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Challenges in the Indian livestock sector and suggested interventions: An overview

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Abstract
Livestock is an integral part of agriculture, and it plays a significant role in the nutritional security of the people. The sector provides livelihood to more than two-thirds of the rural population. India has the largest animal husbandry sector and contributes 18.6 percent to the total milk production of the world. There are many challenges the sector will come across, during the process of achieving any set target in the future, like disease outbreaks, antimicrobial resistance, greenhouse gas emission, inadequate human resources and infrastructure for veterinary services, low productivity of animals, non-remunerative milk prices, the unorganized markets for livestock products, poor livestock extension, and scarcity of feed and fodder. The adoption of sex-sorted semen technology, by-product utilization, use of feed supplements, replacement of low producing animals with the high producers, judicious use of antibiotics, promotion to organized market, livestock-based integrated farming system, and public-private partnership in the livestock sector are some of the suggested interventions to mitigate these challenges. The livestock sector has more equitable distribution than agriculture, so each scheme or policy of the government directly affects the individual household. Each sub-sector of the livestock has an annual growth rate of more than 5 percent, validating the enormous potential for a rainbow revolution in the sector. Hence, it can be truly said that livestock is the new growth dynamo of the agriculture sector.

Keywords: Antimicrobial resistance, economic losses, greenhouse gas emission, integrated farming system, milk pricing, livestock extension, veterinary infrastructure

Introduction
Livestock is an integral part of agriculture, and it plays a significant role in the nutritional security of the masses. The sector employs 8.8 percent of the population by providing livelihood support to 20.6 million people [1]. India holds the largest animal husbandry sector in the world, with 512.06 million livestock heads. It is a leading milk-producer country that shares 18.6 percent of the total milk production of the world. India owns an insignificant 2.29 percent land area while sustains 11.6 percent of the world livestock population. It owns 56.7 percent world's buffalo population, with the best buffalo breed *viz*., the Murrah buffalo. Around 12.5 percent of the world cattle population and 20 percent of the small ruminant population is present in India. The livestock sector contributes 4.5 percent in the total gross value added (GVA) and 25.8 percent in the agricultural GVA [2].

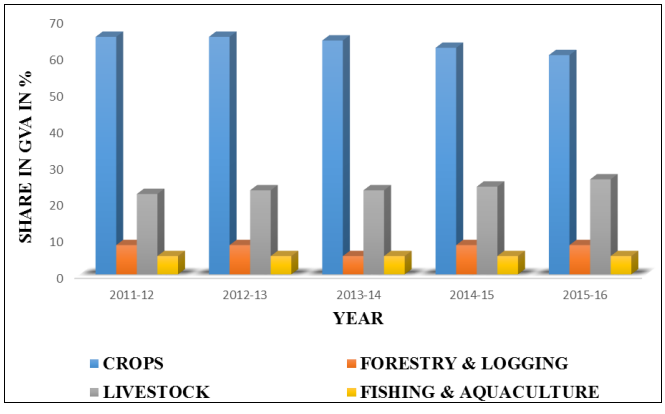


Fig 1: Share of agriculture and allied sector in GVA (%) 2012-2016

India holds rank in total milk production with 165.4 million tonnes of milk production, ranks second in fish and shrimp production with 107.90 lakh tonnes and 7.3 million tonnes production.

