.
- Livestock production and agriculture are intrinsically linked, each being dependent on the other, and both are crucial for overall food security.
- It forms an important livelihood activity for most of the farmers, supporting agriculture in the form of critical inputs, contributing to the health and nutrition of the household, supplementing incomes, offering employment opportunities, and finally being a dependable "Bank on hooves" in times of need.
- It acts as a supplementary and complementary enterprise.
- Dairy industry employs 80 million rural households with the majority being small and marginal farmers as well as landless.
- As per NBAGR (National Bureau of Animal Genetic resources, Karnal) in India there are a total of 212 livestock breeds which include 53 breeds of cattle, 20 breeds of buffalo, 37 breeds of goat and 44 breeds of sheep, 7 for horses and ponies, 9 for camels, 13 for pigs, 3 for donkey, 3 for dogs,1 for yak, 19 for chicken,2 for duck and 1 for geese, in 2022.

- The value of output from livestock sector was about Rs. 11,14,249 crore at current prices during 2020-21 which is about 30.87% of the value of output from agricultural and allied sector and 6.17% of total GVA.
- Milk Production: 230.58 MMT with per capita availability of 459 g/day contributing 24.64 per cent of global milk production.
- Egg Production: 138.38 Billion with per capita availability of 101 eggs/annum.
- Wool production: 33.61 Million kg
- Meat production: 9.77 Million tonnes

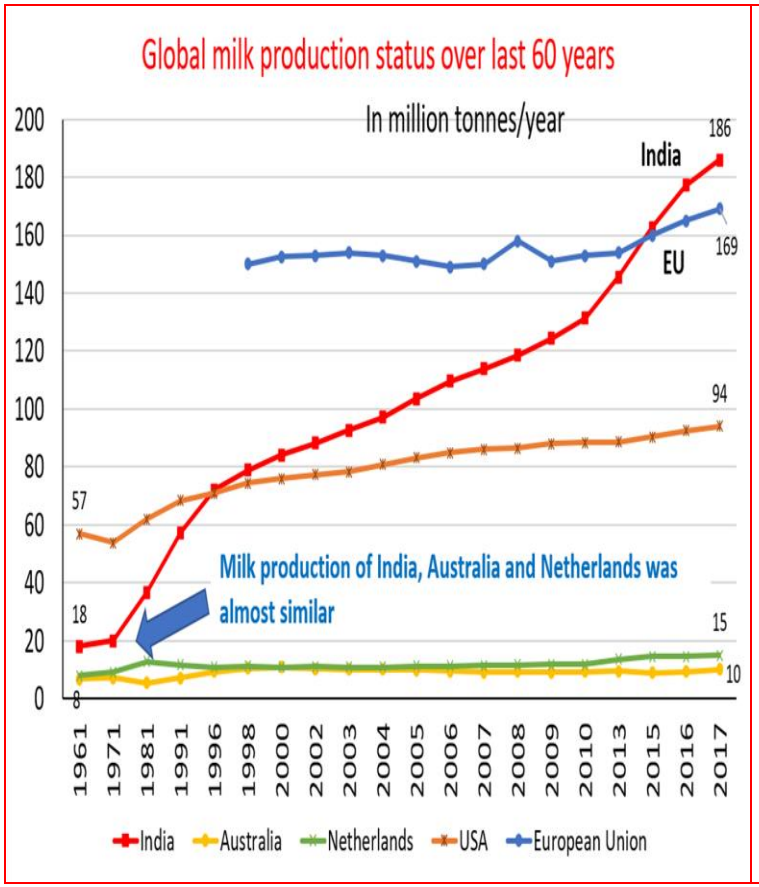
Contribution of livestock sector in GDP





Source: Based on data of MoSPI.

Milk Production Trends



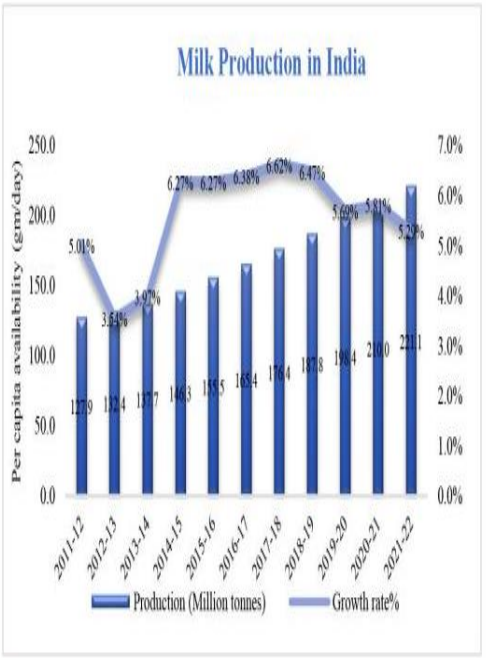


Figure 1

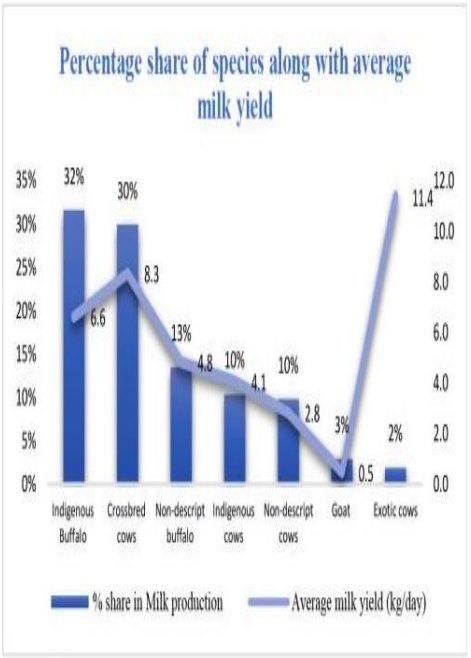


Figure 2

Source: DAHD

Livestock Population of India

Species	Population (In million) 2007	Population (In million) 2012	Population (In million) 2019
Cattle	199.08	190.9	192.49
Buffaloes	105.34	108.7	109.85
Sheep	71.56	65.07	74.26
Goats	140.54	135.17	148.88
Pigs	11.13	10.29	9.06
Mithun	0.26	0.30	0.38
Yaks	0.08	0.08	0.06
Horses & ponies	0.61	0.63	0.34
Mules	0.14	0.2	0.08
Donkeys	0.44	0.32	0.12
Camels	0.52	0.4	0.25
Total Livestock	529.70	512.06	535.78

Changes in exotic and indigenous Cattle In India (2012 & 2019)

Category	Population (In million) 2012	Population (In million) 2019	% Change
Total Cattle	190.90	192.49	+0.8
Exotic/Crossbred			
Male	5.97	3.46	-42.0
Female	33.76	46.95	+39.1
Total Exotic/Crossbred	39.73	50.42	+26.9
Indigenous/Non-Descript			
Male	61.95	43.94	-29.1
Female	89.22	98.17	+10.0
Total Indigenous/Non-Descript	151.17	142.11	-6.0

Reasons for decrease in indigenous cattle population

- Mechanization of agriculture.
- Comparing indigenous cattle with crossbred/exotic only in terms of milk production by farmers.
- Shrinking grazing land for cattle.
- High cost of feed and fodder.
- Less milk production of indigenous cattle.
- Lack of interest in rearing indigenous cattle breeds among farming community.
- Surplus availability of milk in the market.
- High cost of production per litre of indigenous cattle milk.
- Biased policies promoting rearing crossbred cattle than indigenous cattle.
- Lack of adherence to breeding policy and indiscriminate cross breeding were the main causes for genetic erosion of indigenous cattle.

Cattle Genetic Resources

- Indian cattle (*Bos indicus*)
- Indian cattle also known as Zebu cattle are characterized by
  - Presence of hump
  - Long face
  - Upright horns
  - Drooping ears
  - Large dewlap
  - Slender legs
- They have good adaptation to tropical heat and resistance to diseases specially tick borne diseases.
- The basal metabolic rate is low and hence they have better capacity for heat dissipation through cutaneous evaporation.

