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# Prospects and strategies for accelerating the growth of the agriculture and allied sector in Odisha with specific reference to dairying

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**Abstract** Odisha is endowed with rich natural resources and a diverse agroclimatic zone. All these provide sufficient potential to boost its agricultural sector. However, the average monthly income of an agricultural household in Odisha from farming was merely INR 1,407 per month, out of a total income of INR 4,976 per month from all sources, the second lowest in the country as per the 70th round survey (2012–13) of the National Sample Survey Office. Dairying can accelerate income growth in Odisha, and this paper explores its various facets. The discussion can help policymakers design and implement dairy development programmes.

**Keywords** Growth, agriculture and allied sector, dairy cooperative

**JEL code** O13, Q10, Q13

Odisha has a geographical area of 1.55 lakh square kilometre (sq km) and a long coastline of 480 kilometres; it comprises 30 districts, 477 talukas, 47,677 inhabited villages, and 203 urban centres. The population of the state is about 4.19 crore, of which 83% reside in rural areas and 40% (including around 62 tribes, together accounting for 23% of the total population) belong to the socially weaker sections.

Odisha is one of the agrarian states in India; the total cultivated land is 61.80 lakh hectare, on which cereals, fruits, vegetables, flowers, and other crops are grown and supplementary activities, like animal husbandry, undertaken. The gross area under irrigation was 34.4 lakh hectares in 2017–18, or 41.1% of the gross cropped area; cereals and pulses together account for close to 75% of the gross cropped area, and paddy is the major crop in the state (Planning and Convergence Department, Government of Odisha 2019). The annual rainfall exceeds 1,400 mm, and agriculture is largely monsoon-dependent, and prone to natural calamities like cyclones, drought, and floods.

Agriculture forms the mainstay of the majority of the population, and it holds the key to socio-economic development in the state. The share of the agriculture and allied sector in the state economy has declined from an overbearing 60% in the 1960s to less than 20% in 2017–18, although the share of the population dependent on this sector continues to be significant at around 50% (Planning and Convergence Department, Government of Odisha 2018).

Agricultural productivity and farmers' income is much lower in Odisha than in many other states because the agri-allied ecosystem—the infrastructure, market linkages, and supply chains—is not well defined or integrated. Overdependence on agriculture has led the average size of holding to fall, indicating a decline in resources (land), over the years.

**Table 1 Share and growth rates of various components in the agriculture and allied sector (%)**

| Particulars | Share in gross value added (current) | | | | Real growth rate (year on year) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2015–16 | 2016–17 | 2017–18 | 2018–19 | 2015–16 | 2016–17 | 2017–18 | 2018–19 |
| Agriculture and allied sector | 20.2 | 21.5 | 18.8 | 18.9 | “12.7 | 19.4 | “8.2 | 8.3 |
| Crops | 12.4 | 13.8 | 11.3 | 11.3 | “22.2 | 27.4 | “16.7 | 7.7 |
| Livestock | 2.9 | 3.0 | 3.0 | 3.1 | 4.8 | 4.7 | 7.5 | 11.7 |
| Forestry | 3.1 | 2.7 | 2.3 | 2.2 | 5.7 | 2.2 | “0.5 | 4.5 |
| Aquaculture | 1.8 | 2.0 | 2.2 | 2.3 | 10.6 | 21.9 | 17.1 | 11.7 |
| Allied agriculture | 7.8 | 7.7 | 7.5 | 7.6 | | | | |

*Source* Planning and Convergence Department, Government of Odisha. 2019. *Odisha economic survey 2018-19*.

The crop sector in Odisha has witnessed high volatility in its real growth rate, but there was significant real growth in the livestock, fishing, and aquaculture sectors from 2015–16 to 2018–19 (Table 1). The volatility in the crop sector led to fluctuations in the income of farmers who belong primarily to the marginal category, and the allied sector helped reduce the volatility.

The traditional crops account for about 75% of the total cropped area, but these contribute less than 30% of the total value of output from the agriculture and allied sector, and the productivity of cereals and pulses in the state is lower than the country’s average. In 2017–18, the output in Odisha (in quintal per hectare) was 17.3 for cereals (as against 26.5 at the national level) and 5.5 for pulses (as against 8.5). On the other hand, fruits and vegetables account for about 10% of the total area but contribute more than 25% of the total value of output. This explains the need to diversify towards high-value crops to utilize agricultural land efficiently.

Farmers in the state and in the country are not able to sell a large percentage of their production of fruits and vegetables; the percentage is 34% for fruits at the all-India level, but 52% for Odisha, and 45% for vegetables at the all-India level but 58% for Odisha (Committee on Doubling Farmers’ Income 2017). This clearly indicates the urgent need to create marketing infrastructure and institutions near the villages.

