AN ECONOMIC ANALYSIS OF AGRIBUSINESS VENTURES IN KERALA

Thesis submitted to the University of Calicut
for the award of the degree of

Doctor of Philosophy in Economics

By

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CERTIFICATE

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This is to certify that this thesis entitled, **"An Economic Analysis of Agribusiness Ventures in Kerala"** being submitted by *Jessy John K* for the award of the degree of **Doctor of Philosophy,** to the Department of Economics, University of Calicut, Dr. John Matthai Centre, Aranattukara, is a record of bonafide research work carried out by her under our guidance and supervision. The contents of this thesis, in full or in part, have not been submitted and will not be submitted to any other institute or University for the award of any degree or diploma. Plagiarism is checked and found within the permitted limits.

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DECLARATION

I, ***Jessy John K***, do at this moment affirming that this thesis titled "**An Economic Analysis of Agribusiness Ventures in Kerala**" is a bonafide record of research done by me under the guidance of Dr. Mani K.P. Former Professor and Head, Department of Economics, University of Calicut, Dr. John Matthai Centre, Aranattukara, Thrissur and Dr. Zabeena Hameed P., Assistant Professor, Department of Economics, University of Calicut, Dr. John Matthai Centre, Aranattukara, Thrissur. I also declare that this thesis has not been submitted by me earlier for the award of any degree, diploma, fellowship or any other similar title.

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CHAPTER I

THE DESIGN OF THE STUDY

1.1 INTRODUCTION

Kerala accounts for only about 1.18 per cent of India's total geographical area but to support 2.7 per cent of India's population out of which 52.18 per cent lives in rural areas (Census, 2011). The well-being of Kerala depends on the well-being of its rural sector and agriculture development has a rural focus. The share of agriculture and allied sectors in the Gross State Value Added (at 2011-12 prices) is only 11 per cent with a negative growth rate of -0.5 per cent (Economic Review, 2019). About 29.8 per cent of total employment in Kerala is from agriculture and allied sectors (5th Annual Employment-Unemployment Survey, 2016). Kerala accounts for only 6.65 per cent in the national Agri-products export earnings in 2017-18 (Kerala Economic Review, 2018). The performance of agriculture in the state is based on the contributions of 73.33 lakhs (96.7 per cent) marginal farmers (average land size of 0.18 hectares) who occupy around 61.37 per cent of operational land holdings in the state (10th Agricultural Census 2015-16). The performance is greatly affected by the shift in the cropping pattern and the consequent structural transformation of Kerala agriculture from subsistence food crops to remunerative cash crops.

The poor performance of agriculture and allied sectors are due to insufficient price and price instability, lack of market access, inadequate finance and insufficient technology, pre-harvest and post-harvest losses, inefficient systems of post-harvest management and lack of processing and value addition. In this context, incorporation of an effective, efficient and inclusive policy framework of agribusiness through local level planning is required to revamp agriculture and allied sectors.

Agribusiness is an emerging sunrise industry that links the farm sector to consumers through handling, processing, transportation, marketing and distribution of agri-food products of milk, meat, fish and crop variants. Dynamic and efficient

agribusiness reduces post-harvest losses, utilize the surplus agricultural produce, create additional market for farm output, eliminate intermediaries, offer fair price to farmers and create additional income and rural employment opportunities by attracting the youth and women in Agri-entrepreneurship, nutritional security and export potential that can be harnessed for economic growth. Thus, there exist strong synergies between agribusiness and performance of agriculture and allied sectors for economic development especially by reducing rural poverty.

1.2 REVIEW OF LITERATURE

The term agribusiness is evolved from two words "agriculture" and "business" which means any business relating to production, processing, distribution and marketing of agriculture products. A discussion on the existing literature on agribusiness explores the critical points of information on the different aspects of agribusiness around the world. Further, an in-depth review of these studies at the international, national and state level reveals the coverage and relevance of the topic as well as throws light on the areas where researchers need to explore. The major findings of some agribusiness studies in crop, meat, milk and fish are discussed under the following heads.

1.2.1 Reviews on Agribusiness in Crop Products

Sachitra (2020) analyses the farm owner's gender impact on resource-capability-competitive advantage linkage in agribusiness of minor export crops in Sri Lanka. Multiple regression analysis is used to analyse the primary data collected from 465 farm owners using a self-administered structured questionnaire. The study found that gender is not a constraint to gain competitive advantage linkage in agribusiness. The study suggests policy makers, government and local communities to select suitable crops and integrate proper capabilities for greater competitive advantage of agribusiness.

Mariyono (2019) analyses the role of micro-credit for rural prosperity through agribusiness among farm-households in Indonesia. The study makes use of structural equation model based on primary data collected from 220 households in three regions of Java in 2013-14. The study found that micro-credit has a positive

direct and indirect impact on the lives of rural farm-households through improved technology adoption.

Ali (2016) analysed the adoption of innovative agricultural practices like crop rotation, green manuring, crop diversification, sorting, grading, post- harvest marketing and price analysis in the vegetable value chain. The data base for the study is collected from 556 vegetable growers in selected districts of Uttar Pradesh using a questionnaire. Data is analysed using cross-tabulation, percentage and chi-square. Study results reveal that innovative agribusiness practices among smallholders are required for supply chain efficiency and effectiveness.

Anjana (2016) opines that agribusiness is emerging as a multi enterprise model in India due to changing consumer demand towards value added and processed food products but is slowed down by insufficient infrastructure. Wastage is alarmingly increasing due to inadequate and inefficient facilities for cold storages, cleaning, sorting, grading and packaging. Farmer gets only 25 to 60 per cent of the price paid by the consumer due high charges levied at various layers of the long supply chain and taxes. The study suggests that to make agriculture more remunerative for farmers, we need a well-connected and coordinated industry chain where farm products travel across national and international borders.

Pattanayak et.al (2016) opines that the potential of diversified hill farming of Uttarakhand in horticulture, forestry, floriculture, aromatic and medicinal plants has remained underexploited due to inaccessibility of latest technology, inadequate infrastructure for value addition, storage and agri-processing, lack of credit infrastructure, limited marketing facilities and prevalent marketing malpractices. Products are marketed by farmers through commission agents, wholesalers, traders, retailers/vendors and finally to the consumers. Final result is poor price for farmers, high price for consumer and a big chunk of consumers' money goes to the pockets of intermediaries. The study suggests that Public Private Partnership (PPP) models with adequate infrastructural reforms from the part of government can be a solution.

Dhinesh and Ramasamy (2016) made a study on the pomegranate processing and value addition in Maharashtra. The study results state that post-harvest losses are 20-40 per cent and about 10-15 per cent fresh produce lose their market value

and consumer acceptability due to improper post-harvest management. In spite of the nutritional value, medicinal benefits and great global demand, pomegranate processing industry in Maharashtra suffers from lack of technology, resource personnel and scientific research on processing.

Jadav et.al (2016) state that mushroom cultivation is the best way to improve the economic standards of the tribal people with in Narmada district of Gujarat. The study found that mushroom has a good market value due to its rich protein, potassium, sodium, and phosphorus content and low sugar, fat and starch levels. The study argues that it not only helps entrepreneurship development but also integrated rural development by increasing income and providing self-employment opportunities for village youths, women and housewives to make them financially independent.

Senff et.al (2016) made a study on the installation viability of a vegetable-washing machine for carrots and cucumbers for an agribusiness company in Brazil. Results of the study indicate an Additional Return Over the Investment (AROI) of 16.06 per cent higher than the Minimum Acceptable Rate of Return (MARR) of 6 per cent per year for carrots and 14.94 per cent higher for cucumbers. The study reveals that when a competitive strategy of vegetable cleaning through a machine is employed, the impacts are positive which reinforces the soundness of such an investment in agribusiness.