- Exotic cattle (*Bos taurus*)
- Characterized by
  - High milk production
  - Humpless
  - Dewlap less developed
  - Can't withstand high temperature.
  - More prone to tick borne diseases
  - Used for upgrading purpose to improve milk production potentiality in India.
- Eg: Holstein-Friesian, Jersey, Brown-Swiss, Guernsey and Ayrshire etc.

Merits of Zebu and Taurus Cattle

Parameters	Zebu	Taurus
Hump	Present	Absent
Color	Shades of red, brown, white, black and grey	Brown, mostly black with white patches
Body size	Small	Large
Body weight	Less	More
Back	Slightly curved	Straight
Dewlap	More developed	Developed
Preference for shade	Yes	Relatively more
Feed intake	Less	More
Water intake	Less	More
Heat tolerance	More	Less
Resistance to diseases	More	Less
Weaning	Easy	Easier
Management	Relatively easy	Difficult

contd.....

Parameters	Zebu	Taurus
Age at maturity	24-36 months	15-18 months
Age at first calving	3-3 1/2 years	2 1/2 years
Calving Interval	18-24 months	13 months
Dry period	More than 60 days	Less than 60 days
Milk yield	Less	More
Composition (%)		
Water	86.4	87.5
Fat	4.5	3.6
Protein	3.7	3.5
Lactose	4.7	4.7
Minerals	0.7	0.7
Total solids	13.6	12.5
S.N.F	9.1	8.8

Classification of Indian Cattle Breeds

I. On the basis of utility
II. On the basis of type

Classification of Zebu cattle breeds on the basis of utility

- **Milk purpose**
- 1. Sahiwal
- 2. Red Sindhi
- 3. Gir
- 4. Tharparkar

Dual purpose

1.Deoni
2. Kankrej
3. Hariana
4. Mewati (Koshi)
5. Ongole
6. Dangi
7. Red Kandhari
8. Nimari
9. Siri
10. Krishna Valley
11. Rathi

Draught purpose

1. Amritmahal
2. Hallikar
3. Khillari
4. Kangayam
5. Bargur
6. Malvi
7. Kherigarh
8. Kenkatha
9. Nagori
10. Bachaur
11. Ponwar
12. Gaolao

SAHIWAL

- Best dairy breed of zebu cattle in the world
- **Synonym –**
  - Lola, Montgomery, Multani
- **Origin:**
  - Central and southern parts of Punjab
  - Montgomery district in Pakistan
- **Physical characters**
  - Body- Deep and heavy, short legs, loose skin
  - Head – broad with stumpy horns
  - Color – pale red, brownish red and shades of red
  - Naval flap – loose and hanging
  - Dewlap – voluminous
  - Udder - capacious
  - Tail: long and almost reaching the ground
  - Age at First Calving: 1200 days
  - Lactation Length: 320 days
  - Lactation milk yield: 2200 Kg
  - Inter calving period: 450 days

RED SINDHI

- **Synonym:** Red Karachi
- **Origin:** Karachi and Hyderabad districts of Sindh Pakistan
- **Physical Characters:**
  - Body: medium sized, compact and well proportioned. Heavy hump, dewlap and sheath
  - Colour : Deep red, Males are darker
  - Head: Occasional bulge
  - Horns: thick emerging laterally and blunt.
  - Udder: large and capacious
  - AFC: 1400 days
  - LL 300 days
  - LMY 1800 Kg
  - ICP 500 days

Gir

- **Origin**
  - Kathiawar district of Gujrat
  - Exported to Brazil and USA
  - Indubrasil: Gir X Kankrej
- **Physical characters:**
  - Body: Medium sized well proportioned
  - Head: Moderately long forehead prominent and bony, horns are big, curved and turning backwards
  - Ears are pendulous and curled with notch near tip (Curly leaf like)
  - Color: Red or yellowish red with red black patches
  - Tail: long and whip like reaching fetlock
  - AFC: 1500 days
  - LL:310 days
  - LMY: 2000 Kg
  - ICP: 500 days

THARPARKAR

- **Origin** - South west Sindh in west Pakistan, parts of Jaisalmer In India
  - Handsome cattle breed
- **Physical Characteristics:**
  - Body - medium sized, strong built short limbs, broad and flat forehead
  - Head - moderately long, forehead broad and slightly bulging, medium sized curving horns
  - Color - white or light grey and a line along the spine specially in younger animals
  - Udder - moderately developed
  - AFC 1250 days
  - LL 290 days
  - LMY 1600 Kg
  - ICP 450 days

RATHI

- **Origin:** Parts of Rajasthan

- **Physical characteristics:**
  - Admixture of Sahiwal, Red Sindhi and Tharparkar
  - Tolerance to heat, drought and resistance to diseases
  - Colour: Brown with white patches
  - Straight and broad face, deep chest, moderate hump, long and hanging dewlap
  - Horns: Short and stumpy
  - AFC:1500 days
  - LMY: 1600 kg
  - LL: 350 days
  - ICP: 550 days

HARIANA

- **Origin:** Rohtak Hissar, Gurgaon and Jind districts of Haryana
- **Physical characteristics-**
  - Body: compact, moderately long and proportioned
  - Head: carried high, short horns, curving upward and inwards, long and narrow face
  - Color: white and light grey
  - Forehead: black and bony prominence at poll
  - Udder: well formed and compact
  - AFC: 1400 days
  - LL : 270 days
  - LMY: 800 Kg
  - ICP : 550 days
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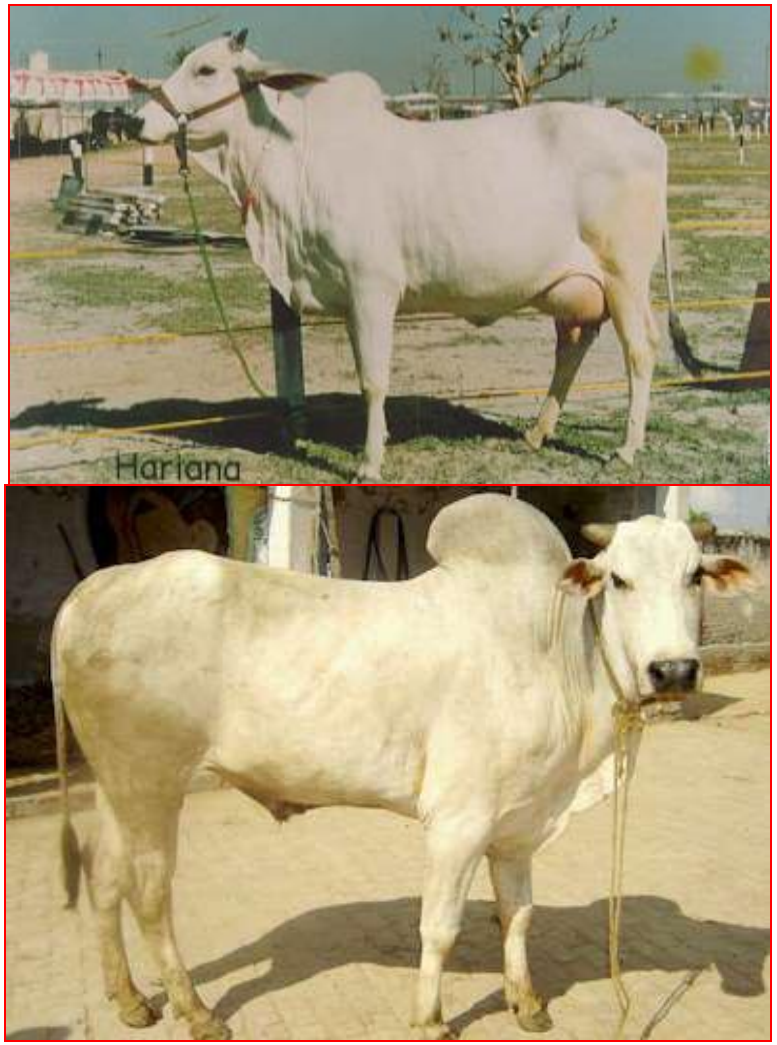