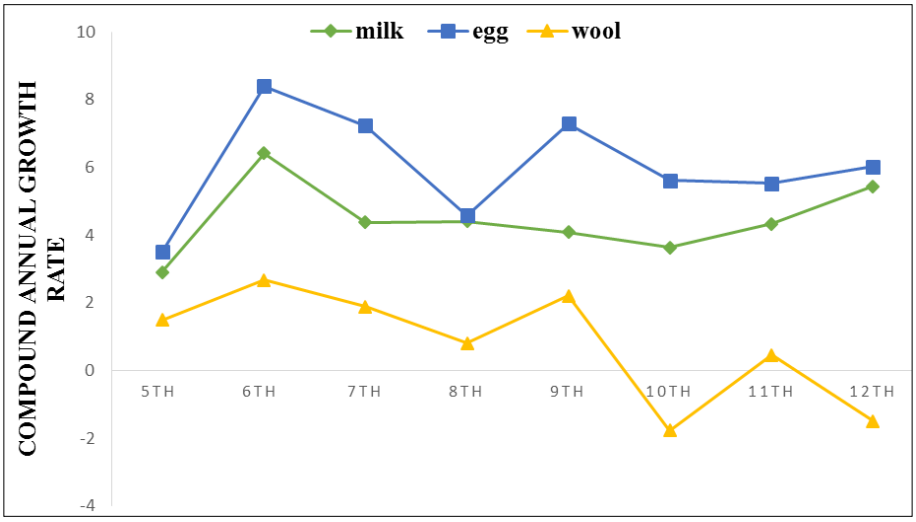


Fig 2: Five year plans

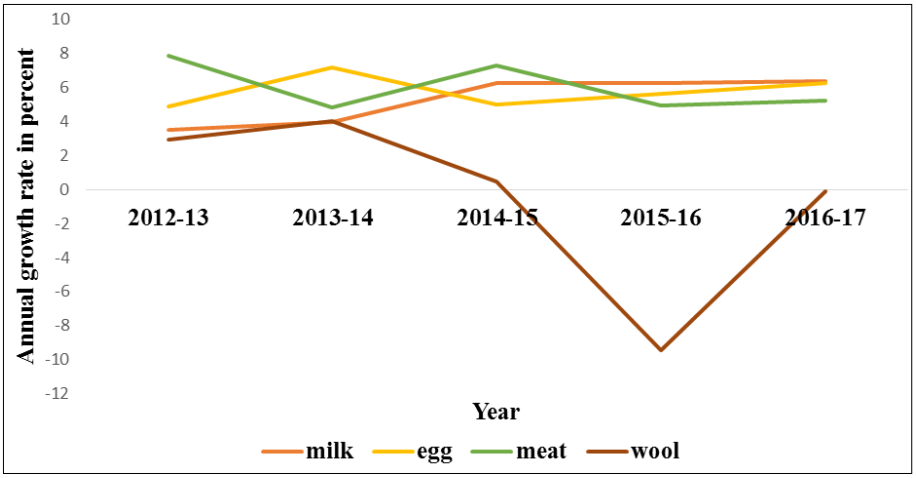


Fig 3: Annual growth rate of livestock products from 2012-17

India holds rank fifth in egg and meat with 88.1 billion and 7.4 million productions, respectively, in the world. In all the sectors like milk, meat, and eggs, the average annual growth rate is more than 5 percent. Increasing demand for animal protein will positively affect the growth rate further [1].

There are various challenges the sector will come across while achieving any set target in the future. Some challenges are global like the outbreak of animal diseases, antimicrobial resistance, and greenhouse gas emission, others like inadequate human resources and infrastructure for veterinary services, low productivity of animals, non-remunerative milk prices, the unorganized market for livestock products, low per animal productivity, poor livestock extension, and feed-fodder shortages, are specific to India.

Challenges and suggested interventions

Disease outbreaks

Around 80 percent of the Office International des Epizooties (OIE) listed animal diseases are prevailing in India like Foot and Mouth Disease (FMD), Haemorrhagic Septicaemia (HS), Peste des Petits Ruminants (PPR), Brucellosis, Anthrax, Rabies, Glanders, Highly pathogenic Avian Influenza, and New Castle Disease (NCD), etc. During the period Jan. 2016-Dec. 2016, there was a total of 749 outbreaks of the above-listed disease in India, out of which maximum outbreaks were of NCD in poultry and FMD in livestock species [3]. The economic losses in India due to major livestock diseases are estimated by various economists, using different economic models. The annual economic loss due to Foot and mouth disease is 12000-14000 crore [4]. Economic losses due to HS are Rs. 3755.95/animal. As far as buffaloes are concerned, it costs Rs. 4262.57/ buffalo while, for cattle, it was Rs. 5583/ cattle [5]. The estimated annual economic loss due to PPR is Rs. 8895.12 crores, of which Rs. 5477.48 crores are in goats and Rs. 3417.64 crores in sheep [6]. Annual economic loss due to Anthrax in cattle is 18.94 lakh [7]. Brucellosis costs around the US $ 3.4 billion loss in Indian livestock [8].

National Animal Disease Reporting System (NADRS) requires to be strengthened with infrastructural support and digitalization with the aim that the reporting of the disease outbreaks can be on a real-time basis. Another intervention can be the administration of the vaccination program for all vaccine-preventable diseases, targeting each susceptible species of the livestock.