Siddiqui (2016) says that India has a bright future as a global player in agricultural products. Despite being a major agricultural producer, India hasn't fully exploited its potential in global market. According to him, Agri Export Zones (AEZ) are considered as the most important creation of India's Export Import Policy to promote agricultural exports from the country and provide remunerative returns to the farming community regularly.

Sreedevi and Harrendranath (2016) in their study opine that there exists a large potential for horticultural crops in Kerala due to the favourable agro-climatic conditions. But the scope is limited due to lack of farmer friendly distribution network and marketing system. Farmers are being exploited by the organised traders

and commission agents. The study suggests that the role of Horticorp is to be strengthened in the procurement, processing, storage and marketing of horticultural produces which can encourage farmers to increase production and prevent unreasonable price hikes.

Subash et.al (2016) study aims to review the existing system and practices and to suggest road map for acceleration of agri-based start-ups and Agri-entrepreneurship. According to them the concept of incubators is at an early start in agriculture and food sector even at the global level. The study found that opportunities and platforms for developing agribusiness and Agri-entrepreneurship are enhancing in the country through the initiatives of National Agriculture Research and Education System (NARES), Indian Council of Agricultural Research (ICAR) and Intellectual Property Rights (IPR) policy of 2016. The study suggests that forging formal links and developing partnership with schemes and projects operating under other agencies of government of India, successful NGOs, professional bodies and associations is a way to take forward the early initiatives. The study indicates that accelerating technology transfer can trigger more agri-based start-ups and attract more entrepreneurs across the country.

Suroso et.al (2016) analyse the impact of the investment incentives on agribusiness and macro economy of Indonesia using the secondary data. The study results reveal that the national output is increased mainly by increasing subsidy on fertilizer, electricity, gas and agricultural infrastructure. Agribusiness in cereals, vegetables and fruits has positively affected by increasing infrastructure subsidy and tax deduction. The study recommends government policy changes to provide tax incentives to emerging Agri-entrepreneurs.

Swain (2016) explores the pros and cons of contract farming to find a solution to the problems faced by small farmers in Indian agriculture. The study results show that on one hand contract farming reduces market uncertainty, price risks, post-harvest losses, offers better technology through private investment, increases efficiency, income, and employment. But on the other hand, contract farming generates problems like degradation of traditional knowledge, soil quality and bias

towards large farmers. Thus, the suggestion is to make contract farming more inclusive and sustainable.

Tiwari (2016) opines that health, nutrition and wellbeing are the key marketing messages used by the entire agribusiness sector. The study search for an urgent need to develop reliable storage and processing systems for fruits and vegetables since it contains a large quantity of initial moisture content and are highly susceptible to rapid quality degradation leading to the extent of spoilage. The study suggests that value addition and processing can extend the shelf-life even in off-season, enhance the acceptability with respect to flavour, colour, texture and safety, provide nutritious foods enhancing good health and help to build business communities and generate income for farmers and manufacturers.

Ankur and Ashutosh (2015) study examine the post-harvest techniques and procurement practices for fruits and vegetables used by firms in Uttarakhand. Data collected from 18 processors, 30 traders and 92 fruits and vegetables growers, are analysed by regression and factor analysis. The results reveal that faulty procurement practices and post-harvest management, inefficient and inadequate storage and transportation facilities resulted in loss of quantity and quality of produce causing increasing price and lowering profit. The study observed that there is ample opportunity for processors, as the demand of processed fruits and vegetable products in future is expected to increase in the wake of increasing per capita income and education of people. The study suggests contract farming as an option to train farmers on scientific techniques, integration of agriculture marketing services with present extension services, to avoid post-harvest losses and crash in prices during peak season and to ensure remunerative prices to farmers.

Chaturvedi (2015) opined that private investment in Agri-infrastructure is very low in India and wastage is very high in the absence of proper post-harvest infrastructure. The study found the newly emerging trends in agribusiness as e-marketing, agri-futures markets, branding agri-products and contract farming. The study suggests that private corporate could bring in modern methods and efficiencies in post-harvest storage cum logistics infrastructure that is critically needed.

Jagruti et.al (2015) state that India is one of the largest producers of papaya and about 25 per cent output goes as waste due to spoilage, 2 per cent is processed and the rest is used in the raw form. A SWOT analysis of the study based on the primary and secondary data from Gujarat reveals the strengths as raw material availability, priority sector status by Government, manufacturing facilities and vast domestic market. The weaknesses are infrastructural backwardness, lack of adequate quality control and testing methods as per international standards, inefficient supply chain due to intermediaries, high working capital and inadequate linkages between Research and Development labs and industry. The opportunities include a potential for agribusiness, Special Economic Zones (SEC) and food parks, rising income, changing lifestyles and consumption patterns, favourable demographic profile, integration of technologies and opening of global markets. The major threats include affordability, preferences of fresh food and high packaging cost. The study suggests that papaya processing unit is the most desirable option for agri-business since it generates income, employment and explores export and domestic market but need technical guidance and promotional support.

Kapoor (2015) opines that producer companies anchored by state or private institutions and promoted by Small Farmers Agribusiness Consortium (SFAC) can supply inputs, create marketing linkages, facilitate finance, insurances, training and networking. They can also give awareness drive about successful producer companies, encourage partnership between researchers and farmers, supply chain financing for day-to-day transactions and extend connections with corporate. The study suggests that producer companies pave the way towards a prosperous India wherein farmers smoothly transit from agriculture to agribusiness and reap the fullest benefits for a sustainable farm economy.

Manoj and Rahul (2015) analyse the agribusiness strategies to promote exports in India using time series secondary data. The results of the analysis using compound growth rate index and instability index show that coffee, tobacco, cashew kernels, marine products, spices, rice, fruits and vegetables are the commodities in the category of high growth and low instability in terms of agribusiness export

earnings and acts as a catalyst for generating employment, national income, foreign exchange and food for people.

Mariyono and Sumarno (2015) analyse the factors that affect farmers' decisions to adopt chilli-based agribusiness in Indonesia. Logistic regression model is used to analyse the farmers' decision. The study results indicate that younger farmers, farmers with more experience, easy accessibility to markets and credit, increased income, availability of market information and agronomic technologies are the motivating factors to adopt chilli-based agribusiness.

Manveer and Ramandeep (2014) analysed the challenges and opportunities of agribusiness groups in Punjab. The study identified the major challenges as competition from the unorganized sector, lack of recognition for retailers, less availability of finance, high cost, lack of adequate infrastructure and multiple and complex taxation system. The study found the major opportunities as provision of new brands and platform for customer interaction, new products with different varieties and quality, more frequent and speedier deliveries, employment generation, increased use of credit cards, increased income and lack of time, urbanization leads to more customers and contract farming that reduces intermediary chains.

Patel (2014) in his paper on "Agri-processing Industry: Key to Enhance Farmer's Profitability" opined that fruits and vegetable processing is highly unorganised and lack of infrastructure to transport and store is the major challenge faced by this sector.

Sharma (2014) in the article on "Agri-based Industries and Rural Development" suggests that Agri-processing industries provide an excellent nexus in promoting integrated development of agricultural industry in India and in transforming a stagnant rural economy into a dynamic economy.

Upadhyay et.al (2014) presented a paper on "Agri-based Enterprise Problems and Strategies: A Study in Udham Singh Nagar District of Uttarakhand". The study reveals that lack of finance, training on agribusiness, management skills and support from government, community and family are the major problems of Agri-based

enterprises. They found that the problems can be easily bridged through interfaces at various stages with the help of Agriculture Department, Human Resource Department, input supply agencies and Public Private Partnership.