The overdependence on traditional crops in the state results in lower farmer income; the net income of a farm household averaged INR 4,976 in Odisha but INR 6,426 in India. The income from agriculture in Odisha was less than half the national average of INR 3,081, but the income from animal farming was almost double the national average of INR 763 (Table 2); in Odisha, animal farming has immense potential to augment farmer income.

The paper attempts to explore the challenges in, and opportunities for, increasing farmers’ income in the allied activities of agriculture, especially in dairying. It also suggests strategies to increase farmers’ income and provides the indicative investment required.

## Allied Sectors of Agriculture

The share of the agriculture and allied sector in the state’s gross value-added has fallen, but the share of

**Table 2 Average monthly income (net receipt) per agricultural household, 2012–13**

| Source of income | Odisha | | All India | |
|---|---|---|---|---|
| | INR/month | % | INR/month | % |
| Agriculture | 1,407 | 28 | 3,081 | 48 |
| Farming of animals | 1,314 | 26 | 763 | 12 |
| Non-farm business | 539 | 11 | 512 | 8 |
| Wages and salaries | 1,716 | 34 | 2,071 | 32 |
| Total | 4,976 | 100 | 6,426 | 100 |

*Source* NSSO (2014)

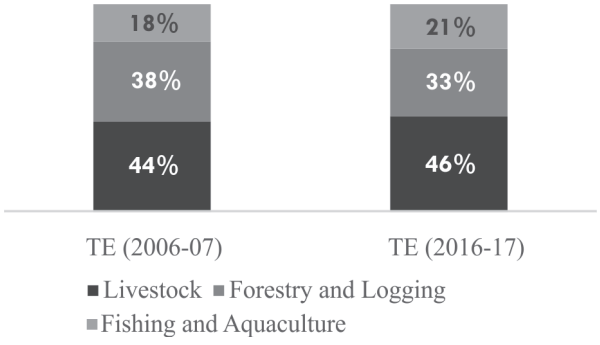


**Figure 1 Share of agriculture-allied activities in value of output (%, at current prices)**
*Source* Derived from state-wise and item-wise value of output from Agriculture, Forestry and Fishing, MoSPI (2019)

the allied agriculture sector remained almost constant, and it continues to play a key role due to its strategic importance to food security, nutrition, employment generation, and poverty reduction. To analyse the contribution of the subsectors in the allied sector in Odisha, the intertemporal analysis of the value of output at current prices was done with two time points—triennium ending (TE) 2006–07 and TE 2016–17 (Central Statistical Organisation 2008; Central Statistical Office 2018). The livestock sector contributes about 46%, forestry and logging 33%, and fishing and aquaculture 21% (Figure 1).

**Forestry and logging**

The composition of the forestry and logging segment has changed; the share of industrial wood in the total value of output of the forestry and logging sector declined from 40% in TE 2006–07 to 33% in TE 2016–17, whereas the share of non-timber forest produce (like sal seed, kendu leaves, lac, broom grass, bahada, harida, amla, karanj, most of which have important medicinal properties) increased from 15% to 23%. The global herbal products market was valued at USD 62 billion, and it is expected to be worth USD 5 trillion by 2050 (Century Foundation 2009). Many valuable medicinal plants grow naturally in the eastern region of India, including Odisha, mostly in fragile ecosystems inhabited predominantly by rural poor and indigenous communities (Singh 2009). Over 33% of the state is forested, and it is also the third largest producer of kendu leaves and forest produce like sal seed and honey. Thousands of tribal families are engaged in either plucking or collecting the forest produce, and there are ample opportunities to provide them market linkages to their non-timber forest produce and improve their livelihood.

**Fishing and aquaculture**

Odisha contributes only about 5% to the national fish production (Table 3), although it has about 6% of the national coastal length (the Bay of Bengal) and 12% of the country's inland water resources (around 10 lakh hectares under tanks, ponds, swamps, lakes, reservoirs, rivers, and canals, 32,587 hectares of cultivable brackish area, 3 lakh hectares of estuaries, brackish water and backwater areas and 93,000 hectares of the Chilika Lake) (Fisheries and Animal Resources Development Department, Government of Odisha 2009). There has been a shift from marine fishing to inland fishing. The share of inland fishing in the total value of output has increased from 51% in TE 2006–07 to 62% in TE 2016–17, while the share of marine fishing has declined from 49% to 38%. Fish consumption increased from 8.70 (in kg per capita per annum) in 2004–05 to 14.42 in 2017–18 (Planning and Convergence Department, Government of Odisha 2019), higher than the all-India average of 9.30 (GoO 2019b). The state sources nearly about 40,000 metric tons of carp from Andhra Pradesh to meet the local demand (GoO 2019b). There is both scope and need for the development of entrepreneurship in freshwater aquaculture, and of freshwater, brackish water, and marine fisheries, to improve the productivity of fisheries in the state.

