CELEBRATING DAIRY: NOURISHING PEOPLE AND THE PLANET

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ABSTRACT

This article explores the multifaceted role of dairy in nourishing both people and the planet. It highlights dairy's nutritional value as a source of essential vitamins and minerals, its importance in supporting global food security, and its contribution to economic livelihoods, particularly in rural and developing communities. The piece also addresses the dairy industry's evolving efforts toward sustainability, including innovations in climate-smart farming practices and resource efficiency. As the world seeks sustainable and nutritious food solutions, dairy emerges as a key player in balancing human health, environmental responsibility, and economic development. Through informed consumer choices and continued innovation, dairy can remain a vital component of a resilient and sustainable food system

KEYWORDS: Dairy nutrition, food security, sustainable agriculture, dairy farming, climate-smart practices, rural livelihoods, global nutrition, environmental sustainability, milk production, community development, dairy industry, sustainable food systems, nutrient-rich foods, dairy innovation, carbon footprint reduction.

INTRODUCTION

Dairy has been a part of human civilization for thousands of years — from ancient pastoral societies to modern-day farms, milk and its byproducts have nourished generations. Today, dairy continues to be a cornerstone of global nutrition, offering essential nutrients that support health and well-being at every stage of life. But dairy's significance goes far beyond the kitchen table. It sustains the livelihoods of over a billion people worldwide, plays a key role in rural economies, and is evolving to meet the demands of a changing planet. As the world grapples with challenges like climate change, malnutrition, and food insecurity, the dairy sector stands at a unique crossroads — one where tradition meets innovation, and where sustainability is not just a goal, but a growing reality. This article explores how dairy not only nourishes individuals but also contributes to healthier communities and a more sustainable world.

From the first splash in your morning coffee to the creamy delight of an evening dessert, dairy is a part of daily life for billions of people across the globe. But dairy is much more than just a source of nourishment — it's a symbol of community, sustainability, and a vital thread in the fabric of food security. As we celebrate dairy, it's worth exploring how this age-old food source continues to nourish both people and the planet.

A GLOBAL SUPERFOOD

Dairy is one of nature's most nutrient-dense foods. Milk, yogurt, cheese, and other dairy products provide essential nutrients such as calcium, protein, vitamin D, potassium, and B vitamins — all critical for growth, bone health, and overall wellness. For children, dairy supports development. For adults, it strengthens immunity and helps maintain muscle and bone mass. In fact, just one glass of milk contains 13 essential nutrients — a small package with a big impact.

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SUPPORTING FARMERS AND COMMUNITIES

Behind every glass of milk is a story — one of farmers rising before dawn, of generations carrying forward tradition, and of families whose livelihoods depend on dairy. Globally, over **1 billion people** are supported by the dairy sector through farming, processing, distribution, and retail.

In many developing regions, dairy farming is a lifeline. Smallholder farmers, particularly women, rely on dairy to feed their families and earn income. These small farms help reduce poverty, enhance food security, and empower communities. When we choose dairy, we're often supporting local economies and sustainable livelihoods.

SUSTAINABILITY IN ACTION

There's a growing conversation about food and climate — and rightly so. The dairy industry is responding with innovation and commitment. Many dairy farmers are adopting **climate-smart practices** like rotational grazing, precision feeding, and renewable energy use. These strategies help reduce emissions, protect natural resources, and increase the efficiency of milk production.

For example, compared to 50 years ago, producing a liter of milk today uses **less land, less water**, and creates significantly **fewer greenhouse gas emissions** — a testament to how tradition and technology can go hand in hand.

A ROLE IN SUSTAINABLE DIETS

As the global population grows, the need for sustainable, nutritious diets becomes more urgent. Dairy plays a pivotal role. It's efficient to produce, widely accessible, and rich in high-quality protein. And because dairy products can be stored and transported in various forms — fresh, dried, fermented — they provide food resilience in both rural and urban settings.

Efforts to improve packaging, reduce waste, and enhance animal welfare are also helping dairy align with the goals of a more sustainable food system.

THE FUTURE OF DAIRY

Looking ahead, the dairy industry is embracing innovation — from **robotic milking systems** and **AI-driven herd management** to **carbon-neutral farms** and **plant-dairy hybrids**.