Vasant (2014) examines the "Growth and Transformation of the Agribusiness Sector: Drivers, Models and Challenges" in India. The study classifies the growth of agribusiness development in India under three phases as Gandhian-Swadeshi phase up to 1950, Nehru-Mahalanobis phase from 1950 to 1984 and Modernization phase from 1984 onwards. The study identified the major agribusiness drivers as increasing productivity, urbanization, economic liberalization, globalization, privatization, information and technology revolution, income growth, changes in food consumption pattern, development of rural economy, rural-urban migration, demand for quality and convenience and commercialization of agriculture.

Hualda et.al (2013) analyse the environment of vegetable agribusiness system in the southern Philippines using a Complex Adaptive System (CAS) Framework. The study was based on qualitative data collected from both primary and secondary sources like interviews with smallholder producers, government employees, financial institutions, institutional buyers and development organizations. The study results show that the challenges in the vegetable agribusiness system are changing preferences of consumers, increasing importance of the supermarkets caused by globalization, population increase, rising income, urbanization and improvements in technology. The study suggests developing partnerships and collaborations to enhance enabling environment and to augment the scarce resources of agents.

Jairath and Purnima (2013) made a study on "Food Safety Regulatory Compliance in India: A Challenge to Enhance Agribusiness" based on India's New Food Safety and Standards Act, 2006. The study observed that food safety law is poorly implemented in the country especially in the marketing of fruits and vegetables. The study suggests the need to build soft and hard infrastructure, Private-Public-People Partnership to undertake awareness programme, sensitization

and capacity building on risk communication in both perishable and non-perishable food items, set up laboratories with skilled manpower to conduct scientific testing, educate and train farmers on personal hygiene along with safe application of pesticides to prevent contamination in fields, frame a set of good and hygienic practices in the market of fruits and vegetables and sensitise farmers on the issue through TV, Radio and mobile SMS.

Kumar et.al (2013) compares the contract farming practices of public and private companies of Punjab. Primary data are collected from 5 public and private each and 100 farmers using a pre-structured questionnaire. Data are analysed by percentages, averages, z-test and t-test. The study results show that area and farmers under public companies are more than private. Cereals in public sector are more successful while vegetables are more successful in private sector. The major problems faced by companies are farmers did not follow the delivery schedules, did not follow the advice of the company and supply poor quality of produce. Poor quality and untimely supply of seeds and other inputs, highly fluctuating prices, untimely payments and lack of advisory and extension services are the problems faced by farmers.

Madhavedi (2013) made a study on the "Marketing Opportunities for Indian Fresh Fruits and Vegetables in Middle East Countries". The study found that, even though India has the advantage of excess production and enormous opportunity to export Indian fresh produce to Middle East countries, it is nullified by spoilage, poor harvest, inefficient processing system and lack of integration of suppliers to synchronize the logistic movement with market demand. Hence the study suggests that Indian farmers need an orientation on pesticides use, post-harvest management, packaging systems and latest logistics technology for meeting the quality as per the international standards.

Venkitesh (2013) in the paper on "Business of Agriculture: Calling in the Corporates" is against the government's move to open up farm sector to corporate control under the public-private partnership (PPP) model. The study among the

farmers of Uttar Pradesh reveals that they were against this model based on their own experiences of land grab by Corporate.

Zylberberg (2013) examines possibility of the integration of smallholders into high-value global markets to reduce poverty in Kenya. The study is based on primary data collected from 4,000 flower producers through an efficient and transparent intermediary. The analysis focuses on the importance of governance, upgrading and strong intermediaries for including smallholders in horticultural value chains. The study found that although smallholder inclusion is both favourable and feasible based on theory, literature and case study analysis, it remains limited. It proposes embracing innovative smallholder-based business models as a viable path out of poverty in countries with low labour costs, suitable climatic conditions and basic infrastructural capacities.

Ashoka et.al (2012) in their study on "An Agribusiness Approach on Business Management of Fruit Processing Unit" focus on the backward and forward integration of fruit processing unit in Tamil Nadu. The study observed that the unique procurement model adopted in mango especially Alphonso and Totapuri are directly sourced from growers located in the districts of Krishnagiri and Dharmapuri without entering into any contract farming arrangement. The processing factory with good reputation makes advance payments at the beginning of the season and the final settlement by way of open cheque to facilitate easy transaction. The firm sells and export mango pulp through eight major corporate directly which avoids marketing process.

Carl and Latha (2012) conducted a study on the "Innovation and Research by Private Agribusiness in India". The study aims to quantify agribusiness innovation and research to provide information on economic, environmental and poverty-reduction impacts of agribusiness innovation and to identify major policies that encourage agribusiness research and innovation. The study found that the economic liberalization allowed large Indian corporations, business houses and foreign firms to invest in agribusiness and decisions to conduct research encouraged by public-

sector research, which provided firms with increased opportunities to develop new products with scientists.

Kormawa et.al (2012) in their working paper on "Agribusiness for Africa's Prosperity: Country Case Studies", made an attempt to shape the agribusiness environment in African countries for the success of agribusiness development processes. They observed that most agribusiness enterprises in rural Africa are informal with micro buyer-driven value chains. But in the urban supermarkets, large foreign and domestic agribusiness companies with a multinational outlook are dominating supply chains to meet demands. They identified the key policy factors for promoting agribusiness as long-term structural changes, medium term development potentials at product and firm level, upgrade agro-industrial value chains, strengthen innovative finance, move to more private sector-led activity and investment, develop and exploit demand at local, regional and global markets, and increase awareness for the promotion of agribusiness.

Kumar et.al (2012) made a study on "Value Chain Analysis of Maize Seed Delivery System in Public and Private Sectors in Bihar". The data are collected through surveys of seed producers, farmers, seed distributors, private seed companies and public research institutions in Samastipur district. The study analysed the value chain of public and private seed systems and find the need for a greater integration of stakeholders involved in the chain. They found that appropriate backward and forward linkages of maize growers with seed companies can generate better returns from maize. They suggested that the government policies to support services needs to enhance efficiency in seed delivery in the state.

Panda and Sreekumar (2012) analyse the factors influencing choices of vegetable farmers of Rourkela in Odisha to sell their produce among formal, informal and non-market participation. The study is based on ten independent variables and the analysis is based on a multinomial logistic regression model. The study finds that informal participation has more marketing efficiency in vegetable agribusiness and the vegetable farmers' marketing channel choice shift from non-market participation to informal participation.

Hachicha et.al (2011) evaluates how risks that evolve over time can affect sequential investment decisions, project implementation and growth opportunities in the olive oil industry in Tunisia. The methodology is based on a decision tree method and binomial lattice method. Study results show that time to build is a very important factor in valuing an agribusiness especially when efficiency is strongly governed by climatic conditions and international market uncertainty. The delay in project implementation not only affects the firm project financing costs and the loss of revenue but also it contributes to modify the initial marketing strategy.

Shelaby et.al (2011) made a study on the "Processed Chilli Peppers for Export Markets: A Capital Budgeting Study on the Agro Food Company" in Egypt which exports fresh chilli peppers to Europe. They found that by developing the processing practices for chilli pepper, the company can capitalize a value-added product and minimize product waste.

Pandey et.al (2010) in their study on "Underutilized Nut Fruits of Hills", Underutilized and Underexploited Horticultural Crops" state that in India, Jammu and Kashmir is the principal nut fruits growing state having monopoly in the production of export quality nuts with rich sources of energy, protein, fat, and essential amino acids. But the study found that nut fruits does not get due importance and comes under the underutilized and underexploited horticultural crops in India due to the delay in harvesting at proper maturity, lack of efficient post-harvest handling and refrigerated storage facilities.

