2022

ANIMAL FEED

INDIAN MARKET ANALYSIS

Realized by:

apexBrasil

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ANIMAL FEED IN INDIA

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1. SCOPE OF WORK

This analysis is focused on the industry of animal feed sector in India detailing the current situation of the same, consumer trends, trade analysis, as well as highlighting the major rules and regulations applicable to the sector.

2. INTRODUCTION TO INDIA

India re-elected in 2019 for a new five-year term the Hindu nationalist Bharatiya Janata Party (BJP) at the head of the country's government, revalidating the majority achieved in 2014. In its previous term, the BJP won the elections with an absolute majority, which gave it a stability unknown in India for more than three decades.

New mandate in 2019 was a clear indication from population in favor of change, economic reforms, development, and improvement in the living conditions of citizens

India is emerging as a flourishing, dynamic, and entrepreneurial developing country. President Modi has been able to convince everyone of the reality of this change, inside and outside the country. Every day new programs or ambitious long-term plans are announced, such as "Make in India" or "Digital India", seeking to encourage foreign investment or internet connectivity.

Despite of negative impact of COVID pandemic worldwide, and especially severe in India, economic growth pace has bounced back strongly, positioning India as one of the most targeted countries for foreign investors. India is seen as an emerging manufacturing hub in global value chains, a growing consumer market, and a global leader in the digital transformation of government and private sector.

New geopolitical order arisen from Ukranian invasion is shaking again the global order and increasing even further the world's interest on a neutral stable player who can ensure a competitive alternate to traditional sources.

This political stability and demographic dividend are amongst the major strengths of India.

India prides itself on being the largest democracy in the world. The 2014 general election was regarded as the largest democratic election in human history, with more than 800 million potential voters.

Ease of doing business, and major reforms are highly appreciated by business community. Excess of bureaucracy has been always remarked as one of the major handicaps by foreign investors while opening business in India. Digitalization and induction of GST reforms has meant a giant leap on the simplification of procedures. Significantly, India has improved more than 60 positions in Doing Business Rank in just five years.

2.1. ECONOMY

India overtook last summer (2022) to UK to become the fifth largest economy of the world, and it is expected to be in the top 3 global by 2027, surpassing Germany and Japan in terms of nominal gross product (GDP). In terms of purchasing power parity (PPP) it Is already the third one.

Country	Rank	%Share	Global Rank	% Share
Developed Economies				
USA	1	24.7%	2	15.8%
Japan	3	6.0%	4	4.0%
Germany	4	4.5%	5	3.3%
United Kingdom	5	3.2%	9	2.3%
France	7	3.1%	8	2.3%
Developing Economies				
China	2	17.4%	1	1 .3%
India	6	3.19%	3	6.7%

Illustration 1: GDP Share per country

Within the global economic framework, it has not only far exceeded the economic slowdown suffered in recent years, but it has registered the third highest growth in the world. According to World Bank, *"India's economy has been remarkably resilient to the deteriorating external environment, and strong macroeconomic fundamentals have placed it in good stead compared to other emerging market economies"*.

Despite this favorable situation, its GDP per capita was still USD 2.250 in 2021, placing it in 128th place out of 196 countries classified according to this criterion. This indicator serves as a sample of the low standard of living that most of the population in India still has.

The combination of a fallen rupee with the effects of Russian invasion of Ukraine is increasing sharply energy and food prices, beyond targeted band of 2%-6% by Reserve Bank of India. This factor may impact negatively in the growth rate during 2023.

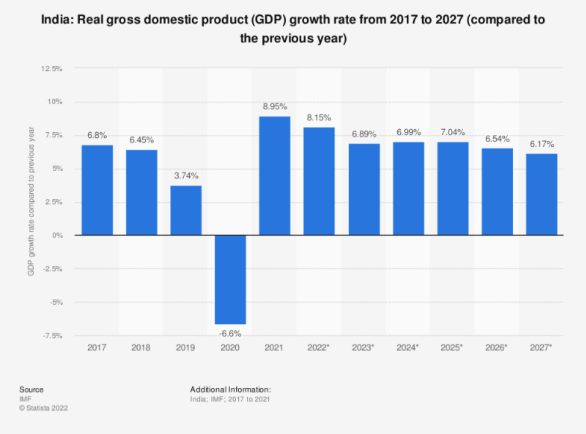

Illustration 2: GDP Growth India (Source: Statista, IMF)

Several structural factors are likely to contribute to economic growth. These include favorable demographics, reducing dependency ratio, rapidly rising education levels, steady urbanization, growing young and working population, IT revolution, increasing penetration of mobile and internet infrastructure, increasing aspirations and affordability, etc.

A good indicator of the country's economic stability is its inflation rate. This has left behind high values such as the 10% reached in 2013, reducing to less than half with 3.6% in 2017 and 4.8% in 2018. The projection of inflation rates is much more stable than in the past and no sudden changes are expected in the coming years.

Economic indicators	2022
GDP (USD billion)	3,17
GDP % real growth	8.9%
GDP per capita	2,277 USD
Inflation Rate (Consumer prices, annual change)	5.1%
Unemployment (%)	6%

Illustration 3: Main macroeconomic figures

In terms of GDP composition, agriculture accounts for 15.4% and employs 43.8% of the active population. It is the fourth agricultural power in the world, the second largest producer of cattle in the world, the third largest producer of sheep and the fourth in fish production.

2.2. ROLE OF PRIMARY SECTOR IN INDIAN ECONOMY

The Primary sector of the economy is the change of natural resources into primary products. Major businesses in this sector are agriculture, agribusiness, fishing, forestry, all mining and quarrying industries. Most products from this sector provides raw materials for other industries.

The share of primary sector has decreased from the past four decades. In 2022, 18.20% of GDP was contributed by primary sector. In 1970 the share of the sector was 50% which has reduced to 29% in 1995 and is now further reduced below 20%.

Despite of this modest contribution to nation's wealth, this sector is critical for Indian society since employs more than 60% of Indian population, providing to many of them their only source of income. Agriculture diversification through animal husbandry is one of the primary drivers of growth in rural incomes and one of the most important ways to achieve the target of doubling farmers' income.

