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From waste to wealth: Livestock in particular indigenous cattle as the foundation of natural farming

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Abstract

Livestock serve as the vital biological and economic engine of natural farming systems, reintegrating animal husbandry with crop cultivation to establish closed-loop, self-sustaining nutrient cycles. By shifting the role of domestic animals—particularly indigenous cattle (*Bos indicus*)—from mere producers of dairy to decentralized bioreactors, natural farming leverages fresh dung and urine to synthesize key microbial inoculants, soil enrichers, and bio-pesticides (such as *Jeevamrita*, *Bijamrita*, *Ghanjeevamrita*, and botanical formulations). These livestock-derived bio-inputs inject a rich, diverse rumen microbiome into depleted soils, accelerating organic carbon sequestration, enhancing aggregate stability, and improving moisture retention without synthetic chemicals. Furthermore, on-farm input generation helps to eliminate recurring expenses on commercial fertilizers, mitigating debt risks for smallholders. Coupled with crop residue utilization and secondary revenue streams from mixed-species rearing, livestock-integrated natural farming delivers a scalable model for long-term ecological restoration, soil health, and farm economic resilience.

Keywords: Livestock, Cattle, Natural Farming, Urine, Dung etc.

1. Introduction

Livestock serve as the primary biological engine of natural farming systems. In traditional chemical-intensive agriculture, livestock production and crop cultivation are often decoupled, creating isolated nutrient cycles and environmental waste. In India the huge bovine base 303.76 million cattle and buffaloes. In particular cattle, India is home to approximately 142.11 million indigenous and non-descript cattle (*Bos indicus*), which make up roughly 73.45% of the country's total 193.46 million cattle population. While exotic and crossbred animals account for the remaining 26.55% (51.36 million), native breeds remain the backbone of rural, smallholder farming ecosystems which provides a continuous supply of fresh cow dung and urine. These are the primary ingredients used to prepare fermented bio-enhancers like *Jeevamrut*, *Beejamrut*, and *Ghanjeevamrut*, which introduce millions of beneficial soil microbes to activate nutrient cycling. In addition to this Panchagavya serves as a multi-functional input. Natural farming systems re-integrate animals directly into the farm ecosystem. Rather than viewing livestock solely as end products for dairy, milk and milk products, etc. natural farming uses them as decentralized bioreactors. They process local biomass into microbial inoculants, organic matter, and botanical crop protection agents, effectively closing ecological nutrient loops without reliance on synthetic off-farm inputs.

Microbial Inoculation and Rumen Microbiome

The digestive tract of ruminants, particularly Cattle indigenous breeds (*Bos indicus*), hosts a complex, highly diverse consortium of beneficial microorganisms. Indigenous breeds possess specialized physiological adaptations, including higher populations of cellulolytic and nitrogen-fixing bacteria in their gut and dung compared to crossbred counterparts. When applied to the land, fresh dung and urine act as vectors, introducing these beneficial microorganisms back into depleted soils. These microbes synthesize plant growth-promoting substances (auxins, gibberellins) and trigger the mineralization of bound soil nutrients.

Composition of Waste i.e Urine and Dung:

Urine (*Bos indicus*) consists primarily of roughly 95% water, 2.5% urea, and 2.5% a complex mixture of minerals, salts, hormones, and enzymes. The composition features trace elements including nitrogen, sulfur, ammonia, iron, copper, and calcium, in addition to vitamins A, B, C, D, and E.

Indigenous cow dung (*Bos indicus*) is primarily composed of water (75–80%), undigested plant fiber (cellulose, hemicellulose, and lignin), organic carbon, and rich microbial populations. It contains vital macro-nutrients like nitrogen (0.3–1.8%), phosphorus (0.15–1.0%), and potassium (0.10–3.0%), alongside micro-nutrients such as calcium, magnesium, and trace minerals.