Sudha and Lisa (2010) in their study on "Jackfruit: Nutritional Data, Medicinal Values and Uses" state that Jackfruit is cultivated at low elevations throughout India and in South India it is a popular food. They found that Jackfruit which is rich in fibre, calcium, phosphorous, potassium, magnesium, Vitamin C and carbohydrates and low in saturated fat, cholesterol, and sodium is grown truly organic even in the smallest home in Kerala since pests and diseases are not a problem under Kerala conditions. According to them a fruit of such a diverse value and use is neither classified as a commercial fruit nor grown on a regular plantation scale and there is a great scope for processing and value addition.

Mani (2009) made a study on the "Potential of Agribusiness Ventures in Kerala: A Block Level Study" and observed that the most important consideration for the farmer is profit rather than quality norms and standards. Farmers have complaints regarding high cost of labour and input prices. Most of the farmers sell their produce in raw form as they do not have time and money for processing and value addition.

Sun and Collins (2009) evaluated the opportunities for potential Australian food exports to China in a free trade environment. The study is based on scaled evaluation criteria consisting of tariff barriers, evidence of recent export activity, and price sensitivity, and future demand stability, opportunities for chain improvement and overall competitiveness that encompass the major factors constraining food exports from Australia to China. The study revealed that products like fruits, dairy products, meat, seafood and fish, fruit, wine and hides/skins have the highest potential and vegetables, edible oil/ oil seed, cotton, grain, sugar and wool showed medium to low potential.

Mangala and Chengappa (2008) analysed the impact of food retail chain linkage on farmers operating with fresh fruits and vegetables. Data are collected from 'Spencer's 'Consolidation Centre' in Bangalore and used Logistic regression model for the data analysis. The results show that a systematic farming and marketing arrangement help to avoid middlemen reduce market risks, transaction cost, and control over quality, supply reliability and price stability. Small and marginal farmers can improve their income by supplying high-value vegetables round the year at a fairly decent price.

Santosh (2008) tried to explore and investigate socio-cultural dynamics associated with agribusiness activities of floriculturists in the Terai region of Uttarakhand. The study revealed that lower middle peasantry who are eager to sweat in quest of better returns are more inclined towards agribusiness and large land holding farmers wait and watch.

Vermeulen et.al (2008) examines the contracting arrangements in agribusiness procurement practices in South Africa. The study is based on the

quantitative and qualitative data collected from a random of 61 Agri-processing companies using a semi-structured survey in combination with a personal interview. Data analysis using percentage methods estimates that 78.5 per cent of the total volume of fruit and vegetables procured by agribusiness companies for processing is based on contracting arrangement, while the balance is procured through a combination of the open market, own estates, agents or imports.

Acharya (2007) analysed the existing facts and emerging issues of agribusiness in India. The study states that agribusiness opportunities are ample in the country and increased investment is required in production, processing, infrastructure, trade, and this can be done by small and micro enterprises. To promote agribusiness, several initiatives have been taken by the government in the form of withdrawal of market related restrictions and setting up of Agri-export zones for the smooth functioning of private investors. The study also suggests changes in marketing system to reduce crop losses, increase competition to reduce undue profits by intermediaries, and to create more employment opportunities for the youth.

Mittal and Singh (2007) made a study on "Shifting from Agriculture to Agribusiness: The Case of Aromatic Plants". They examined the agribusiness opportunities in medicinal and aromatic plants, based on the data collected from U. S. Nagar and Dehradun in Uttarakhand. To examine the economics of aromatic plants, they used the simple cost accounting method. They found that the returns are substantially higher from these crops than the most profitable commercial crops like sugarcane. The major constraints identified are inadequate processing capacities, price risks and non-availability of planting material. They suggest that concerted efforts to address these constraints and increase access to the world market can be a solution.

Shah (2007) made a study on the "Functional Deficiencies of Agribusiness Cooperatives in Maharashtra: Synthesis of an Unsuccessful Case". The study evaluated the performance of fresh fruit export co-operative organizations in Maharashtra. The performance was evaluated not only in terms of its business and welfare activities but also with respect to the benefits accruing to its members in

particular and the farming community in general. The study found several deficiencies such as poor knowledge about the market forces, selfish nature of the management, personal interests in the functioning, failure to generate and promote interests of members, lack of funds and losses resulted in the diversion of produce to private traders.

Goyal (2006) highlighted the importance of fruit and vegetable processing in Indian context. He found that agribusiness firms in fruits and vegetable processing must be innovative and need to anticipate and respond to the requirements of consumers. Only then one can regard fruits and vegetable processing industry as a sunrise industry.

Echnove and Steffen (2005) made a study on "Agribusiness and Farmers in Mexico: The Importance of Contractual Relations" to examine the implications of contract farming for productive relations based on the data collected from central Mexico which is the second largest vegetable producer as well as an important grain producer in the country. The study observed that in Mexico, contract farming dominates in areas of horticultural production for the frozen vegetable industry in order to assure continuous supplies of products that meet certain quality standards and for grain-buying companies to obtain government sponsored subsidies, either at the production stage or in the process of marketing. The study found that despite disadvantages of contract farming for growers and the disproportional risks born by producers, they enter into contract farming because they lack alternatives for financing, technical assistance and access to markets.

Joseph and Barry (1998) in his study "Lanones: An Agribusiness Marketing Simulation" examine the dynamic simulation of marketing by a fruit grower in Philippines. Farmer needs support of agribusiness professionals to determine the appropriate profit-seeking marketing strategy by applying their knowledge and skills in forecasting, demand analysis, statistical analysis, market assessment, marketing strategy formulation, pricing, distribution, and financial accounting. The study reveals the employment opportunities for agribusiness professionals in Philippines.

The above discussion on agribusiness in crop products reveals that, ample research is going on at the international and national level compared to the studies that focus on agribusiness in crop products of Kerala. Another observation is that, in spite of the importance of rice as the staple food of Kerala, value addition and processing is more popular in fruits and vegetables. Hence, there exists opportunities for agribusiness in rice products which can be mobilized for the development of agriculture in particular and the economic development of the economy as a whole. The discussion also highlights the major challenges faced by agri-entrepreneurs in crop products as wastage due to improper post-harvest management, inaccessibility of latest technology and inadequate infrastructure for value addition, processing and storage, lack of credit and marketing facilities, poor price for farmers, high price for consumer and exploitation by intermediaries. Unless further positive steps in this regard are taken, the conditions of farmers remain sluggish and young generation will keep away from this sector.

As India moves from regulations, controls and lockdowns due to Covid-19 pandemic, the impact on the economy is becoming ever more acute. "Many strategies have to be taken by the central, state and local self-governments to improve the productivity and profitability of agriculture. This includes, suitable agro-advisories to peasants to ensure plant and human health, cold storage or other storage facilities, access to good quality seeds, technological and economic empowerment of women and suitable equipment for value addition" (M.S. Swaminathan, 2020). The emergence of innovative, smart and professional Agri-entrepreneurship creates new opportunities in crop sector. Nutrition rich agribusiness products can minimise the impact of economic slowdown on nutritional food security and the dependency on other states resulting in a paradigm shift towards agribusiness sector. Therefore, research gap exists to identify agribusiness prospects and linkages, sustainable innovation process and entrepreneurship for the development of competitive agribusiness.

1.2.2 Reviews on Agribusiness in Meat Products

Dlamini and Huang (2020) made a study on the importance of beef cattle agribusiness in Eswatini of southern Africa. The study used Borich Needs

Assessment Model to analyse the primary data collected from a sample of 397 beef cattle farmers. The study states that beef cattle play a pivotal role in the food security, poverty reduction and economic growth of Eswatini economy. The study results show that farmers are less proficient in cattle production and agribusiness management practices especially the female farmers. The study recommends training to farmers on concepts like farm structure, cattle breeding and rearing, cattle feed and feeding, cattle health, farmer organisation and agribusiness management.