KANKREJ

- **Origin-** South East Rann of Kutch in Gujrat
- **Physical characteristics:**
  - Body - heaviest of Indian cattle, powerful
  - Head- broad, forehead is dished in centre, curved horn in lyre shape with pointed tips
  - Color: White, grey with silver grey markings on hind and forelegs
  - Hump : well developed
  - Gait - Sawai Chal
  - Udder: Moderately developed
  - AFC: 1500 days
  - LL : 290 days
  - LMY: 1600 Kg
  - ICP: 550 days

DEONI

- **Origin-** North west part of Hyderabad Marathwada region of Maharashtra, parts of Karnatka
- **Physical Characters:**
  - Resembles Gir and Dangi Forehead Slightly bulged between horns
  - Colour: black and white to red and white with irregular patches
  - Ears: pendulous, without notch near the tip
  - Well developed dewlap and sheath
  - AFC: 1300 days
  - LMY: 900 Kg
  - LL :300 days
  - ICP: 447 days

KHILLARI

- **Origin:** Kolhapur, Solapur, Sangali and Satara districts of Maharashtra.
- **Physical Characters**
  - Strong built and compact body, long and lean face
  - Massive head and a distinct groove runs in the centre of the forehead.
  - Color - White or grey Horns curve backward for half the length and then turn forward in a peculiar fashion.
  - AFC: 1500 days
  - LL: 190 days
  - LMY: 500 Kg
  - ICP: 540 days

DANGI

- **Origin:** Hills of Maharashtra and Gujarat
- **Physical Characteristics:**
  - Medium sized small head, ears small with short horns.
  - Colour - broken red and white or black and white.
  - Horns : Thick and short
  - Skin, Muzzle, Eyelids, Switch and hooves are black
  - Skin secrets oily secretions which protects from heavy rain and insect bites.
  - AFC 1351 days
  - LMY 550 Kg

MALVI

- **Origin:** Parts of MP and Rajasthan
- **Physical Characteristics:**
  - Medium sized, dual purpose breed deep and compact body conformation
  - Colour is grey to darker grey and extremities black
  - Head short and broad
  - Horns are strong and pointed
  - Ears held in **horizontal orientation**
  - Legs are short and stout
  - AFC 1500 days
  - LL 300 days
  - LMY 1100 Kg
  - ICP 450 days

ONGOLE

- **Origin:**
  - One of the oldest breed of the country
  - Distributed in south coastal districts of AP
  - Named as Nellore in Brazil
  - Ongole animals have been imported by USA, Brazil, Sri Lanka, Jamaica, Australia and Switzerland
  - Their hardness, disease resistance capacity to thrive on scanty and dry fodder have been quite helpful in evolving suitable beef breeds in in other countries
- **Physical characters:**
  - Body - large, heavy with massive and long limbs
  - Head - forehead broad
  - Color - white with dark grey markings on head, neck and hump of male, black points on knee and pasterns.
  - Dewlap - large, fan shaped flashy, pendulous, hanging in folds, extending upto navel flap
  - Udder - well developed and not pendulous

AMRITMAHAL

- **Origin:** Distributed in Chickmangalur, Chitradurga, Davanagere, Hasan, Shimoga, and Tumkur districts of Karnataka.
- **Physical Characters**
  - Body – Medium sized ,compact, short back with bright eyes
  - Horn - typical long sweeping horns,
  - Head- prominent forehead, depressed in the centre, narrow face.
  - Color – white to grey
  - Bullocks can plough on hard soil for 6-7 hrs at a stretch.
- A pair of bullocks can carry a load of 200- 250 kg on village roads and around 300- 350 kg on metal roads with pneumatic tyres.
  - AFC 1337 days
  - LMY 572 Kg
  - LL 299 days
  - ICP 577 days

HALLIKAR

- **Origin :** Distributed in almost all the districts of South Karnataka, Andhra Pradesh and Tamilnadu
- **Physical Characters**
  - Medium sized breed with prominent forehead and short hump with small ears and eyes
  - Color - grey with deep shadings on the fore and hind quarters
  - Horns are long that emerge in proximity to each other near the top of the poll and are carried backward, straight for nearly half their length and then with a forward ending in pointed tips
  - AFC 1400 days
  - LMY 700 Kg
  - LL 270 days
  - ICP 600 days

KANGAYAM

- **Origin** – Kangayam taluk of Coimbatore, T.N.
- **Physical Characters:**
  - Medium sized breed with straight face, broad forehead, strong dewlap and short ears.
  - Color - grey or white in cows; Bulls are grey with dark color on hump, face, fore and hind quarters and legs
  - Horns - Long and strong curving outward and backward then inward, thus nearly completing a circle i.e. Cobra hood like horn pattern
  - AFC 1400 days
  - LL 260 days
  - LMY 700 Kg
  - ICP 500 days

UMBLACHERY

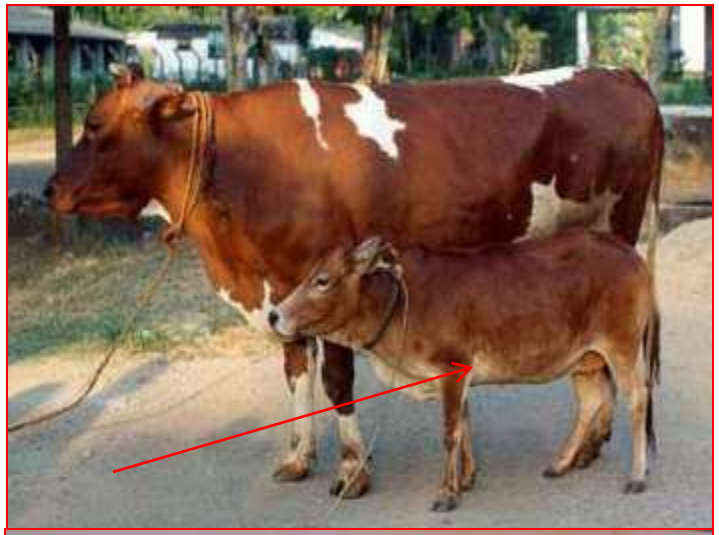
- **Origin:** Coastal plains of T.N
- **Physical characteristics:**
  - Very similar to Kangayam except being smaller
  - Suitable for wet ploughing
  - Colour- Dark grey with white patches mostly on face and legs
  - White star is present is present on the forehead
  - Straight face, short ears, broad forehead
  - AFC: 1600 days
  - LMY : 500 Kg
  - LL : 260 days
  - ICP : 450 days

PUNGANUR

- **Origin** - Chittoor district of Andhra Pradesh
- **Physical Characters**
  - Dwarf type and smaller in stature
  - Color - white, light brown to dark brown
  - Horns - black, small and crescent shaped
  - Dewlap is extensively hanging Legs are short and thin Body is long with well sprung ribs. Tail is long almost touching the ground
  - LMY: 600 Kg

VECHUR

- **Origin-** Sothern Kerala Has good adaptability to hilly terrain and high rainfall ecosystem, high disease resistance
- **Physical characters:**
  - Miniature type cattle
  - Color -light red, black or fawn sometimes white
  - Head- small
  - Neck - thin and small
  - Tail - long and almost touching the ground
  - Udder - well developed, squarely placed with small tapering teats