Nutrient Cycling and Soil Structure

Livestock manure provides the primary source of organic carbon required to feed native earthworms and saprophytic

fungi. Regular application of livestock-derived preparations improves:

- **Soil Organic Carbon (SOC):** Accelerates humus formation and carbon sequestration. Regular application of livestock manure and dung-based formulations increases soil organic matter.
- **Aggregate Stability:** Fungal hyphae and bacterial glues (glomalin) bind soil particles, reducing erosion.
- **Water Retention Capacity:** Increased organic matter improves macro-porosity, allowing soils to retain moisture during drought periods.

Livestock-Based Bio-Inputs and Formulations

Natural farming helps to replace chemical fertilizers and synthetic pesticides with farm-made formulations prepared using livestock byproducts.

Table 1: Important Livestock-Based Bio-Inputs and Formulations

Formulation	Composition	Primary Function & Application
Panchagavya	Cow dung, cow urine, milk, curd, and ghee—often supplemented with natural additives like jaggery, tender coconut water, ripe bananas, and water to accelerate microbial multiplication and improve palatability	30-day anaerobic and aerobic fermentation process after which applied as a foliar spray (typically diluted at 3%) or introduced through irrigation. Panchagavya serves as a multi-functional input. It acts as a powerful bio-fertilizer and bio-enhancer that stimulates root development, accelerates plant cell division, and induces dense flowering and fruiting
Jeevamrita	Fresh cow dung, cow urine, jaggery, pulse flour, undisturbed virgin soil	Microbial Culture: Fermented liquid applied via irrigation or foliar spray to stimulate soil biological activity.
Bijamrita	Cow dung, cow urine, slaked lime, native soil	Seed Treatment: Bio-coating for seeds and roots to protect against seed-borne and soil-borne pathogens.
Ghanjeevamrita	Sun-dried, fermented cow dung enriched with urine and pulse flour	Basal Soil Enrichment: Solid formulation applied during field preparation for slow-release microbial activity.
Pest Formulations (e.g., Neemastra, Agniastra)	Cow urine fermented with crushed neem leaves, garlic, green chilies, and toxic botanical extracts	Bio-Pesticides: Bio-degradable crop protection sprays targeting sucking pests and caterpillars.

These formulations Jeevamrita (a liquid microbial spray) and Ghanjeevamrita (a sun-dried basal soil amendment) activate nutrient cycling, while Bijamrita serves as a protective seed coating against early pathogens. Panchagavya serves as a multi-functional input. Complementing these, the botanical preparations like Neemastra and Agniastra act as biodegradable bio-pesticides against sucking pests and caterpillars, offering smallholders an accessible, closed-loop approach to resilient and chemical-free agriculture.

Cost Reduction and Self-sufficiency

The inclusion of livestock dramatically reduces input costs for smallholder farmers. By manufacturing inoculants directly on the farm using dung and urine, farmers eliminate recurring expenditure on commercial fertilizers and chemical pesticides, reducing debt risks and achieving operational self-sufficiency.

Diversified Income Streams and Risk Mitigation

Integrating mixed-species livestock (ruminants, small ruminants, poultry) offers safety nets against climate-induced crop failures:

- **Direct Revenue:** Sale of milk, eggs, wool, or live animals provides steady cash flow outside seasonal harvest cycles.
- **Biomass Utilization:** Livestock convert crop residues (straw, stover, husk) that are otherwise burned into valuable soil inputs.

Conclusion

Livestock in particular indigenous cattle is an irreplaceable

element of natural farming systems, in particular Indigenous cattle (*Bos indicus*) are the vital engine of natural farming, serving as decentralized bioreactors that turn dung and urine into soil-enriching bio-inputs. By restoring soil biology, improving water retention, and replacing synthetic chemicals, this integrated model drastically reduces input costs and debt risks for smallholders. Ultimately, livestock-driven natural farming bridges ecological health with economic self-reliance, offering a scalable path to climate-resilient agriculture.

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