Suthar et. Al (2019) made an overview of livestock sector in India and stated that the sector has a significant role to play in the expanding and diversifying agriculture scenario of the country. The study suggests that owing to the growing importance, more funds to be allocated to livestock sector of the country for hastening the research and development of livestock products.

Macgregor (2019) analysed the challenges faced by beef industry in Canada. The study states that Canada ranks 10 in per capita consumption and exports of beef in the world. The study identified the major challenges faced by beef farmers as bans in export market, changes in dietary habits, labour shortage, high cost of land and insufficient supply management. The study suggests intervention from the part of government to remove the bans, create awareness among consumers regarding the inclusion of beef in their dietary habits and strengthen the supply management chains.

Sodiq et.al (2019) made a study on the importance of beef cattle agribusiness in Indonesia. The study identified the major constraints in the development of beef cattle agribusiness as lack of feeding technology, and inefficiency in the management of natural resources. The study suggests good farming practices, in order to improve efficiency and feasibility of beef cattle agribusiness.

Lainawa et.al (2019) aims to develop a model of agribusiness in beef cattle in North Sulawesi of Indonesia. The study states that beef cattle farms in the study area are in a growing stage and has the potential to develop by considering the efficiency and market considerations. The study found that farmers are the backbone of the beef cattle agribusiness and there is a need to encourage the

processing and value addition in beef. Constraints related to development of beef cattle agribusiness include lack of feeding technology, landlessness and lack of managing natural resources especially for forages. Implementation of technology in terms of good farming practices including breeding and feeding practices could be considered for increasing feasibility and competitiveness beef cattle agribusiness.

Sun and Tan (2019) in their paper proposed a margin protection scheme for livestock farming in developing nations. The researchers are inspired by the successfully implemented livestock gross margin programme in USA. Using econometric models, the research analysis results show that margin protection scheme is effective and can be constructed for developing countries with rudimentary futures markets.

Drouillard (2018) analyses the current situation and future trends for beef production in USA. The study states that American beef industry is technology driven, utilizing reproductive management strategies, genetic improvement technologies, exogenous growth promoting compounds, vaccines, antibiotics, and feed processing strategies, focusing on improvements in efficiency and cost of production. The study found that USA exported 10.6 per cent of the total beef produced in 2017 either as variety meets or as high-quality beef products while the per capita consumption of beef was 25.8 kg. The study predicts that production and consumption are expected to be slightly higher or stable in future since the industry is highly adaptive and responds quickly to evolving economic signals.

Dash (2017) made a study on the contribution of livestock sector to Indian economy. The study states that livestock plays a vital role by contributing 14 per cent income to rural households, provides employment to about 9 per cent, 4.11 per cent to Gross Domestic Product (GDP), 25.6 per cent to agriculture GDP and a major supplier of nutritious food and raw materials to the country. The study reveals that the country has ample untapped agribusiness potential in livestock sector.

Moreira et.al (2016) made an economic assessment of agribusiness sector in Brazil and its relationship with other sectors of the economy. The study found that agribusiness is a major contributor to food, employment and foreign exchange to the

Brazilian economy. But its average income is lower and tax burden is higher than other sectors. However, agribusiness has a strong linkage between agriculture and livestock, industry and services in other economic sectors of the Brazilian economy. The study came to the conclusion that the development of agribusiness contributes to the Brazilian economic development and therefore vital to the progress of economic policies.

Sundar (2016) explores the scope and opportunities of agribusiness in India in the fields of production, processing, manufacturing, packaging, distribution and export of farm, livestock, dairy, fisheries and forest products. Major constraints and challenges identified are deteriorating natural resource base, low productivity, low investment, disconnected value chains, weak infrastructure, inadequate technological knowhow, multiple intermediaries, changes in consumer taste at the domestic and global level and government policy. The study suggests increased investment to develop basic infrastructure, bring technology from foreign partners, market exploration and linkage development, and promote value addition through commercialization and revision of government policies to bring a conducive environment for agribusiness.

Sarma et al. (2015) examine the impact on income of small-scale beef cattle enterprise in the selected districts of Bangladesh. Data are collected from randomly selected 360 farmers using a well-structured schedule. Descriptive statistical tools like mean, percentage, paired t-statistics and chow test are used for the data analysis. The study result shows that agribusiness in beef cattle has a promising prospect in Bangladesh in terms of income, employment and economic growth. The study recommends intensive support services from government and non-government institutions to improve the performance of beef cattle agribusiness.

Lemma (2014) investigates the knowledge base on livestock enterprises, support services and governmental policies among 89 self-employed graduates in Ethiopia. The study found that student acquires basic entrepreneurial skill for work or self-employment after completing graduation. But quality and affordable livestock support services are limited due to long physical distance, high price, lack of information and socio-cultural barriers. The study results reveal that issues in

livestock entrepreneurship are not fully addressed by the government due to lack of institutional support.

Wender (2011) made a study on the transition from small family farms to large-scale industrial, factory meat farms agribusiness in USA. The study reveals that the transition is attributed to the amendment in the Farm Bill in 2008 allows subsidy to promote efficient agribusiness through large-scale industrial farming operations. USA's agribusiness in meat is gradually confined to large-scale factory farms who are the nation's primary meat producers.

Larsen et.al (2009) examines how agriculture innovation arises in Africa through agribusiness in livestock sector. The primary data is collected through personal interviews with agribusiness representatives on their experiences on innovation in Africa's agriculture sector. The study found that livestock sector in Africa has the potential for growth, innovation and poverty reduction by creating synergies between market and knowledge-based interactions and linkages.

MacDonald (2009) studies the changing structure of American livestock agriculture. Study is based on secondary data from USA's National Agricultural Statistics Service (NASS) and Agricultural Resource Management Survey (ARMS). Study states that livestock farms become large through joint ownership of families and are closely linked to input providers and processors through formal contracts. The study found that management of financial risks become easy with increased productivity and reduced cost of production through speedy diffusion of innovations. But concentration of animal waste and excess use of manure-based nutrients and antibiotics pose risk to environment and human health.

Sekine and Hisano (2008) examined the factors contributing to the increasing agribusiness involvement in local agriculture in Japan. The study found that deregulation of agricultural sector for private joint-stock companies to acquire farmland and allow agribusiness, deregulations of the wholesale market system, increase of supermarket chains, increasing consumer demand for food safety and high quality domestic or local agricultural products are the factors promoting agribusiness.

Ali (2007) opined that livestock sector plays a vital role in the socio-economic development especially of rural households in India. Livestock rearing has a positive impact on poverty and inequality reduction. About 70 per cent of rural landless, marginal and small households in India are livestock owners. Livestock sector in India is emerging as an engine of agricultural growth since these households keep small animals like sheep, goats, pigs and poultry due to the low initial investment and operational costs. The potential of agribusiness in livestock sector is enormous because of the increased demand for value added livestock products due to increased income, urbanization, nutritional security and changes in tastes and preferences.

Waldron et.al (2007) made a study on how agribusiness in sheep meat leads to the development of rural areas of China. The study observed that the Chinese livestock sector leads the world livestock revolution in terms of volume and growth rate. The study found that Chinese sheep meat agribusiness is dominated by a large number of small and semi-subsistence rural households. Agribusiness in sheep meat starts from sheep breeding and meat production, processing and marketing by small and semi-subsistence rural households with a positive direct linkage on their livelihoods.

Gualti (2006), Dev and Rao (2005) argued that market-oriented reforms are coincided with a change in consumption pattern wherein the share of food grains in consumer's food basket declined and that of high valued products like meat, vegetables and fruits have increased. This provided new agribusiness opportunities for farmers to earn higher income by focusing on high-value crops/products as well as better access to market.