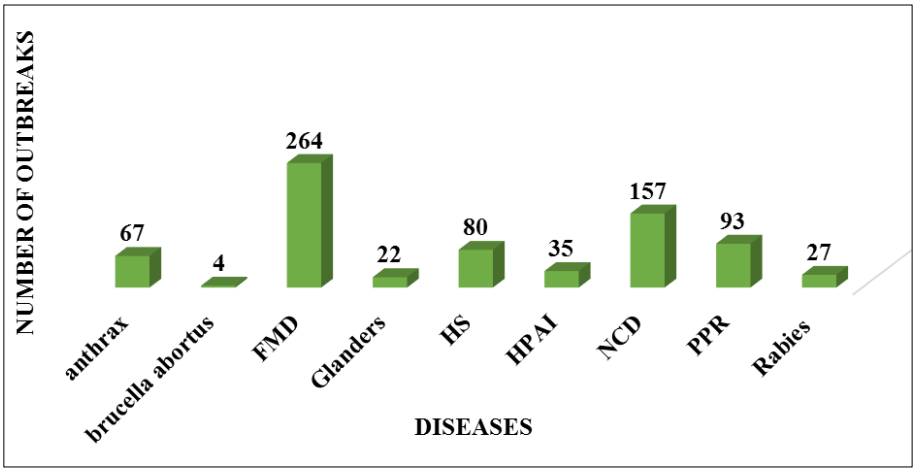
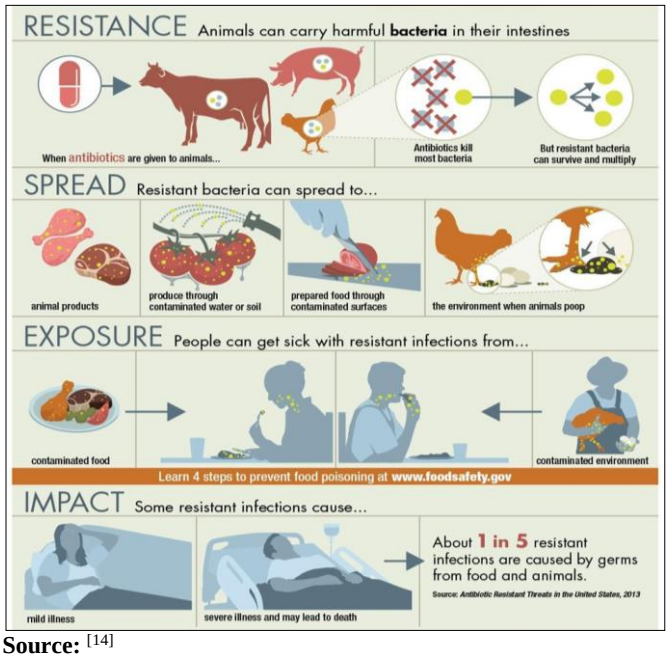


Fig 4: disease outbreaks in India (JAN 2016- DEC 2016)

Human resources and infrastructure for veterinary services are also inadequate in India. Only 67784 registered veterinary practitioners are present in India [1]. The total number of Veterinary Hospitals in India is 12234, veterinary dispensaries are 27140, and veterinary Aid centers are 25827 [1]. There are only 14 states in India that have more than 200 veterinary hospitals/ polyclinics. Uttar Pradesh has the largest livestock population served by 267 dispensaries only. On the other hand, in Gujarat, 27 million livestock is served by 33 veterinary hospitals only. While in Rajasthan itself, 20 percent of the veterinary hospitals of all of India are located. It indicates that the infrastructure for veterinary services does not have a precise spatial distribution. Suggested intervention can be mobile veterinary services [9] for remote areas to provide first aid, artificial insemination, deworming, and vaccination services at farmers' doorstep. There is an utmost need to increase the number of veterinary hospitals in proportion to the livestock population. Through institutional training and short-term skill enhancement courses for the para vet, they can be engaged as certified livestock service providers. Thus strengthening the human resource and increase the coverage of veterinary services delivery at farmers' doorstep.