Himachali Pahari

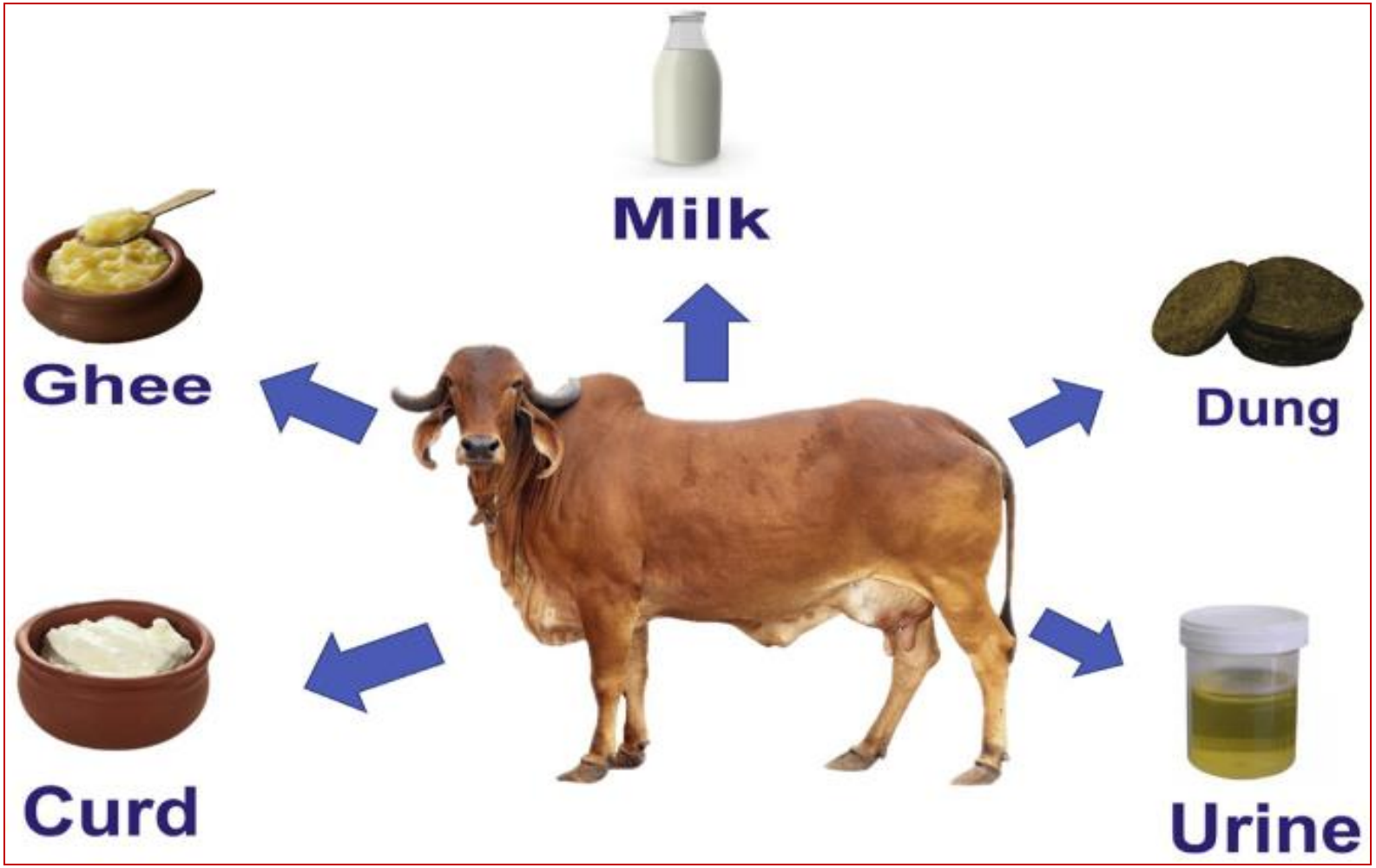
Himachali Pahari Cow

Himachali Pahari Cow

Himachali Pahari Bull

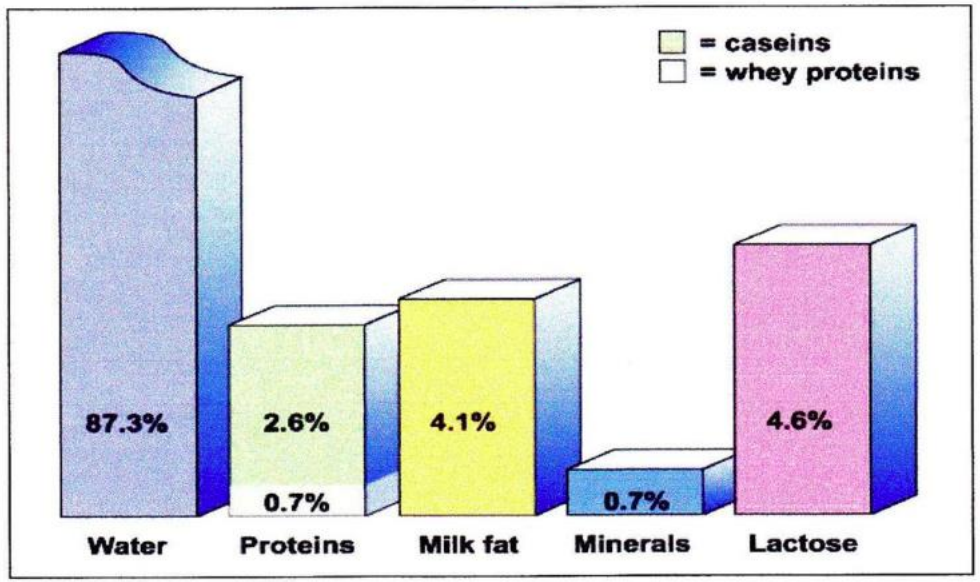
- **Importance of Indigenous Animals in Natural farming**
  - Milk
  - Cow dung
  - Cow urine
- Milk can be defined as the whole, fresh, clean, lacteal secretion obtained by complete milking of udder of one or more healthy milch animals, excluding that obtained with in 15 days before or 5 days after calving or such periods as may be necessary to render the milk practically colostrum free and containing the minimum prescribed percentages of milk fat and milk solids not fat (SNF).