Birthal et.al (2002) made a study on the research priorities for livestock sector at state wise as well as all India level. The study states that the importance of livestock sector is growing as a result of the increased demand for livestock products due to rise in per capita income, urbanisation, changes in food habits and lifestyles. The study reveals the growth potential of livestock sector from its contribution to GDP, employment, draught power, manure, fuel, capacity to reduce interpersonal, interregional inequality and poverty. The study found that compared to many other

states, Kerala, being in an advanced stage of economic development, with high literacy, low incidence of poverty and less undernourished people, allocate comparatively less research resources for agribusiness in livestock.

Nair (1980) made a study on the livestock development policy choices. The study identified linkages between agriculture and livestock sector and the relations within the livestock sector. The study results show that shifts in relationships within livestock sector can maximise milk and meat output. The study suggests that livestock development policy changes should be conducive to livestock development.

The above discussion on agribusiness in meat products reveals that, compared to the progress and advancement of agribusiness in meat at the international level, the potential of agribusiness in meat in India and Kerala is less explored. Researchers identified that value addition and processing in meat is low in the state due to lack of technological advancement and insufficient infrastructure and cold chain facilities. This results in wastage, instability in profit, high risk and low shelf life leading to underutilisation of livestock resources. But the existing literature state that there exists direct positive linkage between agribusiness in livestock products and agriculture growth in particular and economic growth of the economy as a whole in general.

Agribusiness in livestock sector is considered as the thrust areas of post-Covid-19 with lot of Agri-entrepreneurship opportunities. Protein rich agribusiness products from livestock sector can address the nutritional food security and malnutrition (Sunil, Meat Technology Centre, Kerala Veterinary and Animal Science University). Livestock farmers are struggling to market the perishable livestock resources due to shortage of labour, transportation and restricted market operations. Agri-entrepreneurs can promote private investment to utilize the potential of marketable surplus. Therefore; there is an urgency to explore the untapped areas of agribusiness in livestock sector of Kerala.

1.2.3 Reviews on Agribusiness in Milk Products

Addis (2019) observed that Ethiopia's dairy sector has enormous opportunities for development with a large number of small, medium or large-sized,

subsistence or market-oriented farms. However, the growth is slackened by inadequate infrastructural and institutional set-ups, spoilage and absence of processing, insufficient holding grounds and quality feed, low productivity and poor quality of milk, poor animal health and prevalence of diseases, lack of credit and inadequate market information.

Elizabeth et.al (2019) study aims to analyse the working of dairy based farmer producer companies in Kerala. The study observed that there are 11 animal-based farmer producer companies across the northern, central and southern regions of Kerala. The study selected five dairy based companies one from north and two each from central and southern regions. The study was based on primary data collected from 24 members from each of these selected companies using simple random sampling method. The study found that farmer producer companies offer better price for products by eliminating middlemen and provide organisational, production and marketing support. The branding of eco-friendly milk products gives strength and success to these companies and the study suggests that government, service providers and extension officers should sensitise dairy farmers about the benefits of farmer producer companies to enhance entrepreneurship in dairy practices.

Keshelashvili (2018) analysed the value chain management and development of agribusiness in Georgia. The study observed that agribusiness value chain in Georgia connects producers, middlemen, processors, markets and service providers through the introduction of innovations in the value chain process. The study states that effective value chain management promote competition, increase profits and satisfaction of consumers. The major challenges in agribusiness value chain identified by the researchers are lack of advanced technology, business management awareness, poor logistics and low opportunities for market negotiations. The study found that seasonality of raw materials and inadequate supply are the major causes for the value chain instability and efficient value chain reduces costs which contribute to agribusiness development.

Kim (2018) forwarded the World Bank Report on “Future of Food: Maximising Finance for Development in Agricultural Value Chains”. The study

observed that 80 per cent of the poor people in the world live in rural areas and majority depend on agriculture and allied sectors for their livelihood. The study states that their income comes from production, input supply, processing, trade, distribution, marketing of agribusiness related activities. The report says that agribusiness activities are driven by small and large-scale private sectors offering new opportunities in support services including finance, information, technology, water, power and infrastructure.

Jadawala and Patel (2017) made a study on the challenges of Indian dairy industry. The study found that lack of research and modernization, low yield and profit, poor quality milk due to unhygienic handling, competition from abroad, poor infrastructure and inefficient supply chain are the major challenges faced by Indian dairy industry.

Landes et.al (2017) analyse the structure, performance and prospects of dairy sector in India. The study observed that Indian dairy sector is dominated by small scale and fragmented ownership pattern. The performance is not satisfactory because the average milk yields remain well below international standards and breeding and feeding practices are outmoded. Therefore, the study identifies significant scope for future growth in both production and consumption of dairy products.

Rao (2017) analysed the opportunities, challenges and future of Dairy Sector in India. The study observed that exploration of opportunities in Dairy sector can bring economic development by raising rural income, employment and industrial growth. The major challenges are increasing cost of cattle feed, non-availability of labour, inefficient production, processing and infrastructure facilities and stiff competition from European markets. Being the largest producer of milk in the world, Indian dairy sector can play a vital role in promoting rural welfare and reducing poverty.

Vate-U-Lan (2017) analyses the application of smart farming technologies in Canada to increase milk production while maintaining the health of cattle and preserving the environment. In this case study, innovative research integrates advanced technology, digital tracking of cow, genomic testing, digitally signalled

birth, sensor driven crop management and data driven dairy production that increases both quality and quantity of dairy production.

Zhao (2017) made a SWOT analysis of Chinese dairy industry. The strengths of China's dairy industry are its growth, investment and modernization with a focus on food safety and efficiency. The weaknesses lie in small farm pattern, the poor availability and quality forage crops and struggles with food safety issues and perceptions of poor quality. The opportunities lay in the path of recovery with rising consumer income and simulative government subsidies. The major threats are domestic and foreign competition, insufficient numbers of competently trained dairy farm staff and insufficient cash flows.

Shah (2016) analysed the issues related to the supply chain management under private and cooperative dairy sector in India. The supply chain management integrates the production, procurement, processing and distribution of dairy products to make the product available at the lowest cost with maximum consumer satisfaction. The study considered three tyre Amul supply chain with dairy cooperative societies at village level, milk union at district level and milk federation at the state level to eliminate middlemen between the dairy farmer and processor. The private sector dairy companies like Nestle and Reliance Fresh have the capacity to handle large volume in the supply chain than Amul.

Anjana and Raveendran (2013) made a study on the customer awareness and satisfaction levels for Kerala Cooperative Milk Marketing Federation Limited (MILMA) products. The study found that Kerala's milk market is controlled by MILMA and changes in consumer preferences and food habits provide new opportunities for dairy sector agribusiness. The awareness and satisfaction levels of MILMA products, both from customers' and dealers' point of view are helpful to frame strategies to face competition.

Gereles and Galych (2013) studied the main characteristics and success factors of integrated agribusiness in the dairy industry of Ukraine. The study aims to identify the latest trends in Ukraine dairy market. The study observed that dairy industry plays a vital role in the agriculture of Ukraine by supplying nutritious fresh dairy products, different varieties of cheese and milk powder with export potential.

The study found that Ukraine dairy industry is suffering from deficit of raw milk supplied for processing.

Singh (2011) opines that agribusiness is the key force behind the commercialisation of Indian agriculture. Agribusiness started its journey through the forward and backward linkages from and to the dairy farmer petty shops, retail stores, terminal markets, processing units, cooperatives and corporate by creating employment opportunities. Agriculture universities are the power houses to disseminate knowledge on production, processing, distribution and marketing through public private participation and Non - Government Organisation (NGO) relationship mode.

Lokanadhan et.al (2009) in their book on "Innovations in Agri-business Management" opines that India, with its vast potential for the production of temperate, sub-tropical and tropical agricultural commodities has a great scope for agribusiness. The enhancement of agribusiness throws open opportunities for employment in marketing, transport, cold storage and warehousing facilities, credit, insurance and logistic support services.