Antimicrobial resistance

This is an emerging challenge for all of the world. According to the World Health Organization (WHO), antimicrobial resistance is the ability of a bacteria, virus, and some parasites to stop antimicrobials like antibiotics, antivirals, and antimalarial from working against it. Antibiotics are used as growth promoters in food animals and to counter infectious diseases, as well. The largest use of antibiotics is in the case of mastitis in animals [10]. India holds rank four in antibiotics use in animals, wherein the poultry sector is the largest reservoir of antibiotics [11]. The use of antibiotics in animal feed will increase by 82 percent in India by 2030 [12]. Antibiotics have a withdrawal period during which if the livestock products are used, it leads to the unintentional consumption of antibiotic residue, without any ailment, leading to the development of antimicrobial resistance from farm to table [11]. Suggested interventions are regulated sales of antibiotics; they should be sold only on the prescription by a registered veterinary practitioner. Capping the use of antibiotics in farm animals at 50 mg per kilogram of an animal slaughtered can cut India's consumption of antibiotics in food animals by 15 percent by 2030 [11]. Globally, regulatory caps will reduce the consumption of antibiotics by 64 percent [11]. Undoubtedly, the complete check on the use of antibiotics is not possible, but their judiciousness can be promoted. Other practices to counter resistance can be a gradual increase in the concentration of a single or a combination of antibiotics [13]. By rendering knowledge and increased awareness among the stakeholders about antimicrobial resistance use of antibiotics can be lessened. Laboratory facilities can be made available for drug residue testing in livestock products [11].



Source: [14]

Fig 5: Antibiotic resistance from the farm to the table

Green House Gas Emission

Methane has a warming potential 20 times higher than carbon dioxide [15]. Enteric methane emission from Indian livestock contributed 15.1 percent of total global enteric methane emission [16]. In India, the enteric methane's contribution was 91.8 percent of the total GHG emissions, followed by manure methane (7.04%) and manure nitrous oxide (1.15%) in 2010 [16]. As far as India is concerned, cattle ranked first in emitting enteric methane, contributing about half (49.1%) of total enteric methane, followed by buffalo (42.8%), goat (5.38%), and sheep (2.59%), and others (0.73%) [16]. By the year 2050, enteric methane release of about 15.7 percent of the global enteric methane would likely to be contributed by Indian

livestock, which is expected due to animal population growth driven by increased demands of meat and dairy products, especially in the developing countries, unless proper GHG mitigation measures are not adopted in these countries [16].

Indian livestock sector can potentially contribute to the surge in the surface temperature, up to 0.69 mill kelvin over a 20-year time period, which is roughly 14 percent of the total increase caused by the global livestock sector [17]. The negative impact due to livestock emission is not restricted to India but is global. India leads livestock-dominant countries such as Brazil, China, and the US, with a livestock population of more than 500 million heads. Cattle and buffalo were, found to be the major sources of methane emission among India's livestock, accounting for 98 percent. The growth of the livestock population is the key factor influencing levels of atmospheric methane [15]. However, environmental risk management through improved livestock productivity, population stabilization, better feed, and manure use could reduce methane levels [15].

Other possible interventions can be use of feed supplements for the animals [18], feed treatment of the poor quality roughages to increase the nutrient content, composting of the animal waste products, and community biogas plant for the safe and income-generating disposal of the animal waste [19]. Galvanizing Organic Bio-Agro Resources Dhan (GOBAR-DHAN) scheme was launched by the Government of India (GoI) under the Swachh Bharat Mission (Rural). The scheme would focus on managing and converting cattle dung and solid waste in farms to compost, biogas, and Bio-CNG [20]. The Gobar-Dhan scheme not only benefits the villages in terms of cleanliness but also acts as source of income source.

Breed Improvement

Since animal production of our cattle and buffalo is half of the world's average [1], it necessitates breed improvement. Breeds mainly can be improved with two methods one is cross-breeding and the other up-grading. But there are many challenges in improving the breeds, like the availability of elite bull and lack of awareness among the farmers about the scientific breeding practices [21]. Another challenge is the adoption rate of Artificial Insemination (AI) because it has only 24.5 percent full adoption [22].

Total AI center in India is 100,368, out of which 55477 are owned by the government while 44891 run by NGO's and private players [1]. Till 2016-17, AI coverage was only 35 percent among the total breedable females [1]. The number of AI during 2016-17 was 70104, where Gujarat was 1st in the number of AI centers and the number of artificially inseminated animals, as well [1]. The total number of semen stations in India is 57 [1], of which only 35 were of "A" Grade. Possible interventions can be awareness among the farmers about the scientific breeding practices, doorstep AI services, use of progeny tested semen for AI, use of Embryo Transfer Technology, etc. [23]. Moreover, the focus of cross-breeding and grading up should be on non-descript breed instead of pure indigenous breed.