**Livestock**

Livestock is the largest segment within the allied activities of agriculture, and its growth over the years has been impressive. The importance of meat has increased as compared to milk—the share of milk in the total value of output of the livestock sector declined from 49% in TE 2006–07 to 39% in TE 2016–17, while the share of meat increased from 39% to 50% (Figure 2)—but the growth of both segments has been positive. The coverage of the organized dairy sector in Odisha is low, and there are many low-yielding cattle and buffaloes—85% of them low-yielding and nondescript (Department of Animal Husbandry, Dairying & Fisheries (Animal Husbandry Statistics Division), Ministry of Agriculture & Farmers Welfare, Government of India 2013)—and these constitute the

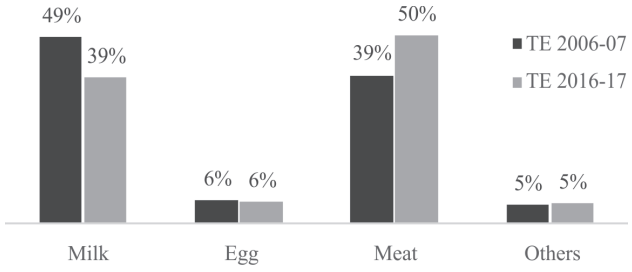


**Figure 2 Composition of livestock sector (% of value of output from livestock)**

*Source* Derived from State-wise and item-wise value of output from Agriculture, Forestry and Fishing, MoSPI (2019)

## Dairy sector—status and growth opportunities

About 50% of the rural households in Odisha own cattle and buffaloes and practise dairy farming (NSSO 2016), but the share of the value of output of milk in livestock declined during the 10 years TE 2016–17, and the value of output of milk increased 3.2% per annum—from INR 3,728 crore in TE 2013–14 at constant prices to INR 4,101 crore in TE 2016–17—as against the national average of 5.4%. The demand for milk and milk products in the country is increasing at 15.7% (IMARC 2019), and interventions are required to speed up the growth of the dairy sector in the state and improve the livelihood of crores of dairy farmers.

**Table 3 Inland and marine fish production (lakh metric tons)**

| Year | Inland (lakh metric tons) | Marine (lakh metric tons) | Total (lakh metric tons) | Share in all-India production |
|---|---|---|---|---|
| 2011–12 | 2.68 | 1.14 | 3.82 | 4.4% |
| 2017–18 | 5.34 | 1.51 | 6.85 | 5.4% |
| Compound annual growth rate | 12% | 5% | 10% | – |

*Source* Handbook on Fisheries Statistics, 2018, GoI

**Table 4 Agricultural household income (Odisha vs All India, INR/month)**

| Particulars | Agriculture | Livestock | Non-farm business | Wages and salaries | Total |
|---|---|---|---|---|---|
| | | Agriculture households not engaged in livestock | | | |
| Odisha | 1,174 | – | 608 | 1,461 | 3,243 |
| All India | 2,287 | – | 628 | 2,162 | 5,076 |
| | | Agriculture households engaged in livestock | | | |
| Odisha | 1,520 | 1,948 | 505 | 1,840 | 5,813 |
| All India | 3,403 | 1,073 | 464 | 2,033 | 6,974 |

*Note* Authors' calculations based on unit-level data (NSSO 2014)

major impediment to achieving high growth in the dairy sector in the state.

Livestock has played an important role in raising the income of farm households. The unit-level data on the Situation of Agricultural Households, 2012–13 of the National Sample Survey Organisation showed that almost 67% of the farm households in Odisha were engaged in animal farming. The income of the agricultural households having livestock was estimated at INR 5,813 per month, almost 80% higher than the households not having livestock (INR 3,243) (Table 4). This underlines the importance of livestock in farmers' income in the state.