Importance of Cows

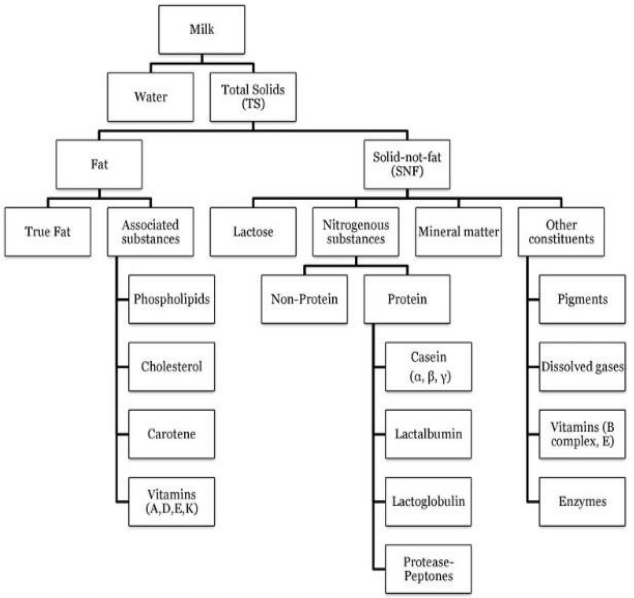


Bajaj et al., 2022

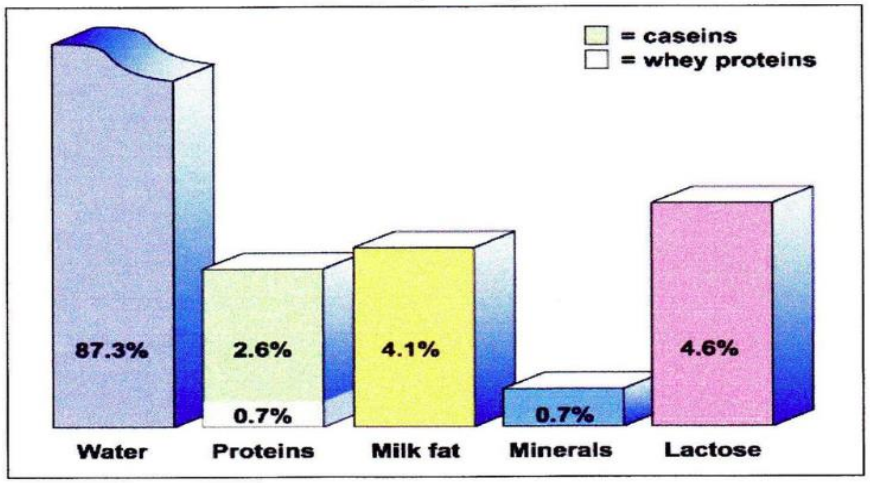
Milk composition

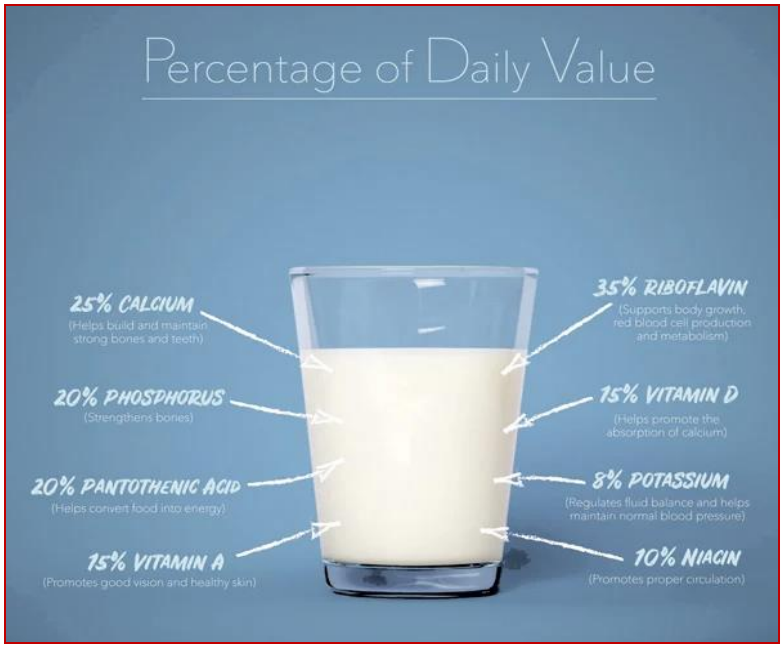


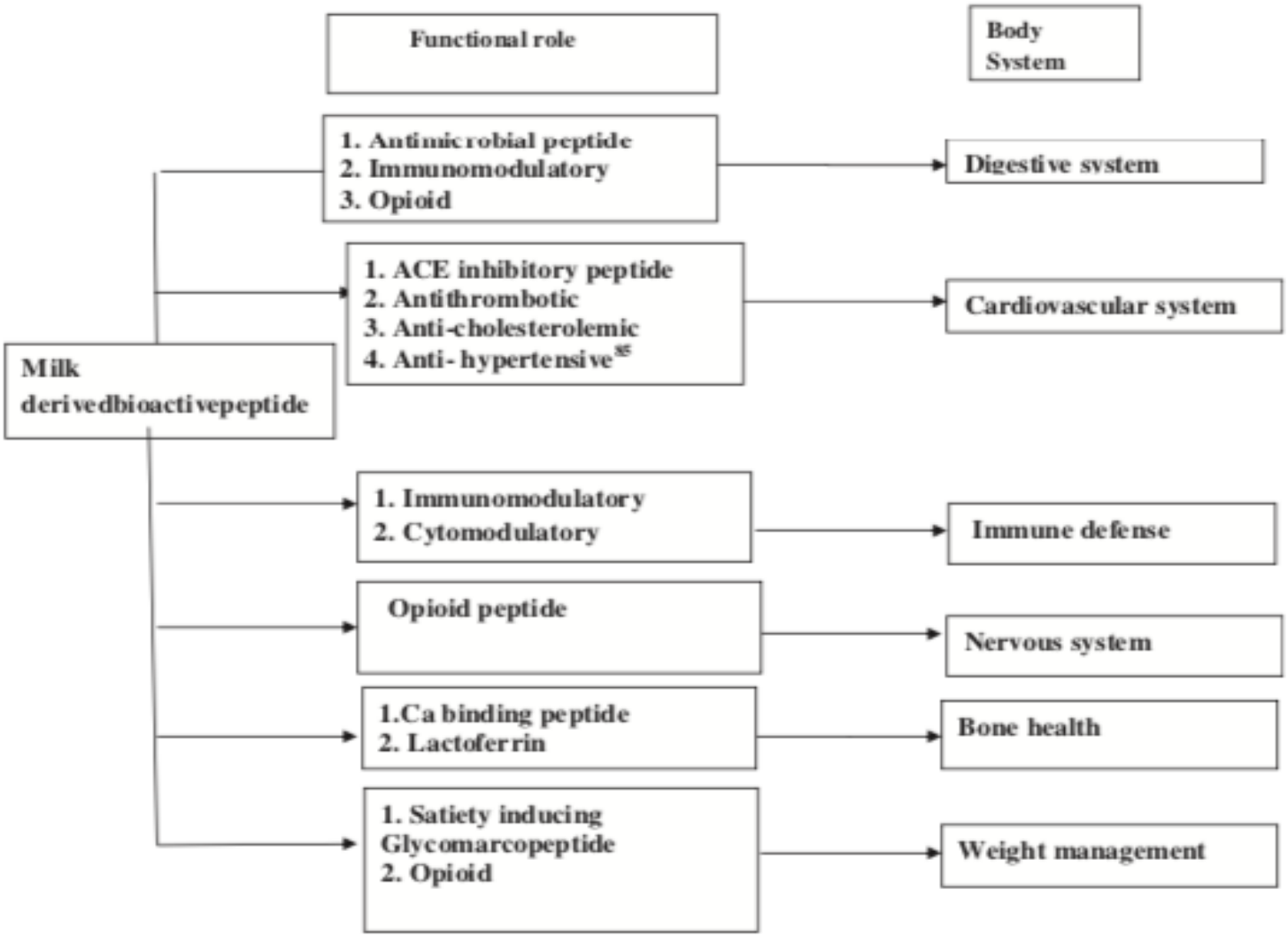
Milk Constituents



Milk composition



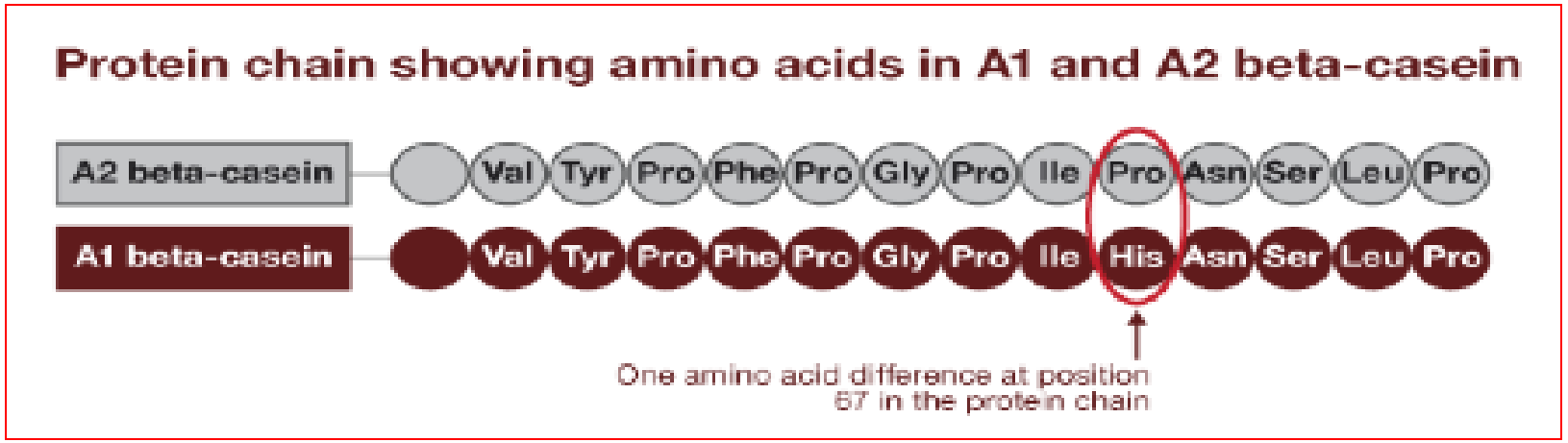


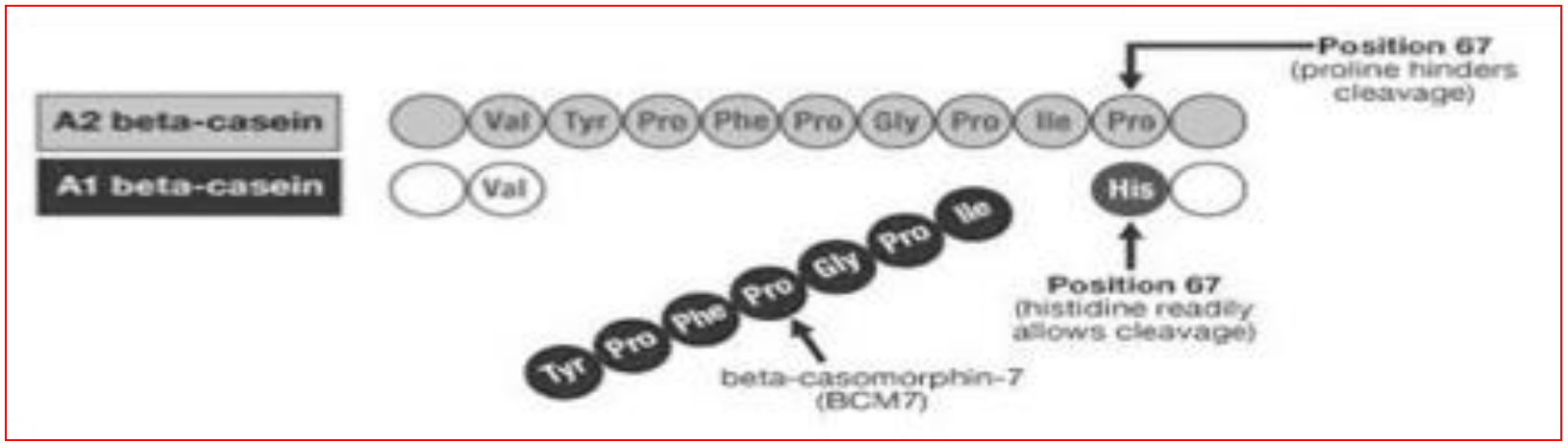


Role of milk derived bio peptides in body systems

Mohanty et al., 2016

A1 vs. A2 Milk





Behera et al., 2017

Health benefits of A2 Milk

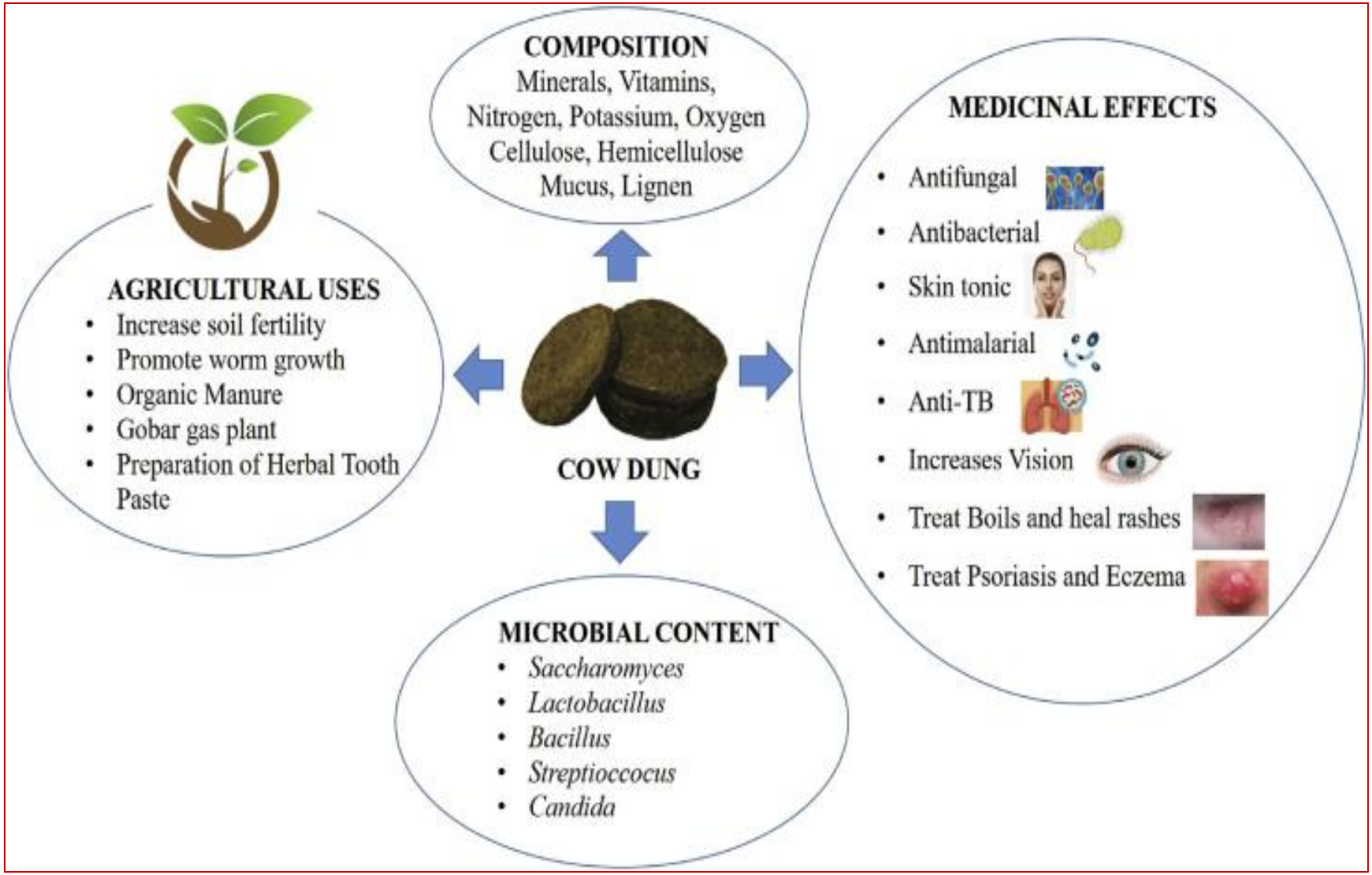
S.N	Health Issue	Therapeutic actions of A2 β-casein
1	GI disorders	1. Improves intraepithelial lymphocytes profile in human 2. Maintains the level of MPO (myeloperoxidase) activity 3. Increases intestinal SCFA level in mice through modulation of gut microbiota 4. Increases useful intestinal bacteria of the genus *Bifidobacterium* 5. Decreases abdominal pain
2	Endocrine disorders	1. Elevates the level of insulin receptor and improves the ability to manage glucose homeostasis
3	Age-related problems	1. Increases the level of GSH (Glutathione synthetase) in the blood 2. Neutralises some of the ageing-associated immune alterations
4	Cardiovascular disorders	1. Maintains LDL and HDL levels 2. Protects from CHD (Coronary Heart Disease)
5	Neurological disorders	1. Improves cognitive functions
6	Respiratory disorders	1. Decreases pulmonary inflammation

Semwal et al., 2022

Cow Dung

- Cow dung (CD) or cow manure is the waste product of bovine animal species.
- Cow dung is the undigested residue of plant matter which has passed through the animal's gut and includes water (80%), undigested residues (14.4%), and microorganisms (5.6%).
- The pH of the CD varies from 7.1- 7.4.
- The faecal matter is rich in crude fiber (indigestible cellulose, hemicelluloses, pentosans, lignin), crude protein, and 24 types of minerals including nitrogen (N), phosphorus (P), potassium (K), iron (Fe), sulfur (S), magnesium (Mg), calcium (Ca), cobalt (Co), manganese (Mn), chlorine (Cl) and sloughed off intestinal epithelium.