The animal husbandry, dairying and fisheries sector plays a significant role in supplementing family incomes and generating employment in the rural sector. More than 20.5 million workers are engaged in animal farming and about 87.7% of the livestock is owned by farmers of marginal, small and semi-medium operational holdings. The animal husbandry and dairy sector provides around 50 % direct & indirect employment to women in the country which is the highest for any sector in the economy. Around 4.43% of usually working persons are engaged in Animal Production, Mixed farming, Fishing and Aquaculture during 2019-20. The fisheries sector provides livelihood to 16 million fishers and fish farmers at primary level.

3. ANIMAL FEED MARKET IN INDIA

Livestock plays an important role in Indian economy. About 20.5 million people depend upon livestock for their livelihood. Livestock contributed 16% to the income of small farm households as against an average of 14% of all households. It also provides livelihood to two-third of rural community. It contributes approximately 5.1% to the country's GDP and 17.11% to the Agricultural GDP.

Even in 21st century, India remains as an agrarian economy. With one of the largest livestock population, animal husbandry becomes a major subsidiary occupation of the farmers of this country. Animal husbandry contributes immensely to the rural economy of the country as it provides milk, meat, draught power and manure.

With the basic objective of rural upliftment, successive Governments in India have been introducing many rural development schemes in the country over the years.

South India concentrates the largest market share. Due to the increase in poultry product manufacturing has experienced growth in Andhra Pradesh, Karnataka and Tamil Nadu in recent years.

The Indian animal feed market is currently one of the largest feed producers in the world. Market reached a value of 403.5 crore in 2020 (about USD 50 million). The market is forecast to grow by almost 15% in the forecast period of 2022-2027.

The animal feed market in India is classified into three broad categories: Aqua Feed, Poultry Feed and Cattle Feed. The poultry feed market has mostly been dominating in terms of its share in the animal feed market with almost 44% share globally. Besides being the last one to be incorporated, the aqua feed segment, which has been a late starter, has seen the maximum growth out of the three segments.

Though the organized sector is quite old, it is still in a nascent stage, supplying only 10 per cent of cattle and aqua feed and 50 per cent of poultry feed in India, says a Rabobank report. The bulk of the remaining feed is being produced by the unorganized sector, which comprises of household industries and custom mixers. The total production2 of compound feed for all livestock stands at 17 million tones.

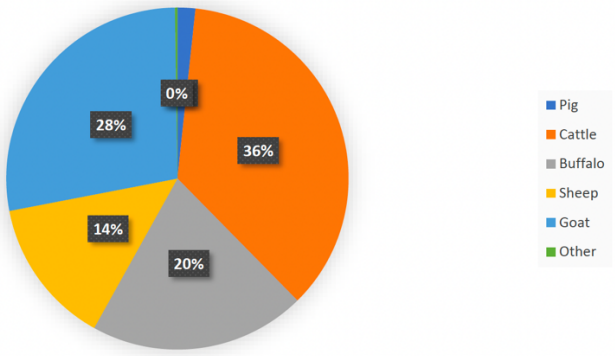

Illustration 4: Livestock Distribution in India

Animal feed includes raw, processed, and semi-processed products; Thus, grasses, cereal grains, hay crops and other food crop by-products are the most common.

These products are formulated with the help of nutritional additives, such as vitamins and minerals, to maintain the overall health of animals and improve the quality of various end products, such as egg, milk and meat. The justification for the support of these nutritional additives is due to the increase in public concern regarding the safety of food products of animal origin due to the prevalence of foodborne bacterial infections.

Raw materials used in animal feed production (soybean, sorghum, and corn meal) are being diverted to human consumption, creating shortages in the feed industry. That is why the industry has chosen to introduce novel ingredients such as insect flour and dry distillers' grains.

The Indian government has taken measures that act in favor of the animal feed market, such as E-Pashu Haat (https://epashuhaat.com), which is a web portal launched by the Ministry of Agriculture and Farmer Welfare under the Department of Livestock and Fisheries to boost dairy productivity in India through the organization of the livestock market.

The industry is undergoing an exciting phase of growth, and this trend is expected to continue in the coming years as well. This is a sizeable and scalable industry, one which is still quite untapped and hence has a great potential to be evolved on a global commercial level. This article thus aims to highlight the achievements of this industry as well as information about what makes it worth putting resources into for the coming years while not ignoring the hurdles that might be experienced in the process.

Though a major portion of the market is unorganized, the total size of the remaining portion which comprises the organized compound feed industry reaches USD 45.000 millions in India and growing at 8% rate. Several factors which have been predominantly working towards this growth include the untapped potential of the market, ever increasing livestock population, growth of the end-user industries and the increase in domestic consumption of the animal products. Also, increase in the purchasing power of the population as well as favorable demographics of the country, from rural areas towards metros, are contributing to the same. The increase in disposable incomes in the metro cities is making people consume more animal products, as dairy products as well as meat, fish and eggs, which in turn, requires more feed of better quality. This is a major factor which will drive growth in the animal feed sector.

India currently has the highest buffalo population, the second highest goat and cow population and the third highest sheep population which is a clear indicator of how important a role feed market has to play in meeting the demand for feed products.

4. TYPES OF ANIMAL FEED IN INDIA

4.1. POULTRY FEED

India is the third-largest egg producer in the world after China and the USA and the fourth-largest chicken producer in the world after China, Brazil and the USA. In India, the per capita consumption of eggs has gone up from 30 eggs per annum to 68 eggs per annum, and that of chicken from 400 gms per annum, to 2.5 kg per annum in the last 5 years. Human nutritionists recommend a minimum of 180 eggs & 10 kg chicken per annum for a healthy adult human, which means that the

Indian poultry market is laden with opportunities. Adult population in most developed countries consume over 240 eggs and 20 kg of chicken per annum.

In the overall animal feed industry, poultry feed occupies the largest share of volume/value mix at 63%/67% on increased penetration of compound feed, especially in the broiler segment. In contrast, the share of cattle feed is lower at 21% (volume: 31%) as farmers rely on pastureland as a means of feed.