Gangadhar Bhatia (2007) in his book on "Agribusiness Management" says that agriculture has become a long way from being a poor villager's bread and butter to becoming a full-fledged entrepreneurial activity employing the latest technology and forming the back bone of the nation's economy. Any business that adds value to agricultural products and those which facilitate marketing of agricultural products to an ever-growing market are coming under the preview of agribusiness.

Esterhuizen (2006) evaluated the competitiveness of the South African agribusiness sector using Agribusiness Competitiveness Status Index (ACS) and Agribusiness Confidence Index (ACI). ACS measures the relative trade advantage and ACI uses variables like climatic conditions, changes in exchange and interest rates, economic growth and changes in turnover and net operating income. The study results reveal that South African agribusiness sector is marginally competitive with a positive trend. The success factors are the availability of high-quality products, intense competition in the local market and continuous innovations. High

cost, inflexible labour policy and public sector incompetence are some of the factors constraining the competitiveness of this sector.

Jesse et.al (2006) observed that Indian dairy sector is characterised by village-based smallholder production units with one to three milk animals. Other observations include low milk production cost, rising milk price, capacity to reduce rural poverty, dominance of informal sector in dairy processing. The study identified the major obstacles faced by this sector as inadequate and poor quality of feed, lack of managerial skill, insufficient infrastructure and market imperfections. Stanton (2000) observed that in Mexico localized agribusiness helped to raise the income of rural population by adding value to raw agricultural products that is otherwise lost to external agents provided government support in basic infrastructure.

Nair (1979) analysed the contribution of animal husbandry and dairy to milk production in Kerala. The study observed that milk production in Kerala is mainly done by small and marginal farmers and found that production and profitability of milk in the state is increasing. The study questioned the demand for ban on cow slaughter and argued that such a demand is harmful to the growth of livestock sector of the state.

The above discussion on agribusiness in milk products reveals that, the potential of agribusiness in milk is less explored in Kerala compared to the progress and advancement of agribusiness in milk at the international level. Researchers identified that agri-entrepreneurs in milk products faces challenges like stiff competition from abroad, low opportunities for market negotiations, changes in dietary habits, poor quality of milk, lack of standardisation, easy to contaminate due to unhygienic handling, lacks modern technology, professional business management awareness, insufficient infrastructure and lacks effective cold chain management. Hence, agribusiness in milk products involves high risk due to instability in profit, low shelf life and wastage leading to underutilisation of dairy resources. But the existing literature state that there exists direct positive linkage between agribusiness in milk products and agriculture growth in particular and economic growth of the economy as a whole in general.

Further it is evident from the discussion that dairy farming in Kerala is dominated by informal small and marginal dairy farmers whose families have always cows and the milk is sold in neighbourhood. Dairy is the only allied sector of agriculture in Kerala that did not suffer a price slump due to covid-19 pandemic since milk supply was running even during lockdown since milk was declared as an essential commodity. But, dairy farms in Kerala who depend on migrant labourers for various activities related to managing livestock, processing value added products, distribution and marketing are facing labour shortage due to the return of migrant labourers due to the spread of covid-19 pandemic. At the same time reverse migration due to covid-19 provides an opportunity for labour intensive agribusiness in dairy products to engage the return migrants in gainful employment. Thus, there is a great necessity to do research in dairy sector agribusiness to develop processing and value addition industries in rural areas for harnessing the dairy sector potential.

1.2.4 Reviews on Agribusiness in Fish Products

Atukundaet.al (2018) examines the role of extension services in the development of fish farming in Uganda. Study is based on primary data collected using a semi-structured interview schedule from 246 fish farming households randomly selected from selected districts. The study results show that even though fish farming provides nutritious food and income, extension services failed (lack of inputs, farming knowledge, motivations and experiences through frequent visits by district extension staff) to address the problems of fish farmers. The study suggests that extension services require adequate budgets, refresher training courses to the staff and interventions should be socially negotiated and adapted in view of aspirations and limitations of fish farmers.

Searle's et.al (2018) aims to analyse European fishermen's viability of value addition to utilize the unused market potential. Study states that fish farmers face stiff competition both from home and abroad. European consumer surveys prove that consumers are willing to pay for local fish of sustainable standards. Case study of family-owned fish farms in Germany, Italy, England and Greece found that they face problems like less access to capital, lack of training and experience in business management, technological knowhow, legal restrictions, low output, high operating

costs, low prices and low profitability which hampers the younger generation to enter the business.

Samantha and Sebastian (2017) analysed the history, size, diversity, government support and research of aquaculture in China. The study states that technological and scientific advancement in China transformed small-scale and family-based aquaculture to a market driven economy. The study found that the Bureau of Fisheries under the Chinese Ministry of Agriculture supervises fishery laws, signs bilateral fisheries agreements, supports fisheries education and research, manages fisheries technology extension centres and fish processing industries, support and train fish farmers by disseminating the research output. China's aquaculture industry employs 6 million people and became the world leader as per Food and Agriculture Organisation 2016 estimates.

Xinhua et.al (2017) examines the need, importance, awareness of people, role of government and viability of fisheries insurance business in China. The study found that understanding and awareness of insurance for fishery and aquaculture need to be improved and there is a need to develop more types of aquaculture insurance schemes. Even though Chinese governments at the centre, provincial and local level issue clear policy guides and regulations on fishery and aquaculture insurance programmes, premium subsidy for fishery and aquaculture has yet to be included in government budget.

Lakshmi and Raju (2016) examined Kerala's marine fisheries potential exploitation levels and the contribution of this sector towards the Gross State Domestic Product. The study observed that marine fishery resources from Kerala contribute a significant part in the export earnings of India. The study suggests a comprehensive programme for the development of fisheries sector. The study concludes with an optimistic note that if the rich unexploited fishery resources are utilized effectively, Kerala can be one among the top fish producing state in India and can contribute more towards the economic development of the state.

Salim et.al (2015) studied the status of fish food security in India by analysing the growth in production, consumption, distribution, exports and prices in domestic and export markets. The study observed that urban consumers are willing to pay a

higher price and the price is high in domestic market than export market due to a significant fish demand-supply mismatch in domestic market. The study suggests conducting awareness programme among domestic consumers to augment the consumption of high-value fish.

Adigun (2014) examines the impact of existing food safety policies on emerging agribusiness enterprises in selected states of Nigeria. The data for the study is collected from 50 randomly selected food vendors in Ojoo and Bodija areas using a well-structured questionnaire. Ordinary Least Square, Simple Regression Analysis, adjusted R^2 and F-statistics are used to analyse the data. The study results reveal that, educated and emerging young agri-entrepreneurs are aware of food safety policies and willing to pay for food safety measures. The less educated, experienced and old food vendors are aware of the food safety policies, but neglect safety norms and are not willing to pay for food safety measures. The study observed that although Nigeria took steps to increase food production to prevent hunger, food security received only little attention and the implementation of food laws are poor. The study recommends that the food agency in Nigeria must extend surveillance and awareness-creation activities to food vendors and needs to ensure that food vendors meet basic food safety standards as well as proper sanitary practices.

Ancy and Raju (2014) analyses the structural changes in the fisheries sector of Kerala. The study observed that fisheries sector of Kerala contributes much in the form of export earnings, employment and nutritional food security. The promotion of seafood export requires efficient quality infrastructure and processing facilities with the help of private and public participation. The financial constraints retard the growth of fisheries exports and private investments are essential for the long-term sustainable growth of fisheries sector. Transformation of production and consumption pattern of fisheries sector can have a positive impact on economic growth and reduction in inequalities among various fish clusters.