In Odisha dairying is ancillary to agriculture, but it forms a sustainable source of income for resource-poor marginal and landless farmers, who own more than 80% of the bovines. Odisha has 2.6% of the total milch animal population of the country, but it contributes 1.2% of the country's milk production. Of the 33 lakh milch (in-milk and dry) cattle and buffalo, about 95% are cattle and more than 75% are low-yielding nondescript cows. Odisha produced 23.1 lakh metric tons of milk in 2018–19, translating into 63 lakh kg per day (lkgpd) and just over 1% of the country's milk

**Table 5 Milk production and productivity**

| Year | In-milk animals ('000) | Yield (kg/day) | Production ('000 metric tons) |
|---|---|---|---|
| 2013–14 | 1,921 | 2.6 | 1,858 |
| 2018–19 | 2,511 | 2.5 | 2,306 |
| CAGR (%) | 5.5% | –0.8% | 4.4% |

*Source* Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India (2019).

production. The growth was 4.4% per annum between 2013–14 and 2018–19. The marketable surplus in 2018–19 was estimated at 37 lkgpd. At the aggregate level, the in-milk yield was just 2.5 kg per day, much less than the all-India average of 5.1 kg per day (Table 5). Further, the in-milk yield in the state was almost stagnant, as against the country's average growth of 2.7%.

Of the total milk produced in the state in 2018–19, the share of crossbred cow was 45%, followed by local cow (42%) and buffalo (12%). A decomposition model was used to understand the relative contribution of in-milk animals and productivity on the incremental change in milk production during the period from 2013–14 and 2018–19 (Figure 3). This analysis reveals that of the additional milk production of 4.5 lakh metric tons, 5.7 lakh metric tons was contributed by growth in in-milk animals, while productivity and its interaction with in-milk animals contributed negatively by 1.2 lakh metric tons. This addition of milch animals for increased milk production in a fodder deficit state like Odisha is not sustainable. Making dairying a sustainable proposition for them is the quintessence for a viable dairying plan for the state.

**Demand for milk and milk products**

The total milk demand is estimated at about 80 lakh litres per day in the state, of which about 15 lakh litres per day is met through milk powder mostly sourced from outside the state. The milk powder market is estimated at about 4,200 metric tons per month; it is reported that Amul sells about 67% of the milk powder (IMARC 2019), 2,800 metric tons of Amulspray and 300 metric tons of Amulya.

The state sources an additional 1–2 lakh litres of liquid milk per day from neighbouring states during the summer months. Also prominent are milk-based products (paneer, ghee, curd, lassi, and indigenous

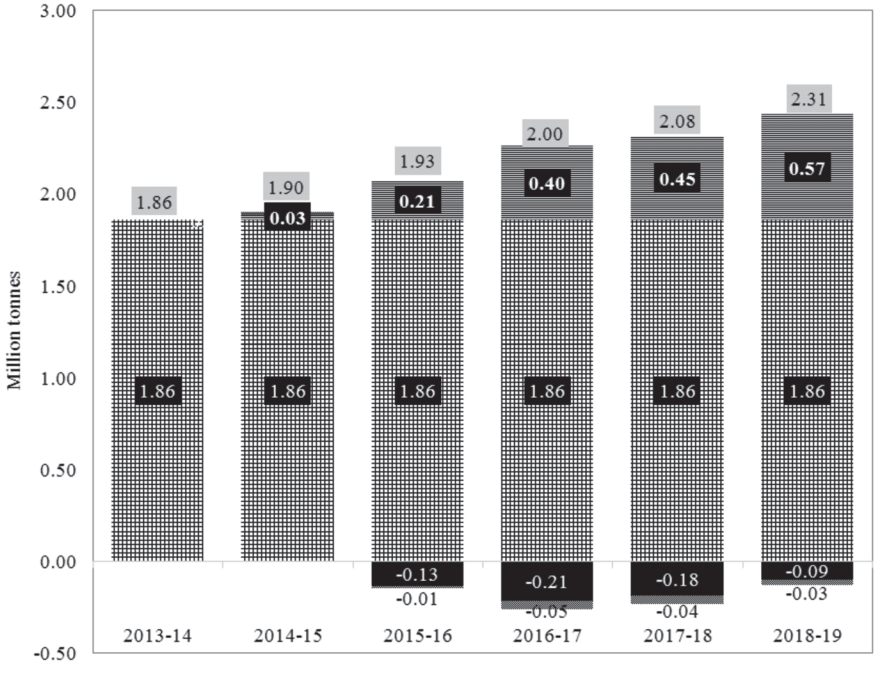


**Figure 3 Decomposing growth in milk production**

*Source* Authors' calculations based on state-level data, accessed from Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India. 2019. *Basic animal husbandry statistics 2019*.

**Table 6 Dairy cooperative societies**

| Year | Organised | Functional | Membership ('000 nos) | Procurement ('000 kg/day) | Marketing ('000 ltr/day) |
|---|---|---|---|---|---|
| 2010–11 | 3,256 | 2,400 | 187 | 276 | 290 |
| 2019–20* | 5,946 | 3,832 | 308 | 443 | 406 |
| CAGR (%) | 6.9 | 5.3 | 5.7 | 5.4 | 3.8 |

*Source* Milk Unions of Odisha
*Note* * Provisional

products like rasogolla, chennapoda, peda, and khoa). The state has ample opportunity to increase milk production, cater to the demand, and bridge this demand–supply gap.