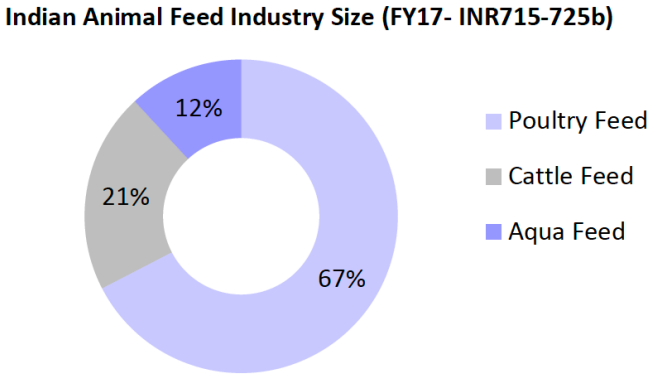

Illustration 5: Animal feed industry share

The growth in the poultry industry and increasing demand for chicken per person which is already high in urban areas and now having its impact in rural areas as well. The cheaper availability of chicken is going to drive the poultry feed industry at a faster rate. India's consumption of eggs per person is lower on average than many other developing countries despite India being the third largest egg producer in the world. There is an immense scope for improvement in domestic consumption of eggs with better awareness for its health benefits, through designer eggs and hence a scope for improvement in the poultry feed sector. Also, stable feed prices, entry of more organized players and higher integration in the poultry feed industry will drive its growth.

Parameter	Baseline 2016	Required in 2022
Eggs	83 Billion	136 Billion
Commercial Layers	375 Billion	550 Billion (additional 175 million layers required over base period)
Yield- eggs/ annum (taking across India for all varieties)	220	250 (Taking nearly 15% increase in yield)
Total Feed Required	11 MMT (annualized @ 45 Kg in a laying cycle)	15 MMT (also factoring 7% improvement in FCR with 42 kg per bird in a laying cycle)
Feed Ingredient- Maize @ 35%	4 MMT	5.25 MMT
Feed Ingredient- Soya @ 15%	1.7 MMT	2.25 MMT

Illustration 5: Poultry feed requirements

FEEDS FOR POULTRY

Poultry feeding is one of the important aspect of poultry science. Poultry feeds are of three types

- Starting poultry feed: An all mash ration to be fed to chicks upto the age of 8 weeks.
- Growing poultry feed: A ration to be fed to growing chickens after 8 to 20 weeks or until laying commences.
- Laying poultry feed: A ration to be fed to laying birds after 20 weeks onwards or after laying commences.

Following are the nutrient constituents of poultry feeds

- **Proteins:** In poultry, the products produced consists mainly of protein. On a dry weight basis the carcass of an 8 weeks old broiler is more than 65% protein and the egg contents are about 50% protein. Typical broiler rations will contain from 22 to 24% protein and in layers ration the amount varies between 16-17%.
    - Source: Meat scraps (lysine), fish meal (lysine, methionine), poultry by-product meal (tryptophan, lysine), blood meal, liver and glandular meal, feather meal (hydrolyzed), animal tankage, milk products, cottonseed meal, peanut meal, soybean meal, sesame meal, sunflower seed meal.
- **Carbohydrates**: The main function of carbohydrates in the diet is to provide energy to the animal. The polysaccharides of major importance are starch, cellulose, pentosans and several other complex carbohydrates. Although cellulose and starch are composed of glucose units, chickens possess enzymes that can hydrolyze only starch. Cellulose, therefore, is completely indigestible. Cereal grains and their by-products are excellent source of starch and thus constitutes a bulk of poultry ration.
    - Source: Corn, sorghum grains (milo) barley, rye, oats, wheat, wheat middlings, various grain by-products.
- **Fats**: Fats make up over 40% of the dry egg and about 17% of the dry weight of a broiler. Although fats supply concentrated form of energy (2.25 times more energy than carbohydrate and protein) their inclusion as true fats or oils in the ration is seldom practised because of high cost and the risk of rancidity which develops on prolong exposure to air, heat, sunlight, etc. Most feed ingredients (maize, barley, safflower, milo, wheat, rice, bran, etc.) contain 2-5% fat and that is enough for the inclusion of one essential fatty acid (Linoleic acid), which must be present in the young growing chicks or they will grow poorly, have an accumulation of liver fat and be more susceptible for respiratory infection. Laying hens with diets deficient in linoleic acid will lay small eggs that will not hatch well.
    - Source: Animal tallow (beef), lard, corn-oil, other vegetable oils.

- **Minerals**: The body of the chicken and the egg excluding shell contain nearly 4 and 1% mineral matter respectively. The elements known to be required in the diet of poultry are calcium, phosphorus, sodium, potassium, magnesium, chlorine, iodine, iron, manganese, copper, molybdenum, zinc and selenium. Usually, the grains and vegetable protein ingredients are relatively poor in mineral contents when compared with those of animal protein feed stuffs. The common mineral supplements in poultry feed are as follows:

  i. Limestone
  ii. Bone meal
  iii. Oyster shell
  iv. Sodium chloride
  v. Dicalcium phosphate
  vi. Manganese sulphate
  vii. Potassium iodide
  viii. Superphosphate.

    - Source: Meat scraps, fish meal, milk products, ground limestone (calcium), ground oyster shells (calcium), dicalcium phosphate (calcium, phosphorus), defluorinated rock phosphate (phosphorus, calcium), steamed bone meal (phosphorus, calcium), salt (sodium, chlorine, iodine), manganese sulfate (manganese), manganese oxide (manganese), zinc carbonate (zinc), zinc oxide (zinc).

- **Vitamins**: Vitamins most commonly function as coenzymes and regulators of metabolism. The 13 vitamins required by poultry have been summarised in tabular form. Apart from natural sources, commercial vitamin mixture suitable for poultry are also available. One point to remember, of course, is that the natural vitamins are likely to have other factors associated with them. These may be other recognised nutrients or they may be unidentified factors. Diets continuously deficient in any one of the required vitamins will seriously tell initially upon the egg production and then the life of the chickens.

    - Source: Yeasts, fish solubles, distillers' solubles, liver meal, alfalfa meal, milk by-products.