These advancements are not just about productivity; they're about caring for the land, animals, and people involved in the journey from farm to fridge.

As consumers, we have the power to support sustainable choices. By choosing responsibly sourced dairy, we are making a statement: that nourishment should be good for us, and good for the Earth.

THE MILK WE DRINK, FOOD FOR THOUGHT

Milk and dairy products are an increasingly important part of people's diets worldwide, providing essential nutrients like protein and calcium. Over half of the global population drinks milk or eats dairy products every day, and these products now make up about 30%–50% of daily calorie intake. Interestingly, milk only became a common daily food in northern Europe about 70 years ago. Before then, people mostly used milk from local farms to make butter and cheese from the sour milk left over. In the past, a typical cow produced about 600 kg of milk per lactation, but today cows can produce between 6,000 and 8,000 kg. Global milk production is currently estimated at over 600 million tons and is growing fast.

To meet the increasing demand for milk, traditional farming methods have shifted to commercial, high-production systems. In traditional farming, cows would graze on grass, mate naturally, and after a 280-day pregnancy, they would produce milk for about 5 or 6 months to feed their calves, giving about 5 liters of milk per day. In contrast, modern farming uses artificial insemination when the cow is 12 to 14 months old. After giving birth, the calf receives colostrum (the first milk) for 5 days, and then the cow is milked every day for 300 days. Two to three months after giving birth, the cow is inseminated again and continues to produce milk while pregnant. About 60 days before the next delivery, milking stops during what's called the "dry period." This modern cycle means that cows are milked for 10 months of the year, with about 7 months of that time while pregnant. As a result, around 75% of the milk produced in industrialized countries comes from pregnant cows.

Sex hormones from the placenta, such as estrogen and progesterone, are found in measurable amounts in cow's milk. In fact, cows

that produce a lot of milk have higher hormone levels in their milk than in their blood, and pasteurization does not remove these hormones. Dairy products are the main source of animal-derived estrogens for humans, making up 60%–70% of our total intake. The most common estrogen in milk is estrone sulfate (ES). Milk from nonpregnant cows has about 30 picograms per milliliter (pg/mL) of ES, but this rises to 150 pg/mL by the second month of pregnancy and can reach 1,000 pg/mL by the final stage. Milk from pregnant cows also contains progesterone (P4), the hormone responsible for maintaining pregnancy in cows, at levels around 10,000 pg/mL—much higher than the estrogen content. On average, milk from pregnant cows contains about 500 nanograms per liter (ng/L) of estradiol-17β (E2), 1 milligram per liter (mg/L) of estrone (mostly in the form of ES), and 10 mg/L of P4. In contrast, human breast milk and milk from nonpregnant cows have very low levels of estrogens and progesterone. Milk from pregnant cows typically contains high levels of sex hormones, including about 500 ng/L estradiol-17β (E2), 1 mg/L estrone (mostly as estrone sulfate, ES), and 10 mg/L progesterone (P4). In contrast, milk from nonpregnant cows and human breast milk generally has much lower amounts of these hormones (1). Because E2 and P4 are fat-soluble, their concentrations tend to be higher in full-fat milk products, such as butter and cream, than in skim milk (1). A recent survey using ELISA analysis of commercially available cow milk with 2–3% fat content from 13 developed countries revealed detectable levels of E2, ES, and P4. These levels were comparable to E2 concentrations observed in the human early-to-mid follicular phase and P4 concentrations similar to those in the human midluteal phase. Interestingly, milk from countries in East Asia (such as Thailand, India, and China) contained no measurable levels of P4 or ES (1). The biological significance of these hormone levels in milk remains controversial, as studies on the effects of cow milk on uterine development in rodents have produced inconsistent results (1).