**Organized dairy sector**

The Operation Flood programme was instituted in 1981 to provide market access to the dairy farmers in the state, and dairy cooperatives were set up under the programme. The state has 51,000 villages; assuming a threshold production level of 100 litres per day for a potential village, about 12,650 villages are dairy potential villages. However, dairy cooperatives have yet to cover almost 50% of these potential villages, and about 33% of the villages covered earlier need to be revived (Table 6). Further, a dairy cooperative society in the state procures only 115 kg of milk per day on average (compared to about 400 kg per day at the national level), impacting the viability of the village-level institutions and the affiliated milk unions. The volume is low because the marketable surplus in the villages is low, which in turn is due to the low productivity of cattle and buffaloes, and also because the growth of milk marketing has stagnated and restricts the milk procurement by dairy cooperatives.

The organization, membership, and milk collection of dairy cooperatives have grown at 5–7% per annum, but the growth in milk marketing has not kept up with the increase in demand. The growth in liquid milk sales and the expansion of the value-added portfolio have been limited, and dairy cooperatives are constrained to procure only as much milk that they can sell. Moreover, the government exclusively decides the producer prices in the dairy cooperative sector; the dairy cooperatives have no autonomy. Further, the demand for chenna-based products is higher, and these products are more profitable, and so dairy farmers in the state convert milk into chenna.

Pragati and Milk Mantra are two major private players, together selling about 4 lakh litres of milk in the state. Aggressive advertisements, eye-catching packaging, and good quality assurance have helped both these private dairies grow during the past few years and directly compete with dairy cooperatives in the state. Both these dairies have extensive marketing reach in rural and semi-urban areas.

**Major issues in the dairy sector**

The farmers in Odisha produce milk at relatively competitive costs due to lower land cost and wage rate. The availability of grazing land and cheaper feed resources also contribute to this low production cost. For the marginal and small farmers, who collectively own more than 80% of the bovines in the state, dairying can become a sustainable source of supplementary income. However, this sector faces several issues.

Animal productivity in Odisha is much lower than the national average, due primarily to the large number of nondescript low-yielding animals, and also to the low coverage of artificial insemination. Artificial insemination is critical for the genetic improvement of dairy animals, but coverage in the state is about 20%, as against the country's average of 30%. Considering the infrastructure available in the state, the challenge is to increase coverage by improving operational efficiency and without adding new artificial insemination centres. Further, the presence of scrub bulls, which leads to indiscriminate breeding, poses a great threat for genetic improvement and leads to the transmission of various diseases.

Poor feeding of milch animals affects their genetic

potential. Cattle and buffaloes depend mainly on crop residue and grazing on the common property resources for fodder, but very few farmers cultivate fodder crops, and the state has a deficit of green fodder (55%), dry fodder (50%), and concentrates (80%) (GoO 2015). The wastage of fodder was also found due to the practice of feeding of unchaffed fodder. The analysis of data from the Information Network for Animal Productivity and Health (INAPH) reveals that 80% of the animals are deficient in energy and protein. The prevalence of imbalanced feeding is indicated by the greater emphasis on feeding dry fodder and less availability of green fodder coupled with the low usage of concentrates and mineral mixture. Further, feeding of calves is mostly neglected, which results in delayed puberty, age at first calving, and overall loss of productive life. Feed and fodder production would need to be augmented to support higher milk production.

The major diseases—such as foot-and-mouth disease, haemorrhagic septicaemia, and mastitis—result in a reduction in milk production and an increase in treatment costs, thereby impacting farmers' income. The reach of veterinary treatment services, especially under the dairy cooperatives, is limited. A cost-effective, efficacious animal treatment infrastructure, simple enough so that the knowledge is transferred to the farmers, is required to manage important ailments.

The share of the organized sector in the milk and milk products market is about 30%; it needs to be augmented to ensure the supply of hygienic, safe, and good quality milk and milk products to consumers. The sector has many unorganized players, and the issues related to milk quality need to be addressed.

The dairy cooperatives cover all 30 districts in the state, but their coverage is not uniform; their presence in the central part of the state is larger. About 38% of the state's villages lie in this central region, and the village cooperative coverage and milk procurement is about 67%.