- **Feed additives**: Additives are never nutrients. They either singly or in combinations are added to a basic feed, usually in small qualities for the purpose of fortifying these with

certain nutrients or stimulants or medicines. They are often called "non-nutrient" feed additives.

4.2. CATTLE FEED

India has 17.5% of the world's population and 20% of the world's livestock population on just 2.3% of the planet's land area. The human population is growing at a rate of 1.6% annually, while the population of animals is growing at a rate of 0.66% annually. The expanding human and animal populations are vying ferociously for land resources to produce food and fodder, respectively. As a result, only 4% of the India's total cultivable area is used for growing farmed fodder. The nation currently confronts a net deficiency of 35.6% green fodder, 10.5% dry crop leftovers, and 44% concentrate feed ingredients.

The traditional feed includes crop residues or straws of jowar, bajra, ragi, wheat, barley, etc. either in the form of whole straw or powder form, either taken as a sole feed or supplemented with green fodder. There are very few options for expanding the amount of land used for fodder agriculture. As a result, there is an imbalance between the supply and demand for feed, which has an indirect impact on livestock productivity. The non-traditional feed resources or alternate feed sources are crucial in helping to close this supply-demand mismatch. The term "non-conventional feed resources" (NCFR) refers to all feeds that are either not typically utilized in commercially manufactured livestock rations or have not historically been used in animal feeding. NCFR typically includes a range of feeds derived from perennial crops as well as feeds with both animal and industrial origins.

Dairy animals mainly depend on crop residues as their staple diet and any intervention for bringing about changes in feeding system of dairy animal has to essentially look into this aspect. Cattle feed consists of three components namely the greens, dry fodder/roughages and the concentrate feed. There is huge deficit in terms of requirement versus availability of feed resources for dairy cattle

Feed	Requirement (million tonnes)	Availability (million tonnes)	Shortfall (percentage)
Concentrates	123	45	63.41
Green Fodder	1025	390	61.95
Dry Fodder	570	443	22.28

Illustration 7: Shortage on availability of Cattle feed

Apart from the shortage of resources in quantity, there is a huge gap in terms of quality of feed resources relating to requirement v/s availability. The shortage regarding quantity and quality necessitates the need for ration balancing by way of incorporating the locally available non-conventional feed resources including industry by-products, horticulture and vegetable wastes,

local grasses, tree leaves, weeds, etc. Crop residues are abundantly available and there is apparently no competition for these resources between other species and dairy animals. The feed manufacturers primarily provide concentrate feed and the farmers manage green fodder by grazing/cut grass and the dry fodder from nearby sources.

Main cattle feed ingredient	Level of incorporation (percentage)
Grains: Maize, sorghum, wheat, rice, oats, barley, ragi, millets etc.	10-15
Brans: De-oiled rice bran, rice polish, wheat bran, maize bran etc.	35-45
Protein meals/cakes: Rapeseed meal/cake, soybean meal, cottonseed meal/cake (decorticated and un-decorticated), groundnut meal/cake, coconut meal/cake, palm kernel meal/cake, sesame cake, linseed cake, maize germ oil cake, maize gluten meal, sunflower meal, kardi (safflower) meal, guar meal etc.	25-35
Chunnies: Guar, tur, urd, moong, gram & chunnies of other locally available pulses.	4-6
Molasses	8-10
Agro-industrial by-products: Babul chunni, tamarind seed powder, mango kernel extraction, Prosopis juliflora pods, tapioca waste etc.	5-7
Minerals and vitamins: Mineral mixture, calcite powder, common salt, di-calcium phosphate, vitamins A, D_3 & E.	1-2

Illustration 8: Composition of ingredients of Cattle Feed

India is the world's largest exporter of buffalo meat and accounts for 58 per cent of the world's buffalo population. Buffalo in India contributes about 30% of total meat production in the country. However despite this potential and growth, the sector is not well integrated. The present system of production and marketing of buffalo meat for domestic and export market is endowed with multifarious challenges and needs corrective measures at various levels.

BRANDED CATTLE FEED INDUSTRY

The concept of branded cattle feed as a packaged commodity, though not a very recent concept, is gaining popularity in India too. The packaged feed, as a product, possesses special features like hygiene, quality, convenience to handle, etc. to its advantage. Farmer community in India has started using such products. The traditional feeding pattern practiced in India is a mix consisting of green grass, dry grass, cotton seed cake, coconut cake, rice bran etc. But, as time elapsed, due to both environmental and social changes, there has been gradual shift from the age-old pattern to Compounded Cattle Feed (CCF). The major contributing factors for this shift are: (i) Shrinkage of

open land for cattle grazing, urbanization, and resultant shortage of conventionally used cattle feeds, (ii) Need for specialized feeds arising from the use of high yield cattle, (iii) Marked shift in eating habits of people because of urbanization, with an increased intake of milk and other cattle-based products etc. Indian milk scenario underwent a metamorphosis with the advent of "Operation Flood", greatly increasing the per capita consumption of milk thus sparking of high demand for cattle feed; the estimated growth in milk consumption being 2.8 percent per annum.

ALTERNATIVE FEED FOR LIVESTOCK

Alternative feed is any kind of feed that is not a standard treatment for animals. Animals might receive alternate feed for reasons related to their health, environment, or sustainability. Alternative feed is beneficial for farm animals including chickens, cows, pigs, and others because it benefits both the environment and the animals. In 2021, the Indian market for animal feed had a value of USD 10.950 millions. The market is expected to grow at a growth pace of 9.6% from 2022 to 2027, reaching USD 18.740 millions. It has been an increase of 50% in the prices of maize and soya over the last 3 years. Thus, increasing the production cost by 40-50%. It is the need of the hour to come up with ways to feed animals that are more sustainable as our population continues to increase. Given the concerns about sustainability and the future of both our human and animal populations, it should not be surprising that we are starting to look at alternative feed sources for animals. Furthermore, the industry players are being encouraged to convert to more sustainable and affordable ingredients for livestock production due to the price volatility, and supply instability of these raw materials. The potential alternatives to conventional animal feed are insect feed, algae-based feed, and Genetically Modified feed.