Milk Pricing

It is likewise a big challenge as the livestock farmers are not getting a reasonable price of milk. The income, in comparison to the cost of production per liter of milk, is very less. The cost of production is Rs. 26.76/liter for non-descript milch cow and Rs. 23.17/liter for milch buffalo, Rs. 19.04 for cross-bred cow [24]. Suggested interventions can be a rational milk pricing policy such that farmers can recover their input cost. With the support of the National Dairy Development Board, the dairy cooperatives require to be structurally transformed. The third possible intervention can be better supply chain management and better marketing facility for livestock products. Like, Karnataka, Haryana, and Telangana, other states can also extend incentives to the farmers during the months when milk prices drop because of surplus production [25].

Unorganized Market

The livestock market is underdeveloped, and the supply chain is poor. Dairy cooperatives and private dairies procured only 20 percent milk, while 32 percent was sold in the unorganized sector [1]. For dairy commercialization, organized markets are necessary. There should be provisions for bulk milk cooling, milk collection centers, and transportation facilities [23]. The government has set a target that 50 percent of the milk to be procured by the organized sector, up to 2022-23 [1]. Other possible interventions can be the value addition of the livestock products to increase their shelf life and profit earned [26].

Poor Livestock Extension

Livestock extension is very poor or almost absent since only 5.1 percent of households have access to livestock-related information [27]. There is no exclusive livestock extension program, and most services are animal health-focused, not extension-focused [28]. Possible steps that can be taken in this direction are need-based extension services. The sector contributes around 26 percent of the agricultural GVA, so a separate livestock extension cadre is required. Another can be the induction of animal husbandry specialists in Krishi Vigyan Kendras (KVK) and Agricultural Technology Management Agency (ATMA), wherever needed. Use of information and communication tools for information dissemination to the livestock farmers [29].Livestock Innovation System on the lines of Agriculture Innovation System [30]. Livestock extension officers can be used as certified livestock advisors by enhancing their knowledge and skills [31].

Feed and Fodder shortage

India is a deficit country, in dry fodder by 11 percent, green fodder by 35 percent, and concentrates feed by 28 percent [32]. By 2025, the deficit in green fodder and dry fodder will be 65 percent and 25 percent, respectively [32]. Only 5 percent of the cropped area is utilized for fodder production [32]. There is a need for restructuring the land use strategy to elevate the overall percentage of cultivable lands for fodder production to not less than 10% [32]. According to IGFRI, the estimated population of livestock will be around 250 ACU in 2030. With these feed and fodder resources, we can maintain 300 adult cattle units (ACU). So there is an urgent need for concrete strategies for a continuing supply of feed and fodder. The possible steps can be low producing animals' replacement with the high producers, balanced feeding, feed supplements, by-products utilization, crop residue utilization, utilization of unproductive land for growing fodder, and Azolla cultivation [1] can be taken. As per Information Network for Animal Productivity & Health (INAPH) data, a balanced ration led to an increase in average daily milk yield of 0.26 kg and milk fat by 0.10 percent, feeding cost reduced by Rs. 2.13 per kg of milk, and the average net daily income of milk producers increased by about Rs. 25 per animal [23].

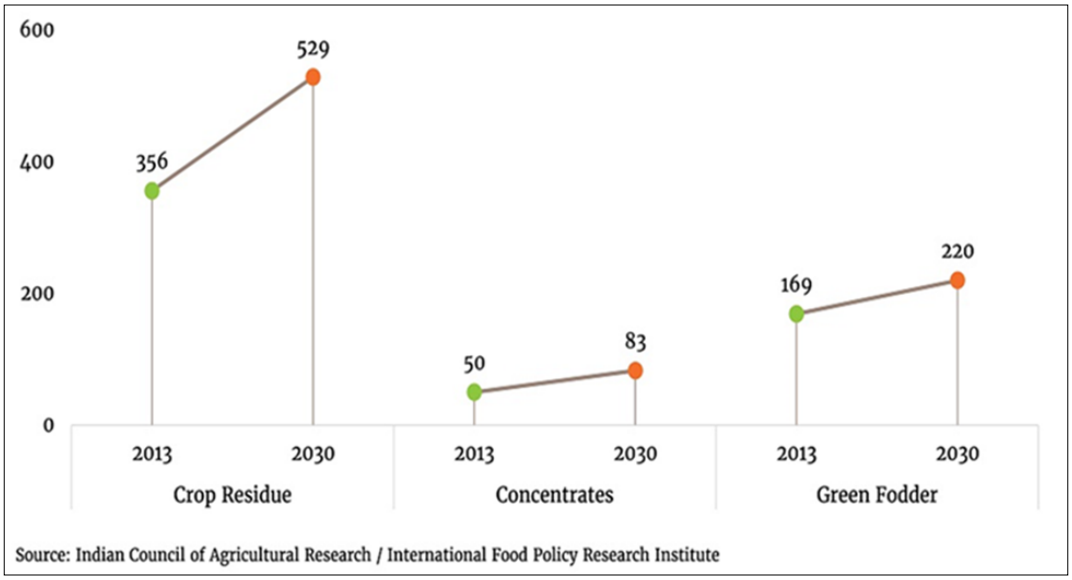
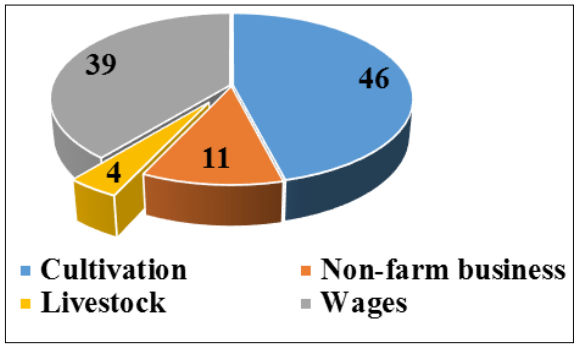