According to U.S. Food and Drug Administration (FDA) guidelines, consuming these hormone levels through dairy intake is considered safe, as they account for less than 1% of the amount naturally produced by the population group with the lowest daily production. For instance, the estimated daily intake of E1 from consuming three servings of whole milk constitutes only 0.01% to 0.1% of the daily production in humans, which falls within the FDA's acceptable daily intake limits (2). However, less is known about the effects of ingested P4 on human physiology. P4 production in humans varies widely by age and sex, from 0.15 mg/day in prepubertal boys to as much as 563 mg/day in pregnant women. Drinking three servings of milk daily could potentially expose consumers to several micrograms of P4, which, for prepubertal boys, might reach or exceed the FDA's acceptable limit. Nevertheless, since P4 has an oral bioavailability of only 10% due to first-pass metabolism in the liver, the actual exposure from ingestion is significantly lower (3).

A small study has challenged the assumption of minimal absorption, showing that drinking cow milk can lead to a measurable increase in plasma E1 and P4 levels, accompanied by a decrease in gonadotropins and testosterone within a few hours. This suggests that milk-derived hormones can be absorbed and might temporarily suppress reproductive hormone secretion.

This year, as we celebrate the vital role of dairy, let's remember that it's more than just food — it's a force for good. It nourishes bodies, builds communities, and, when produced responsibly, helps protect the planet we all share.

Table 1: Key Nutrients in Common Dairy Products

Dairy Product	Calcium (mg)	Protein (g)	Vitamin B12 (mcg)	Vitamin D (IU)	Calories (kcal)
Whole Milk (1 cup)	276	8	1.1	124	149
Yogurt (plain, 1 cup)	415	10	1.3	115	154
Cheese (cheddar, 1 oz)	200	7	0.9	12	113
Cottage Cheese (1/2 cup)	111	14	0.4	8	98

Table 2: Global Economic Impact of the Dairy Sector

Region	People Employed in Dairy (approx.)	Primary Dairy Products
South Asia	100+ million	Milk, ghee, yogurt
Sub-Saharan Africa	30 million	Fresh milk, fermented milk
Europe	23 million	Cheese, butter, milk
North America	10 million	Cheese, milk, cream
Latin America	15 million	Milk, cheese, dulce de leche

Table 3: Environmental Improvements in Dairy Farming (Past 50 Years)

Metric	1970s	Today	Improvement (%)
Water usage per liter of milk	8 liters	4 liters	50% reduction
Land usage per liter of milk	2.5 sq. meters	1.2 sq. meters	52% reduction
Greenhouse gas emissions/liter	2.0 kg CO_2e	1.1 kg CO_2e	45% reduction
Milk yield per cow/year	3,000 liters	8,000+ liters	~167% increase

Table 4: Dairy's Role in Achieving Sustainable Development Goals (SDGs)

SDG Goal	How Dairy Contributes
Zero Hunger (SDG 2)	Provides affordable, nutrient-dense food
Good Health and Well-being (SDG 3)	Supplies essential nutrients for growth and immunity
Decent Work and Economic Growth (SDG 8)	Creates employment in farming, processing, and distribution
Climate Action (SDG 13)	Promotes adoption of low-carbon and climate-smart agricultural practices
Responsible Consumption (SDG 12)	Encourages food waste reduction and resource-efficient production

CONCLUSION

Dairy is more than just a dietary staple — it is a powerful contributor to global nutrition, economic development, and environmental stewardship. From the nutrients it provides to the communities it supports, dairy plays an essential role in building a healthier, more resilient world. As the industry embraces sustainable practices and technological innovation, it continues to evolve in ways that benefit both people and the planet.

By recognizing the value of dairy and making conscious choices to support responsible production, we can all be part of a movement that prioritizes nourishment, sustainability, and shared prosperity. As we celebrate dairy, let us also reaffirm our commitment to ensuring that its benefits remain accessible, equitable, and sustainable for generations to come.

REFERENCES

Shemesh M, Shore LS. Naturally produced steroid hormones and their release into the environment. Pure Appl Chem 2003;75:1859–71.

Macrina AL, Ott TL, Roberts RF, Kensinger RS. Estrone and estrone sulfate concentrations in milk and milk fractions. J Acad Nutr Diet 2012;112:1088–93.

Maruyama K, Oshima T, Ohyama K. Exposure to exogenous estrogen through intake of commercial milk produced from pregnant cows. Pediatr Int 2010; 52:33–8.

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