INSECT FEED

The demand for the production and consumption of edible insects is increasing relating to their high nutritional content and minimal danger of transmitting zoonotic diseases. In comparison to conventional meats like poultry and animals, insects have higher protein and lower fat content. They can be produced on organic waste and produce less ammonia and greenhouse gases than conventional animals. This is fueling market expansion. Insects are effective at turning food sources into protein. For example, to generate the same amount of protein, crickets require 12 times less feed than cattle, 4 times less feed than sheep, and 50% less feed than pigs and broiler chickens[9]. In India, there are no standard rules or specifications by BIS/ FSSAI on usage of unconventional feed materials in food formulation. The insect farming has not been promoted for the feed production as there are no legislation framed for many of the most growing insects like Black Soldier Fly in the feed inclusions though other insects like silkworms have already been accepted as inclusions in the animal feeds. The global insect feed market was valued at USD 667.9 million in 2017 and is anticipated to increase by 12% to reach USD 1.996 million by 2032.

MICROALGAE BASED FEED

Another source of protein-rich alternative feed is algae. Compared to meat and eggs, it is a significantly more environmentally friendly source of protein for both people and animals . Although there are many species of algae that might be utilized as feed, several varieties are now widely accessible in the market. Blue-green and green algae are increasingly being added to feed products, and they can be utilized for both animal and human feed. These algae contain a remarkable 40% to 60 % protein content together with many amino acids. Chlorella, Scenedesmus, and Arthrospira are a few examples of the microalgae that can be added in a small quantity (4% or 8%) to traditional feed to improve growth, health, and overall physiology of animals as well as product quality and quantity. They provide a variety of nutritional advantages to animals and will promote their long-term health. Globally, the demand for microalgae in the animal feed industry was USD 57,54 million in 2021. With a 3.5% growth for the years 2021 to 2031, the market is anticipated to reach USD 80.96 million by 2031.

GENETICALLY MODIFIED FEED

Genetically Modified crops are consumed by over 95% of livestock in the United States. Over 80 % Poultry in Europe is fed Genetically Modified crops. The European Commission has authorized maize and soybean as genetically modified crops to be used as animal feed[15]. Corn, canola, cottonseed, soybeans, and potatoes are the GMO crops most frequently used in animal feed and pet food. These crops are primarily employed as a source of protein or energy in the feed regimens for livestock. The nutritional content, safety, and quality of eggs, dairy products, and meat from animals that consume GMO food are comparable to those of animals that consume solely non-GMO food. The DNA of the GMO food does not enter the DNA of the animal when consumed as feed. However, in India, policy makers have been wary of GMO, and the current regulatory framework only permits Bacillus thuringiensis (Bt) cotton as a GM crop. In May 2022, due to consistent request by Indian Poultry Industry, the India imported 550.000 metric tons of genetically modified Soy Meal to meet the demand for feed in the country.

Additionally, State Animal Husbandry Departments, the National Dairy Development Board, Veterinary Schools, and Indian Council of Agricultural Research institutions offer regular advice and training to farmers and entrepreneurs to help them produce packaged animal feed items like pallets, complete feed, region-specific mineral mixtures, etc. Further, there is focus on raising overall productivity through a distinct set of livestock policies. Under National Livestock Mission there is a sub mission on feed and fodder development to strengthen fodder seed chain to improve availability of certified fodder seed required for fodder production and encouraging entrepreneurs for establishment of fodder Block/Hay Bailing/Silage Making Units through incentivization. For setting up a feed/fodder value addition unit for the preparation of hay, silage, a total mixed ration (TMR), fodder blocks, or fodder storage facilities, the Central Government offers beneficiaries of the National Livestock Mission Scheme a 50% capital subsidy. Thus, in a situation where the demand

outstrips supply, it is evident that there are massive investment and innovation opportunities for entrepreneurs and corporations in India's feed sector.

4.3. AQUA FEED

Aquaculture accounts for 52% of global fish feed production for human consumption.

India is the world's second largest producer of fish and about 68% of Indian fish comes from the aquaculture sector. This sector has recorded an impressive annual growth rate ranging from 8 to 12% in the last decade, reflected in the value of India's annual exports at 6,750 million USD.

In terms of employment, the sector employs more than 28 million people in India. Export earnings from the fisheries sector amounted to 6.000 million USD in 2020-21.

The growth of the aquaculture or fish farming sector, as it is popularly understood, comes mainly from the freshwater aquaculture sector, as marine fin fish farming is hardly practiced on a large scale. About 12.8% of the total animal protein consumed in India comes from freshwater fish.

For a long time, India has traditionally used only pond fish farming systems and has not thoroughly explored other options for diversifying farming systems that could significantly increase fish production. Recently, some provinces in India have adopted cage farming of freshwater fish. In fact, the limitation for the development of cage farming until 2008 was that extruded floating feed for fish was not available.

In addition to pond and cage-based systems, India can adopt many other modern systems that can significantly increase production while conserving water, land use and optimizing inputs such as feed, energy, fuel, and others.

The aquaculture industry in India is suddenly thriving with a higher demand in the shrimp market which is leading to a sudden shooting up of growth in the aqua feed industry. There is also an increase in the demand for fish from India both domestically and internationally which requires more effort from the aqua feed market to maintain the demand for high quality fish available in India. The demand for fish is seeing a rise, especially globally, due to its high protein value, and comparatively considered to be safer. Fish production is yet another huge initiative towards ensuring food security. The only major concern currently is that majority of aquaculture practitioners in India still depend on traditional feed due to its low price and easy availability. This is responsible for a slow transition towards commercial feed in our country. Hence, this is the opportune moment for international aqua feed industries or even new domestic players to come and establish themselves in the market.

India's first extruded feed mill opened in 2008, and thereafter several feed mills were built and put into operation. At the end of 2013, there were 12 feed mills with an installed capacity of 1.55 MT of feed

per year. However, the demand for extruded formulated feed for fish did not increase proportionally to the installed feed capacities. One of the main reasons was the narrow range of feed-consuming species farmed in India. The country relies heavily on carp, which can be fed with various combinations of feed other than those formulated. When the price of carp on the farm is economical for the farmer, they are fed with good and high-priced feed, and when prices fluctuate and fall, the fish are fed with low-cost and complementary ingredients.