Cow dung Uses



Bajaj et al., 2022

Microbial diversity of Cow Dung

- The microbial diversity of cow dung has received the attention of biologists in recent times.
- The presence of naturally occurring beneficial microorganisms, predominately bacteria (bacilli, lactobacilli, and cocci), and some actinomycetes, fungi, and yeast have been reported in cow dung (Radha and Rao 2014; Sharma and Singh, 2015).
- Cow dung harbours a rich microbial diversity containing almost 100 species of bacteria (i.e. *Bacillus sp*., *Lactobacillus spp*., *Corynebacterium spp*.), fungi (*i.e*. *Aspergillus*, *Trichoderma*), 100 species of protozoa and yeasts (*i.e. Saccharomyces* and *Candida*) (Gupta *et al.*, 2016; Bhatt and Maheswari, 2019).

Diversity and Distribution of microorganisms in cow dung

Microbial strains	References
Bacillus cereus, Bacillus Subtilis	Muhammad and Amusa (2003)
Paenibacillus favisporus	Velazquez et al. (2004)
Bacillus subtilis	Swain et al. (2012)
B. pumilus, B. macereans, B. sphearicus, B. laterosporus, Micrococcus varians, Proteus mirabilis, E. aerogens	Adegunloye et al. (2007)
Pseudomonas spp., *Bacillus* spp.	Akinde and Obire (2008)
Enterobacter spp., *Rahnella* spp.	Fuentes et al. (2009)
Citrobacter spp.	Pandey et al. (2009)
Pseudomonas jessenii, P. synxantha	Srivastava et al. (2010)
Thermoanaerobacterium thermostercus	Romano et al. (2010)
Ruminococcus sp., *Enterococcus casseliflavus/gallinarum*	Wahyudi et al. (2010)
Bacillus sp.	Teo and Teoh (2011)
Clostridium cellulosi	Carillo et al. (2012)
Bacteroides, Fermicutes, Proteobacteria	Girija et al. (2013)
Lysinibacillus xylanilyticus, B. licheniformis, B. subtilis, B. cereus	Radha and Rao (2014)
Pseudomonas xanthomarina, P. stutzeri, and Bacillus niacin	Das et al. (2017)
Pseudomonas otitidis, Stenotrophomonas korensis, Serratia marcescens	Vyas and Kumar (2018)
Bacillus cereus	Croos et al. (2019)
Proteus mirabilis	Dhiman et al. (2019)

Dhiman et al., 2021

Table 1 — Microbial populations in *Jaivik krishi* inputs used in organic agriculture

S. No.	Organic formulations	Total Bacterial Count (cfu/mL)	Total Fungal Count (cfu/mL)	Total Actinomycetes Count (cfu/mL)
1.	Jeevamrut (JA)	6.33×10^8	0.51×10^5	3×10^5
2.	Panchagavya (PG)	14.9×10^8	5.8×10^5	8×10^5
3.	Silica in Panchgavya (SiPG)	7.6×10^8	0.15×10^5	1.25×10^5
4.	Matka khad (MK)	9.32×10^8	0.76×10^5	4.1×10^5
5.	Bhabhut Amrit pani (BAP)	7.01×10^8	0.6×10^5	0.7×10^5
6.	Beejamrit (BA)	5.16×10^8	0.7×10^5	0.6×10^5
7.	Fafundnashi (FN)	3.98×10^8	0.05×10^5	3.5×10^5
8.	Dasparni (DP)	9.65×10^8	1.15×10^5	4.8×10^5
9.	Vermiwash (VW)	3.7×10^8	0.26×10^5	2.9×10^5
10.	Silica enriched Vermiwash (SiVW)	1.15×10^8	0.415×10^5	4.15×10^5
11.	Compost tea (CT)	0.23×10^8	1.2×10^5	0.65×10^5
12.	Silica enriched compost tea (SiCT)	6.1×10^8	0.025×10^5	0.15×10^5
13.	Teekha sat (TS)	0.05×10^8	0.05×10^5	0.2×10^5
14.	Gomutra (GM)	0.2×10^8	0.6×10^5	0.29×10^5

Sharma et al., 2021

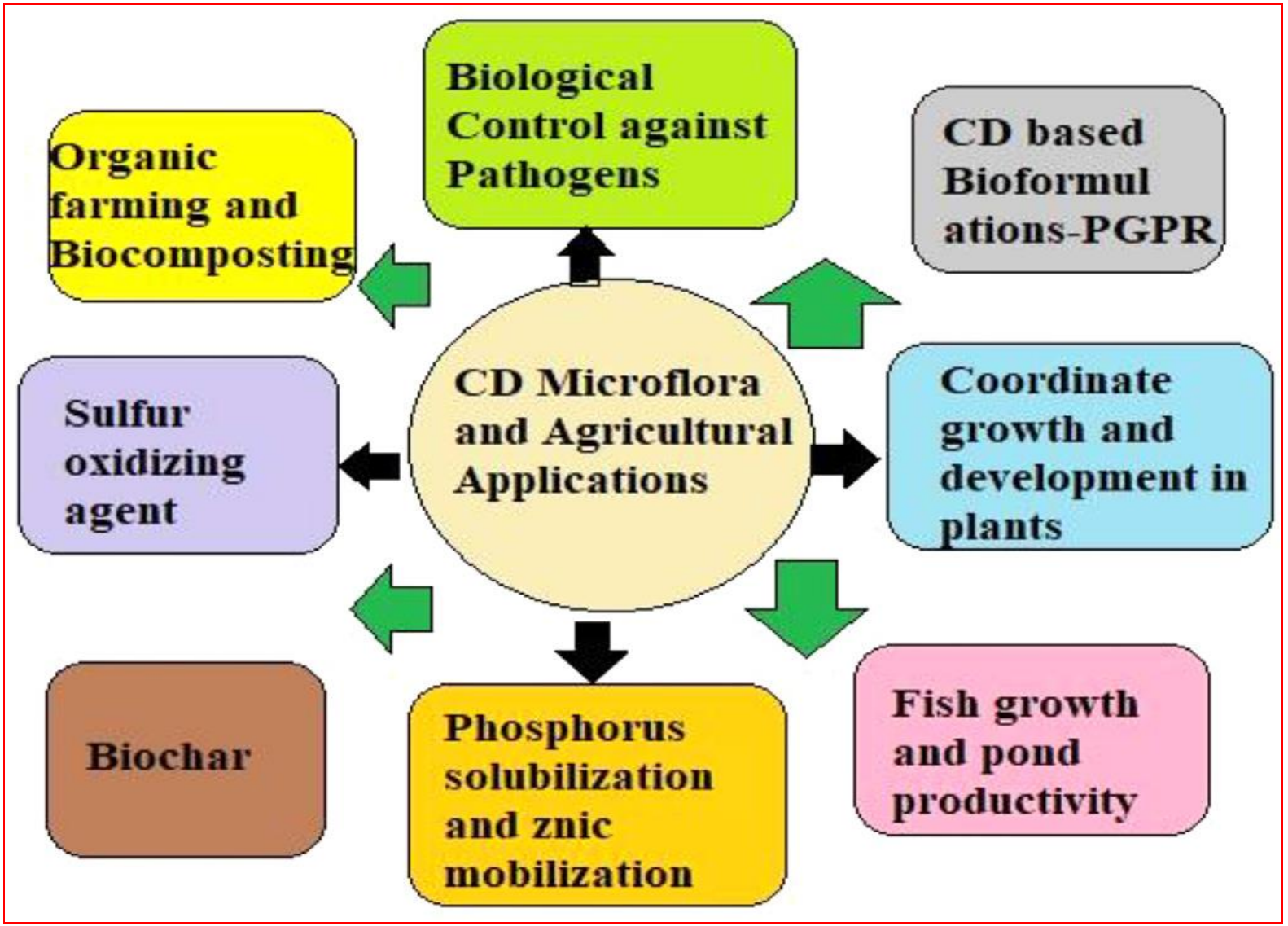
Table 2: Microbial population in different organic preparations at different time intervals