Fig 6: Availability of dry matter in 2013 against projected availability in 2030

Way Forward

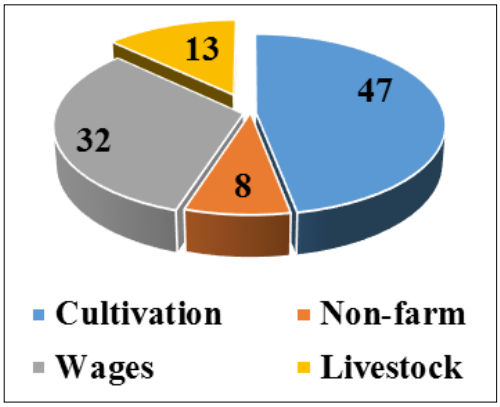
To minimize the input cost and productive utilization of the resources, a livestock-based integrated farming system is the need of the hour [33]. An increasing trend of intensive livestock farming poses a threat of zoonotic diseases for the human population [34]. Since livestock products are highly perishable, they require immediate processing, storage, and preservation, to move them from production areas to demand centers [35]. Processing and market linkages are, therefore, prerequisites for value creation and addition [35]. As the gross capital formation is very less in the sector, there is an urgent need for public-private partnerships to increase investment [36]. In the data-driven world, database management of animal information is necessary for monitoring and surveillance of various livestock development programs. To address the problem of the disposal of male animals, in cattle, sex-sorted semen technology [37] should be promoted. In the case of buffaloes, the semen of the high genetic merit bulls should be made easily available to the farmers to improve productivity. There is a necessity to increase the insurance cover to shift the livestock owners' risk to insurance companies, as only 15.47 percent of animals are under insurance cover [2]. The area-specific policy should be carried up example, in areas suitable for poultry production, policy focus should be towards poultry. The policy focus in rainfed areas should be on livestock rearing or livestock-based integrated farming system [38]. The policies related to fisheries and aquaculture should be promoted, in, coastal areas. Kisan Credit Card facility should be extended to livestock farmers also, to provide them formal credit access. 'Optimum usage of technology' available for herd management and genetic improvement such that only non-descript populations are targeted and no dilution of pure indigenous breeds [39].

The livestock sector has more potential than crops [40]. In 2002-03 share of livestock in farm income was 4 percent, which was increased by 9 percent in 2012-13 and reached 13 percent when the share of cultivation increased by just 1 percent in this period [41].



2002-03

Fig 7: Share in farm income (%)



2012-13

Fig 8: Share in farm income (%)

Every sub-sector of the animal husbandry is growing around 6 percent annually [2], confirming the immense potential of the sector. The livestock sector has equitable distribution, unlike agriculture here upon each scheme or policy of the government affects the individual household directly. Additionally, chances of elite capture of the schemes are rare in the livestock sector, unlike agriculture.

Conclusion

Stakeholders are ultimately admitting the structural shift in the agriculture sector that has been happening for a decade. Livestock is the new growth dynamo of the agriculture sector. The livestock sector has immense potential in the production, value addition, and export of dairy, fishery, poultry, and other products. Apart from performance, some challenges also exist that are posturing an impediment to sustainable production. We need to overcome these challenges to ensure nutritional security for the masses, achieving sustainable development goals, augmenting farmers' income, and grab global market opportunities.

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