An advantage of using feed-based feed is that it contributes significantly to water conservation. It should be remembered that India only has 4% of the world's water resources and 17% of the world's population, so water conservation is of vital importance.

5. TRADE ANALYSIS

5.1. HS 2309: PREPARATIONS OF A KIND USED IN ANIMAL FEEDING

The Indian import data of HS 2309 from 2017 to 2021 were:

Exporters	Imported value in 2017	Imported value in 2018	Imported value in 2019	Imported value in 2020	Imported value in 2021
World	**367.827**	**475.875**	**459.012**	**439.705**	**591.569**
Thailand	51.268	65.081	68.843	70.344	104.097
Sri Lanka	59.452	82.242	74.329	73.076	103.106
China	50.091	56.454	57.292	59.288	75.513
Vietnam	49.945	63.026	58.907	69.921	64.948
Singapore	12.886	49.145	47.426	31.703	53.580
USA	21.582	26.797	21.882	19.417	29.973
South Africa	827	6.230	9.345	12.071	19.289
Belgium	6.684	9.443	11.113	13.382	17.724
Netherlands	9.049	10.054	17.723	13.335	17.629
Greece	0	7.137	2.590	5.801	10.584
Spain	3.970	6.195	6.571	8.736	10.346
Germany	22.136	14.128	13.638	10.043	8.626
France	19.678	16.260	14.910	9.057	8.550
Italy	4.456	4.560	5.105	6.138	7.617
Finland	5.908	8.189	8.938	6.905	6.336
United Kingdom	3.665	5.588	3.821	4.371	5.934
Canada	2.690	1.804	1.877	1.147	4.212
Taipei, Chinese	3.459	5.665	3.741	3.070	4.049
Ireland	2.099	3.390	2.895	3.521	3.763
Croatia	0	0	134	109	3.025

Indonesia	2.245	2.386	333	291	3.007
Malaysia	2.740	3.830	3.195	2.891	2.808
Korea, Republic of	1.926	1.784	865	928	2.589
Brazil	**2.378**	**1.868**	**1672**	**2.320**	**2.402**
Slovenia	48	448	149	415	1.988
Hungary	402	573	721	916	1.795
Norway	1.245	833	596	1.115	1.719

5.2. HS 230990: PREPARATIONS OF A KIND USED IN ANIMAL FEEDING (EXCL. DOG OR CAT FOOD PUT UP FOR RETAIL SALE)

The Indian import of HS 230990 in 2021 in quantity and value were:

COUNTRY	2021	SHARE IN INDIA'S IMPORTS (%)	QUANTITY IMPORTED IN 2021	QUANTITY UNIT	UNIT VALUE (USD/UNIT)
World	**473.112,00**	**100%**	**190.877,00**	**Tons**	**2.479,00**
Sri Lanka	103.106,00	22%	22.292,00	Tons	4.625,00
China	73.147,00	16%	33.894,00	Tons	2.158,00
Vietnam	64.663,00	14%	68.413,00	Tons	945,00
Singapore	53.580,00	11%	6.080,00	Tons	8.813,00
Thailand	41.737,00	9%	11.240,00	Tons	3.713,00
USA	27.569,00	6%	9.184,00	Tons	3.002,00
Belgium	17.123,00	4%	3.915,00	Tons	4.374,00
Netherlands	17.098,00	4%	6.181,00	Tons	2.766,00
Greece	10.584,00	2%	2.655,00	Tons	3.986,00
Germany	8.117,00	2%	2.561,00	Tons	3.169,00
France	7.484,00	2%	1.089,00	Tons	6.872,00
Finland	6.336,00	1%	1.376,00	Tons	4.605,00
United Kingdom	4.650,00	1%	648,00	Tons	7.176,00
Spain	4.049,00	1%	3.078,00	Tons	1.315,00
Taipei, Chinese	4.033,00	1%	1.721,00	Tons	2.343,00
Ireland	3.534,00	1%	3.176,00	Tons	1.113,00
Malaysia	2.595,00	1%	403,00	Tons	6.439,00
Brazil	**2.402,00**	**1%**	**1.593,00**	**Tons**	**1.508,00**

Units in '000 USD

Illustration 6: Indian import HS 230990 (Source Trademap)

Major sources of imports are neighboring countries such as Sri Lanka or China.

CUSTOMS DUTIES

Duties paid for preparations for Animal Feed (230990) are 15%.

6. INDIAN IMPORTERS

6.1. HS 230990: PREPARATIONS: OF A KIND USED IN ANIMAL FEEDING (EXCL. DOG OR CAT FOOD PUT UP FOR RETAIL SALE)

The top 15 Indian importers (dec.2019-dec.2022) are the following ones:

INDIAN IMPORTER	VALUE SUM($) (IN THOUSANDS)
Suguna Foods Private Limited	$ 59.768,76
Hivetz Nutri India Private Limited	$ 17.740,53
Dsm Nutritional Products India Private Limited	$ 17.165,84
Venkateshwara B V Biocorp Private Limited	$ 14.895,57
Avanti Feeds Limited	$ 9.144,86
Venkys India Limited	$ 8.665,43
Huvepharma Sea Pune Pvt Ltd	$ 8.478,31
Danisco India Pvt Ltd	$ 8.430,36
Divi Enterprises Plot No 11 A Vijaya Gardens	$ 8.079,59
Ab Mauri India Pvt Ltd	$ 6.483,14
Novus Animal Nutrition India Private Limited	$ 6.441,14
Aquamart Feeds Private Limited	$ 6.018,06
Basf India Limited	$ 4.358,57
Timo Eva Wellness Private Limited	$ 3.359,34
Trouw Nutrition India Private Limited	$ 3.281,99