The market is estimated at 80 lakh litres per day, but dairy cooperatives sold only about 4 lakh litres per day in 2019–20, about 5% of the demand. The state's marketing is poor, and it constrains the collection and impacts the income of dairy farmers.

## Strategies to propel growth in the dairy sector

The smallholder dairy production systems in the state face two major challenges: the productivity of animals is low, and the performance of producer-owned institutions has stagnated. Strategies to enhance productivity and improve village-level institutions and marketing are essential to address these challenges and augment farmers' income.

### Animal productivity

Animal productivity can be improved by instituting the infrastructure, including scientifically designed feeding and health management programmes, required for the genetic improvement of dairy animals. More than 85% of the bovines in the state are nondescript, low-productive, indigenous cows; there is a call for undertaking a scientific breed improvement programme for local cows by providing artificial insemination services at the farmers' doorstep.

The prominent descript breeds of the state are (in cattle) Binjharpuri, Ghumusari, Khariar, and Motu and (in buffalo) Chilika and Kalahandi; a scientific selection programme can increase their milk yield potential. Nondescript cattle may be upgraded with Sahiwal, Gir, or Red Sindhi, or crossed with exotic breeds (Holstein-Friesian or Jersey); nondescript buffalo may be upgraded or crossed with Murrah. As regards relatively resource-poor farmers, cattle may be upgraded using indigenous breeds like Rathi, Hariana, and Tharparkar; buffalo may be upgraded using Murrah.

Infertility is a major problem in the state, and extensive fertility improvement programmes on reproductive management need to be conducted at the village level. Natural services are still prevalent for animal breeding, and it is important to test the bulls being used for natural service programmes regularly for various sexually transmitted and other communicable diseases.

### Animal nutrition

The scientific feeding of dairy animals can improve milk productivity in Odisha significantly. Concerted efforts are required to bridge the gap between the availability and requirement of various feed and fodder by promoting round-the-year production of green fodder, development of pasture land, supply of chaff-cutters, and promoting silage-making through village dairy cooperative societies. Advisory services for feeding balanced ration to dairy animals need to be popularized among all dairy farmers.

The National Dairy Development Board (NDDB) developed the INAPH and Pashu Poshan applications to help dairy farmers calculate the balanced ration formulation based on locally available feed ingredients. The analysis of INAPH data for Odisha indicates that balanced feeding improved the average milk yield by 230 ml per day per animal, reduced the daily feeding cost by INR 12.30, and raised the daily net income of farmers by INR 19.40. It is estimated from the INAPH data that ensuring balanced feeding for the entire lactation may raise the income per animal per year by INR 5,795.

The NDDB designed a calf rearing programme to reduce the calf mortality rate and age at first calving by improving growth in the early phase of life. The programme, already being implemented in Gujarat, Punjab, and Karnataka, has reduced mortality by 50% across all categories of animals, and calves attained puberty early (indigenous cow calves at 11 months and buffalo calves at 11.5 months). This programme may be taken up in a modular approach in the state.

**Animal health**

To improve productivity by preventing production loss and by managing infertility, animals should be dewormed periodically and prophylactic vaccination administered against foot-and-mouth disease, haemorrhagic septicaemia, black quarter, anthrax, brucellosis, and theileriosis. Common ailments (like mastitis, pyrexia, and diarrhoea) can be treated by ethnoveterinary medicine, a form of pashu Ayurveda that uses locally available ingredients. Ethnoveterinary medicine is easy to prepare, and it has been proven to have Ayurveda values and effects in domestic animals. The practice of ethnoveterinary medicine will reduce the use of common antibiotics, which in turn will help reduce antimicrobial resistance, a potential public health threat. Farmers need to be oriented in the practice of ethnoveterinary medicine and encouraged to use it.

**Village-level institutions**

The dairy cooperatives constitute the largest organized player in the state, but about 54% of the functional dairy cooperative societies supply less than 100 litres of milk per day. They need to increase their procurement volume by expanding coverage and membership in the villages where they operate and ensure the maximum share in the village-level marketable surplus; sourcing milk from potential villages would minimize the operational cost and improve operational efficiency. Alternative forms of producer-owned institutions, like milk producer companies, may be promoted where dairy cooperatives are weak or absent.

**Milk testing and quality**

Village-level dairy cooperative societies should check the milk for adulteration, and cold chain infrastructure—like bulk milk coolers, chilling centres, and milk testing equipment—is important to ensure quality, but only about 37% of the functional dairy cooperative societies have automated milk collection units or data processing milk collection units, as compared to 55% at the national level. Dairy cooperatives should strengthen the village-level infrastructure by installing electronic milk testing equipment and equip dairy plant or processing facilities that handle 30,000 litres per day with Milkoscan. This would improve the quality of milk, create transparency in the system, and gain the trust of both farmers and consumers.