Microbial groups	Amritpani (cfu ml^{-1})	Jeevamrita (cfu ml^{-1})	Panchagavya (cfu ml^{-1})	Vermiwash (cfu ml^{-1})
Bacteria (on Nutrient agar)	$24x10^7$ (0 DAP)	$288 x10^7$ (6 DAP)	$125x10^7$ (21 DAP)	$4x10^7$ (15 DAP)
Fungi	$1.2x10^5$ (0 DAP)	$44.2 x10^6$ (14 DAP)	$4 x 10^5$ (4 DAP)	nil
Actinomycetes	$85.4 x 10^7$ (> 25 DAP)	$65 x10^6$ (>25 DAP)	$8 x10^6$ (20 DAP)	$10.4 x10^5$ (15 DAP)
G^+ bacteria	$17x10^7$ (3 DAP)	$47 x 10^7$ (>25 DAP)	$12 x 10^7$(25 DAP)	$36.5 x 10^6$ (15 DAP)
G^- bacteria	$50 x10^7$ (9 DAP)	$11.9 x10^7$ (6 DAP)	$35.8 x10^6$ (20DAP)	$12 x10^5$ (15 DAP)
Pseudomonas	$48x10^6$ (14 DAP)	$12.6 x 10^7$ (3 DAP)	$57 x10^6$ (20 DAP)	$10 x10^4$ (15 DAP)
Rhizobium	$16.4 x10^5$ (20 DAP)	$35 x10^8$ (3 DAP)	$67.4 x10^5$ (3 DAP)	$7 x 10^3$ (15 DAP)
P-solubilizing	$68x 10^7$ (9 DAP)	$78 x 10^5$ (3 DAP)	$21.3 x 10^5$ (25 DAP)	$60 x10^3$ (15 DAP)
Azotobacter	$29.7 x10^6$ (0 DAP)	$51 x 10^5$ (>25 DAP)	$45 x 10^5$ (0 DAP)	$14 x 10^4$ (15 DAP)
Azospirillum	$2.01 x10^6$ (0 DAP)	$9 x10^5$ (0 DAP)	$16 x10^4$ (20 DAP)	$7 x 10^3$ (15 DAP)

*DAP-Days after Preparation

Ram et al. 2022

Agricultural applications of cow dung Microflora



Behera and Ray, 2021

Cow Urine

- Cow urine, popularly known as **"Gomutra,"** is well known for its germicidal, antibiotic, antimicrobial, and medicinal properties that are evident from ancient Ayurveda.
- It can inhibit *Salmonella typhi, Escherichia coli, Pseudomonas aeruginosa, Staphylococcus epidermidis, Streptococcus pyogenes*, and many more.
- A healthy cow produces 6-10 L of urine a day. A farmer rearing two cows at home will benefit from 4380L of urine annually, which equals 65kg of nitrogen or 136kg of urea.
- Only 20% of the nitrogenous material consumed by cows is absorbed while 52% of the dietary nitrogen intake is expelled in cow urine and 28% in cow dung.
- Cow urine is an aqueous solution of nitrogenous compounds and trace minerals; it has low level carbon (C) concentrations with a pH of 7.5–8.5.
- It contains 95% water with urea (2.5%) and trace mineral salts (2.5%), including plant enzymes and hormones.
- Apart from urea, which constitutes a major portion of the total nitrogenous material excreted (69%), cow urine also contains 5.8% hippuric acid, 7.3% allantoin, 3.7% creatinine, 1.3% uric acid, 2.5% creatine, 0.5% hypoxanthine, 2.8% ammonia, and 1.3% free amino acid N.
- The presence of creatinine, urea, phenols, calcium, and manganese contributes to the germicidal property of cow urine.

Properties of Cow Urine

Table 1 Properties of cow urine.

S. no.	Constituents	Concentration
1	pH	7.4–8.4[a]
2	Specific gravity	1.025–1.045[a]
3	EC	>23.7 mS/cm[b]
4	Urea nitrogen	23,000–28,000 mg/L per day[a]
5	Total nitrogen	6800–21,600 mg/L per day[a]
6	Ammonia nitrogen	1000–1700 mg/L per day[a]
7	Allantoin	770–3400 mg/L per day[c]
8	Calcium	100–140 mg/L per day[a]
9	Chloride	10–110 mg/L per day[a]
10	Creatinine	15–20 mg/L per day[a]
11	Phenols	4.7580 mg/100 mL[a]
12	Urea	440 mg/L[c]
13	Hippuric acid	5.96–8.93 mg/L[c]
14	Total phosphorous	305 mg/L[d]
15	Amylase	90.236 units[a]
16	Magnesium	3.7 mg/L per day[a]
17	Potassium	14.4–27 mg/L per day[a]
18	Sodium	4300–6100 mg/L per day[a]
19	Ammonia	20 mg/L[c]
20	Sulfate	3–5 mg/L per day[a]
21	Uric acid	150–530 mg/L per day[c]
22	Leucocyte	<15 μL[a]

Devasena and Sangeetha, 2022

Composition and medicinal effects of cow urine

Constituent	Formula	Health benefits and medicinal effects
Iron	Fe	Formation of RBCs and hemoglobin
Calcium	Ca	Blood purification; maintains bone strength
Copper	Cu	Prevent deposition of fats
Phosphate	P	Prevent formation of stones in the urinary tract
Manganese	Mn	Germicidal effects; prevent gangrene
Potassium	K	Increase appetite; reduce muscle weakness; cures hereditary rheumatism.
Sulphur	S	Blood cleanser; improve bowel movement
Nitrogen	N_2, NH_2	Regulates kidney function; prevent abnormalities in the blood; diuresis
Sodium	Na	Blood purification; antacid
Ammonia	NH_3	Enhance blood formation; maintains bile and mucus
Carbolic acid	HCOOH	Germicidal effects; prevent gangrene
Aurum Hydroxide	AuOH	Improves immunity system; antibiotic; anti-toxic
Creatinine	$C_4HgN_2O_2$	Germicidal action
Hipuric acid		Helps in the excretion of toxins in urine
Lactose	$C_6H_{12}O_6$	Reduce nervousness; strengthen the heart
Urea	$CO(NH_2)_2$	Increase urine formation; germicidal effect
Uric Acid	$C_5H_4N_4O_3$	Diuretic effect; help to maintain good heart health
Water	H_2O	Maintains fluidity of blood and body temperature

Bajaj et al., 2022

Effects of Cow Urine on crops

- Growth parameters
- Nutrient content and uptake
- Physical and Chemical properties of soil
- Soil microbiology
- Biopesticides

Pradhan et al., 2018

Conclusion

- The population of Indigenous cattle in India is declining day by day mainly due to unawareness of their importance.
- The indigenous cattle are well adapted to different agroclimatic zones of country and are best suited under low input low output system.
- In addition to providing nutritious A2 type of milk, they immensely contribute in improving the socioeconomic status of the farmers through draught power and providing manure.
- Important microorganisms has also been recorded in the dung of these animals which in turn helps in improving the soil fertility.