Units in '000 USD

Illustration 9: Top 15 importers

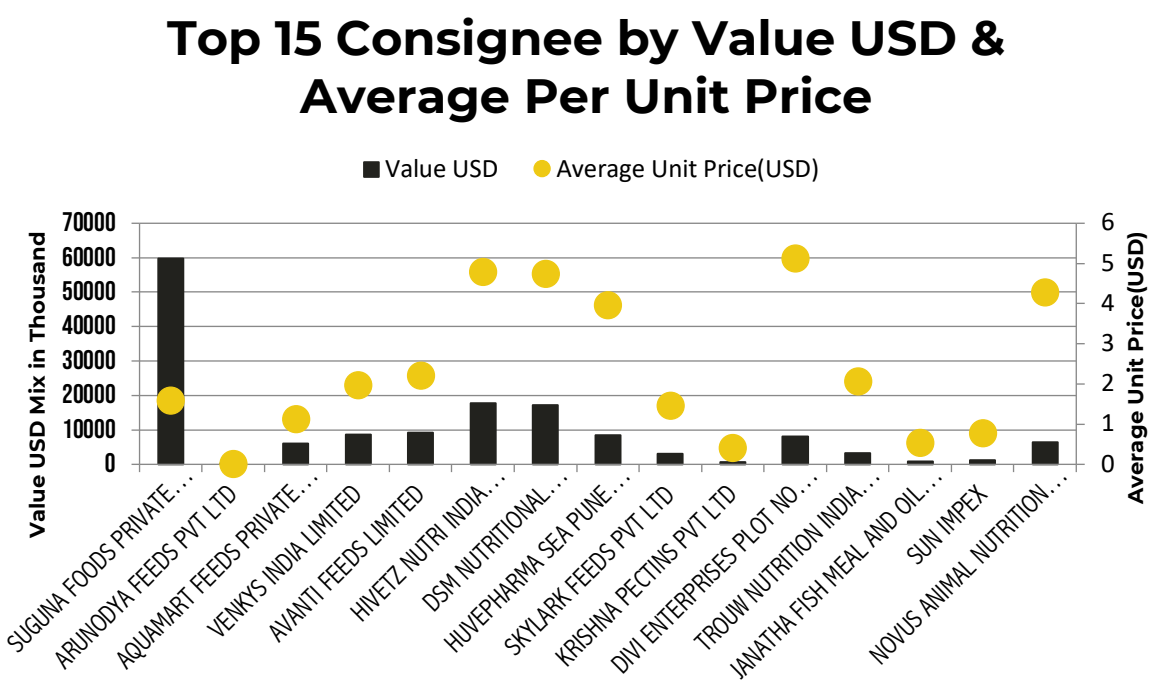

Illustration 7: Main importers animal feed (HS 230990)

It is very interesting to analyze the relevance of southern region on Animal Husbandry and thus animal feed import. Chennai port and Tuticorin port, both in Tamil Nadu, are first and third port of entry of animal food.

PORT OF DESTINATION	QUANTITY SUM (IN THOUSANDS TONS)	QUANTITY SUM (%)	VALUE SUM USD (IN THOUSANDS)	VALUE (USD) SUM (%)
Madras Sea	62.373,68	46%	122.930,71 USD	39%
Jnpt	30.850,04	23%	106.449,95 USD	34%
Tuticorin Sea	6.297,83	5%	28.541,40 USD	9%
Calcutta Sea	5.696,42	4%	18.522,91 USD	6%
Bombay Air	473,86	0%	7.377,36 USD	2%
Hyderabad Icd	3.160,73	2%	7.263,86 USD	2%
Mundra	661,02	0%	3.343,22 USD	1%
Delhi Tkd Icd	17.682,93	13%	2.569,41 USD	1%
Delhi Air	1.023,91	1%	2.510,35 USD	1%
Mannur Jmftz Sez	732,00	1%	2.102,71 USD	1%

Illustration 8: Main ports of reception of animal feed

In terms of time series distribution, it is important to notice the bounce back of imports after the forced stoppage due to COVID:

QUARTER	AVG UNIT PRICE ($)	QUANTITY SUM (IN THOUSANDS)	QUANTITY SUM(%)
OND-2019	$2,36	$6.172,31	5%
JFM-2020	$-	$-	0%
AMJ-2020	$-	$-	0%
JAS-2020	$-	$-	0%
OND-2020	$-	$-	0%
JFM-2021	$-	$-	0%
AMJ-2021	$-	$-	0%
JAS-2021	$-	$-	0%
OND-2021	$-	$-	0%
JFM-2022	$1,77	$53.776,29	40%
AMJ-2022	$2,22	$41.571,57	31%
JAS-2022	$3,16	$19.963,25	15%
OND-2022	$3,42	$14.208,66	10%

Illustration 9: Time series of import of animal feed in India

SHIPPER	AVG UNIT PRICE ($)	QUANTITY SUM (IN THOUSANDS)	QUANTITY SUM (%)	VALUE SUM ($) (IN THOUSANDS)	VALUE ($) SUM (%)
Aminovit Pvt Ltd	3,3264	14.941,02	3,78%	49.699,13	6,04%
Aminovit Private Ltd	1,3599	35.471,60	8,98%	48.237,74	5,11%
Adisseo Asia Pacifi Pte Ltd	4,9436	8.267,75	2,09%	40.872,54	3,95%
Hivetz Nutri Pvt Ltd	4,8111	6.561,10	1,66%	31.565,91	3,63%
Dsm Nutritional Products Asia P	5,4606	5.314,17	1,35%	29.018,34	2,96%
Basf Hong Kong Ltd	6,0829	3.886,87	0,98%	23.643,26	2,04%
Finnfeeds Oy	6,8346	2.380,08	0,60%	16.266,95	1,97%
Farmchemie Manufactures Private Limited	5,4739	2.870,44	0,73%	15.712,59	1,84%
M S Dsm Nutritional Products Asia	1,9395	7.566,00	1,92%	14.674,44	1,73%
Thuan Dao Branch - Nutreco International Vietnam	0,8802	15.688,25	3,97%	13.808,78	1,63%
Huvepharma Food	3,9768	3.271,64	0,83%	13.010,50	1,34%
Huvepharma Food	4,0364	2.660,29	0,67%	10.738,11	1,03%
Ab Vista Inc	4,7173	1.739,12	0,44%	8.204,00	0,94%
Synchem International Co Ltd	25,633	291,90	0,07%	7.482,27	0,81%
Lallemand Sas	14,1	456,58	0,12%	6.437,85	0,80%

Illustration 10: Top animal feed exporters to India

7. REGULATORY FRAMEWORK

Trade of livestock and livestock products are regulated as per the Foreign Trade Policy of Government of India which is implemented by Department of Commerce.