The solids-not-fat (SNF) content of milk is low (8.0–8.2%), and dairies reconstitute skim milk powder to correct the SNF content and meet the standards for packed milk laid down by the Food Safety and Standards Authority of India (FSSAI). Dairy cooperatives may incentivize milk producers to supply milk with the correct SNF content, and procure quality milk at the village level, to reduce the transport and processing cost and raise their profit margin.

**Milk marketing**

Urbanization is growing; about 55% of the state's urban population reside in small towns (town class 2 to 6), as against the national average of 40% (Table 7). The dairy cooperatives should expand their retail network in these small towns and market milk and milk products instead of concentrating on bigger towns. Competition from organized private players requires the state dairy cooperatives to improve the efficiency of their operations. The COVID-19 pandemic has disrupted the market, and the dairy cooperatives need to aggressively undertake new marketing strategies such as home delivery by developing sales applications and tying up

**Table 7 Population distribution by town class**

| | Town Class | Number of towns | | Population (lakh) | |
|---|---|---|---|---|---|
| | | 2011 | Share | 2011 | Share |
| Odisha | Class 1 towns | 10 | 4% | 32 | 45% |
| | Other towns | 213 | 96% | 38 | 55% |
| | All | 223 | 100% | 70 | 100% |
| All India | Class 1 towns | 559 | 7% | 2,264 | 60% |
| | Other towns | 7,508 | 93% | 1,508 | 40% |
| | All | 8,067 | 100% | 3,771 | 100% |

*Source* Office of the Registrar General & Census Commissioner, Ministry of Home Affairs, Government of India. 2011. Census of India.

with online food delivery platforms like Swiggy, BigBasket, and Grofers. Educated urban consumers value quality and health, and the marketing approach needs to address consumer preferences by introducing immunity-boosting products like haldi dudh, ginger dudh, and fortified milk with vitamins.

The product mix of dairy cooperatives includes traditional milk products like chennapoda, rabdi, rasmalai, rasogolla, and gulab jamun, but production involves traditional or semi-automated methods that impact quality. Automating the production process would improve quality and consumer confidence; dairy cooperatives may avail of funds to strengthen their processing infrastructure and marketing network under the National Programme for Dairy Development of the Government of India.

India has 5.43 crore inter-state migrants, according to the 2011 Census, of which about 13 lakh are from Odisha, and many have been forced to return by the COVID-19 pandemic. Dairying needs low capital investment; its operating cycle is short; its income flow steady; and it can meet the family's nutritional requirement. Therefore, dairying may well be a viable livelihood option for these migrants. Input service delivery activities (artificial insemination, animal nutrition, and health services) are critical, and the demand in rural and peri-urban areas for marketing of milk and milk products is great; entrepreneurship development programmes can groom migrant youth into village-level entrepreneurs who can perform these activities.

**Integrated farming**

Rural livelihoods can be improved by holistically and scientifically integrating agriculture, horticulture, fisheries, poultry and goatery enterprises, and dairy animal rearing. This approach uses the by-product of one activity as an input for others; for instance, crop residue as dairy animal feed, cow dung as crop fertilizer, biogas generation for household cooking, and slurry as feed for fishes. There is a need to diversify production, reduce the risk of natural calamities, and augment rural income. The value addition of manure (Box 1), and the provision of market linkages, can substantially augment farmer income.

**Investment required for growth**

Interventions in animal breeding, nutrition, and health, and the integration of these interventions, are key in enhancing the income of dairying households; the milk processing infrastructure needs to be modernized, in addition, and the village-level infrastructure and marketing strengthened.

The coverage of artificial insemination, now 20%, needs to be increased to 50% to improve breeds. About 40 lakh doses of semen are required; each district needs liquid nitrogen silos and a cold supply chain of frozen semen doses. The state has 36.4 lakh animals; 36,500 infertility camps are needed, and the investment is estimated at about INR 24.6 crore.

To improve animal nutrition, ration balancing advisory services need to cover 80,000 animals in 4,000 villages. The calf rearing programme should cover 1,500 calves; and it should aim to reduce the calf mortality rate and the age at first calving by improving the growth rate in the early phase of life.

Green fodder should be produced year-round. About 2,100 hectares should be brought under perennial

fodder, 1,400 hectares under seasonal fodder, and 100 hectares under pasture land; and 10,000 chaff-cutters should be provided, and silage-making promoted, through village dairy cooperative societies. Over a five-year period, these activities are estimated to cost INR 61.5 crore.