The Department of Animal Husbandry and Dairying regulates import livestock and livestock products in accordance with provision of Section 3 and Section 3A of the Livestock Importation Act., 1898 to prevent ingress of Exotic diseases though import of such livestock and livestock products.

Imports of animal and animal products are only allowed through seaports/ airports of Bangalore, Chennai, Delhi, Hyderabad, Kolkata, and Mumbai where animal quarantine and certification services are available. Imports of fish products are allowed through the seaport of Vishakhapatnam (in the State of Andhra Pradesh), Sea and airport of Kochi and the Land Custom Station at Petrapole (for imports from Bangladesh only). This import is regulated under Live-Stock Importation Notification, 2001.

However, this restriction does not include those products which are not of animal origin which are dedicated to animal feed.

The import of livestock products is only allowed against a sanitary import permit issued by the Department. The permit shall be issued if, after an import risk analysis, the authorities are satisfied that the import of the consignment will not adversely affect the health of the animal and human populations of India. The import permit specifies the conditions to be fulfilled in respect of the consignment, including pre-shipment certifications and quarantine checks.

The Bureau of Indian Standards established in 2009 standards for feeds/feed materials intended for meat and milk producing animals. On December 10, 2019, the FSSAI issues guidelines, based on the Food Safety and Standards Act (2006), requiring commercial feeds/feed materials intended for food producing animals to comply with the relevant BIS standards, and to be manufactured, imported, distributed, and sold only with BIS Certification Mark. With the new FSSAI guidelines, the intent is to make the BIS standards mandatory.

The authority's action is premised on the imported nature of commercial feeds/feed materials and their utilization in the domestic meat (i.e., from the domestic/Asian water-buffalo, Bubalus bubalis) and dairy (both water buffalo and Bos taurus) cattle herds. The FSSAI guidelines set an implementation date of June 10, 2020, 9 months from the date of issue of the notification.

On January 27, 2020, nevertheless the FSSAI amends its December 10, 2019, guidelines. It notes that commercial feeds intended for cattle will comply with BIS specifications only for compounded feeds for cattle (IS 2052:2009) and shall carry a BIS Certification Mark on the label of products.

Implementation is set to begin six-months from the date of issue of this guideline, that is on July 27, 2020.

On July 24, 2020, the authority, however, amends the guidelines' compliance timeline, establishing a new compliance date of January 21, 2021.

On January 1, 2021, the FSSAI extends the compliance date for stakeholders to adopt BIS standards pertaining to the commercial feeds/feed materials intended for meat and milk producing animals. The new compliance date is July 1, 2021, with the timeline extended to accommodate requests from industry stakeholders due to the COVID-19 pandemic outbreak and the nationwide lockdown in early 2020.

BIS has been decided to extend the timeline for compliance with the provisions of the direction as mentioned above for those businesses whose applications for BIS Certification/licensing of their product are currently pending until January 1, 2022. From such date all manufactures of commercial feeds/feed materials must obtain BIS License at its earliest, and their product label must bear the BIS Certification mark conform to Indian Standard IS 2052:2019.

OTHER REGULATION

Legal metrology act: legal metrology (packaged commodities) rules, 2011

Any company which pre-packs or imports any commodity for sale shall register his name and complete address with the appointed authority. All packaged commodities must bear a label with the name and address of the manufacturer or importer, the common or generic names of the commodity, the net quantity and the month and the year it is packed. Quantities must be given in metric values. Listed commodities must be packed in standard quantities by weight, measure, or number.

8. MAIN OPPORTUNITIES

Animal feed has to play a major role in the future development of animal husbandry in India. The country is observing a clear evolution from traditional feeding systems to scientifically based feeding products looking for a better health habits and increasing the yield of the same.

India accounts with the largest livestock in the world, but it is still in a nescient stage towards implementation of correct feeding habits for animals. As it happens in the case of agriculture with biofertilizers, it will take years for Indian farmers to complete the evolution process towards modern farming practices. Good evidence of the same is the huge amount of losses in poultry or calves due to unhealthy habits or unproper feeding habits at birth.

Although local producers are available in the market, there is good enough room for foreign products with proven benefits in terms of yield while assuring sanitary habits.

This point is essential when Indian products are targeting foreign markets. Main international markets demand evidence of proper feeding habits and health controls. It is needed to remember that 80% of some seafood products such as shrimps are meant for exporting markets.

In the case of cattle field, the industry has grown at over 6 per cent per annum in the last decade, making India one of the largest and fastest growing cattle feed markets in the world. Despite this growth, there is a huge gap between requirement and production. There is a huge opportunity for cattle feed formulators to reposition themselves as an effective tool to enhance livestock productivity.

Rural dairy farmers who contribute over 90 per cent of the total milk production rear low yielding animals which are reared mainly on grazing of low nutritious grass and some homemade concentrates. Even farmers who use compound cattle feed use the low-grade variety which mainly contains De-Oiled Rice Bran (DORB) and some other grains. The need for balanced feeding and feed balancing is not known to these farmers. Good quality compound cattle feed is mainly used by large dairy farmers and farmer-members of cooperative organizations.

To meet the domestic demand for the milk in the coming years, higher growth of milk production needs to come from increasing the average milk production from each animal. This clearly drives the focus on feeding, breeding, and management. These initiatives provide a great opportunity to the cattle feed industry to reposition themselves and develop new strategies to fully exploit the cattle feed potential to the maximum extent to achieve the growth targets in milk production.

There is also a strong need for clean milk production which can be achieved through better management practices and offering residue free quality feed. The feed industry also needs to make technological improvements in manufacturing practices to provide quality feed as per the cattle's age, breed, production cycle, pregnancy stage, etc. to get the maximum out of each animal as well as to utilize the available resources in a best possible way.

9. LIST OF ILLUSTRATIONS