Dairy animals are economically important; to make animal husbandry practices in the state sustainable, it is important to eradicate diseases like foot-and-mouth disease, haemorrhagic septicaemia, black quarter, brucellosis, and theileriosis. In 2019, the Government of India instituted the National Animal Disease Control Programme (NADCP); this five-year programme is intended to control foot-and-mouth disease and brucellosis in all the states, including Odisha, and union territories. The NADCP has an outlay of INR 13,343 crore; under the programme, all the populations of cattle, buffalo, sheep, goats, and pigs susceptible to foot-and-mouth disease will be vaccinated at six-month intervals, and female calves (four to eight months old) susceptible to brucellosis will be vaccinated once in a lifetime. The state should aim to vaccinate all animals consistently for five years to control and eradicate foot-and-mouth disease and brucellosis.

Village-level institutions procure 4 lakh litres of milk per day; an additional 2,800 automated milk collection units and data processing milk collection units and 198 bulk milk coolers should be provided to the potential dairy cooperatives to raise procurement to 7 lakh litres per day by the end of the fifth year. This is expected to improve the fairness and transparency of the milk collection system and the quality of milk. To strengthen marketing activities, visible coolers and milk crates should be funded and training and capacity building of marketing personnel undertaken.

Dairy cooperatives sell 4 lakh litres of liquid milk per day. Increasing the share of value-added products is expected to raise sales to 5.5 lakh litres per day by the fifth year with. Strengthening village-level institutions and marketing activities would require about INR 78.5 crore; the investment may be borne by dairy cooperatives and the state government.

Most of the milk processing plants in the state are old; these need to be refurbished, modernized, and made energy-efficient to ensure the quality of the milk and milk products. Modernization would require about INR 26.3 crore.

Implementing a comprehensive manure value chain scheme will augment farmers' income. Piloting this scheme in all the 30 districts of Odisha would require an investment of about INR 30 crore over five years.

Integrated farming would improve the livelihood security of farmers. Setting up an integrated farming unit in each district every year through start-ups/ entrepreneurs, 150 units by the end of the fifth year, would require INR 22.5 crore. The central and state governments may bear the investment.

The activities needed to boost dairy development in the state are estimated to require INR 243 crore over a period of five years. The investment can be funded from centrally sponsored schemes, concessional financing from banks and financial institutions, the state budget, and a matching share from cooperatives and farmers. The investment would go a long way in enhancing farmers' income, ensuring sustainable rural development, and creating rural wealth, which in turn would spur the economic growth of the state of Odisha.

## Going forward

In Odisha, the allied activities of agriculture—livestock, forestry, logging, and aquaculture—can serve as engines for sustainable growth in the state's gross domestic product and, thereby, increase the income of farmers. Dairying can improve the livelihood of rural households, predominantly marginal farmers, as can the promotion of integrated farming systems. To address the gaps in the sector, the dairy cooperative structure should be used to provide farmers ownership and involvement in the process, alternative forms of producer-owned institutions explored, strategies and policies formulated and implemented, and public investment targeted and made.

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**Box 1**

**Manure value chain**

India has around 30 crore bovines; these produce about 160 crore metric tons of manure per annum. Animal manure can be used to produce biogas and slurry-based fertilizers; if a sustainable disposal mechanism and market linkages are provided, the cumulative saving and pay-out has the potential to supplement farmers' income from milk, their main produce. Manure has not received the attention it deserves, however, because there is no robust value chain in place. A sustainable manure management model, which can easily be scaled up throughout the country, is needed, and NDDB has been developing one. NDDB has initiated a pilot in Zakariapura village of Anand district in Gujarat, where households have installed small biogas units next to their dairy sheds.

The biogas generated is used to cook; it has replaced dung cakes, firewood, and fossil fuel–based cooking gas cylinders. The slurry generated from the biogas plant is used to produce biofertilizers, phosphate-rich organic manure, and different grades of fortified liquid slurry under the brand name 'Sudhan'; their use helps in reducing the application of chemical-based fertilizers, improving soil health and the productivity of crops, including vegetables (Rath and Patel 2020), and providing farmers an additional source of income. Selling slurry and saving LPG makes INR 3,600 per month for a farmer with two or three animals. This business model is socially and economically sustainable—the entire village of Zakariapura has been converted into a biogas village—and it is replicable in other states, including Odisha.

Odisha has more than 1 crore cattle and buffaloes; these produce about 3.4 crore metric tons of dung per annum. The dung can generate around 136 crore cubic metre of biogas, and 1 crore metric tons of slurry, per annum—sufficient to meet about 68% of NPK in terms of nutrient availability for the soil consumption need of the state (Fertiliser Statistics 2017–18).