Hanson et.al (2011) aims to examine the challenges and opportunities of fish and fish products market supply chain sustainability, strategic government policy and sustainable trade policy in China. The study is based on three supply chain

flows, namely, out flow of fish exports to the rest of the world, inflow of fish imports for processing and outflow of fish products for exports and inflow of fish for processing and consumption in China. The study results show that China adds value to its fish products by extracting ingredients for cosmetics and medicines but international development of appropriate standards and certification is still at a relatively early stage. Study suggests that China has the means and will to create positive changes to meet the challenges and opportunities of aquaculture market supply chain.

Desmond and Siebert (2009) in their study on "Toward Better Defining the Field of Agribusiness Management" argues that agribusiness management is fundamentally a multi-disciplinary endeavour because it operates at various levels of firm, inter-firm and market that requires different disciplinary approaches. According to them, a dialogue between the fields of management, sociology and economics and other related fields, not only highlight the unique approaches to examining various levels of analysis in agribusiness management research but also serves to advance the pluralistic nature of this field.

Landes (2008) examines "the environment for agricultural and agribusiness investment in India" based on the secondary data and interviews of representatives from Indian Agribusiness Systems, Ltd, of Okhla in Uttar Pradesh. The study observed that despite strong overall economic growth and strengthening food demand, investment in Indian agriculture and agribusiness has remained sluggish. The study revealed that there is an array of policies and regulations affecting agricultural production, marketing and food processing but weak infrastructure and lack of market services have discouraged private investment in agribusinesses.

Harikumar and Rajendran (2007), Director and Deputy Director of Fisheries (Inland) in Kerala opined that the state has tremendous untapped fisheries potential for expansion. They suggested that for the optimal utilisation of available fisheries resources, there is a great need for modernisation and diversification through the use of deep-sea fishing technology, boost coastal and inland aquaculture, development of cold storage and cold chain infrastructure and modernisation of fish markets.

Mandal et.al (2007) analyses the economic, social and financial viabilities of the production, marketing and conservation of ornamental fishes in the North-Eastern states of India. The study observed that these states contribute bulk of India's ornamental fish exports and provide employment but the resources still remain untapped and there is increased scope for agribusiness opportunities. Primary and secondary data analysis based on Internal Rate of Return (IRR), Benefit Cost Ratio (BCR) and Net Present Value (NPV) results show that ornamental fishery sector is financially as well as economically viable and investment-friendly with government incentives.

Cherian (2006) observed that the percentage shares of agro processing industries of Kerala state in total manufacturing in terms of employment, fixed capital and value of output and net value-added showed a rising trend. But the growth rate of agro-processing industrial units is less than the growth rate of total industrial units in the manufacturing sector. The study found that major problems faced by ago-processing industries are high market price, irregular availability and shortage of raw materials.

Karim et.al (2006) analyses the potential of agribusiness-focused aquaculture in Bangladesh. The study observed that agribusiness-focused aquaculture has the potential to generate employment, increase profitability and income, reduce poverty and achieve national economic development. The study suggests that governmental institutions and policies must be directed towards the promotion of supply chain from hatcheries to retailing and export with backward linkages of production and marketing of fish seed and fish feed and forward linkages of icing, transportation, storage, processing.

Kumar (2006) in the paper on "Contract Farming through Agribusiness Firms and State Corporation: A Case Study in Punjab" compares direct contracts with agribusiness firms and indirect contracts through the state. Direct contract farming is observed to operate effectively, with positive outcomes for the farmers irrespective of the farm size. Indirect contracts seem to favour only those farmers with larger farms, who do not benefit as much as direct contract farmers.

Welch (2006) analysed the recent agrarian transformations associated with globalization, including the organized response of workers and farmers to the loss of millions farm livelihoods in Brazil. The study found a polemic between a peasant vision of expanded family farming and the agricultural capitalist model promoted by powerful agribusiness interests.

Singh (2005) presented a paper on "Agribusiness Industry: Challenges and Opportunities in the 21st Century: An overview of Agricultural Education". The study cited Entrepreneurial Training Institutes (ETI), Export Processing Zones (EPZ), Special Economic Zones (SEZ), Export Oriented Units (EOU) and Agri-Export Zones as government initiatives for promoting Agribusiness. The paper suggests that these provisions can attract private investors to make investment in infrastructure development of cold storage chains, improvement in road, rail, sea and air transport systems.

Ayyappan and Krishnan (2004) opined that India has a vast untapped potential in fisheries but the country faces many challenges in fisheries development. If we are able to overcome the challenges like poor estimation of fish catch, backward technology, sub-optimal yield due to harvest and post-harvest losses, inadequate landing and berthing for vessels in ports, fisheries can contribute much more in terms of exports, employment and the welfare of fishermen to achieve a better socioeconomic status.

Santacoloma and Rottger (2003) in the article on "Strengthening Farm-Agribusiness Linkages" share the experiences of agribusiness development in Asia, Latin America and Africa. The article explains the opportunities for improved linkages between farm and agribusiness through government and with other private sector organizations. The article speaks of strategies for farmers to adopt a more business-like attitude and promote entrepreneurial skills in farming and agribusiness activities.

Kumar (2002) examines the "Prospects of Regional Agribusiness" in the South Asian region in the post-World Trade Organisation (WTO) period. Although the south Asian countries have attained self-sufficiency in food production over the years in varying degrees, they failed to introduce competitiveness in agribusiness

sector due to their restrictive (agricultural) trade practices. The study observed that, as a result of liberalization and privatization reforms in the agribusiness sector of this region in the pre-WTO period, the government monopoly in agribusiness is now virtually controlled by the private operators.

The above discussion exposes the critical points on the knowledge about agribusiness in fish products. Various researchers at international and national level explored the subject and opined that fisheries sector play a vital role in the development of the country in terms of income, employment and nutritional food security. The fishery resources of the country are not exploited optimally and there is scope for further expansion. What is required is technology driven growth of processing and value addition in fish products.

Covid-19 badly hit the fisher folk community and measures are to be taken to reinforce the significance of fisheries sector. Studies suggest that long-term Agro-based activities and enterprises in rural areas are to be promoted by attracting private investments especially by the young generation. Government support is required to ensure the institutional credit availability to these upcoming agribusiness units.

Let us sum up the discussion on the reviews on agribusiness in crop, meat, milk and fish products by revealing the critical points. There exists the necessity to do research on agribusiness as a remedy to the problems of post-harvest loss, quality deterioration, low price, exploitation of farmers by intermediaries and to identify the future prospects of processing and value addition.

The studies indicate that strengthening of agribusiness helps to create more employment opportunities especially among the youth and women, better livelihoods, bring more investments, value chain development, value addition, building agribusiness incubators and accelerates innovation and entrepreneurship. These agribusiness linkages aim at zero wastage of food through effective post-harvest management and increased food processing. Hence, further research is required to identify the agribusiness linkages to make farming profitable by converting agriculture into agribusiness.

1.3 RESEARCH GAP

Previous studies found strong synergies between agribusiness and agricultural development. Forward and backward agribusiness linkages lead to sustainable and inclusive development of agrarian economies of the world. Protein rich agribusiness products can address the nutritional food security and malnutrition. It is very clear from the earlier studies that ample research on agribusiness is going on at the international and national level, but very few studies are available on agribusiness in rice, meat, milk and fish in Kerala. Kerala being the most literate state in India is undergoing a structural transformation towards a service sector dominated economy with weak agribusiness linkages. Since a large proportion of farmers in Kerala earn their livelihood from agriculture and allied sectors, there is the necessity to develop and strengthen agribusiness linkages by doing research on agribusiness opportunities. Hence it is inevitable to identify the opportunities in agriculture sector, the financial and economic feasibility of agribusiness ventures, forward and backward linkages and challenges faced by the Agri-entrepreneurs in Kerala.

1.4 STATEMENT OF THE PROBLEM

Agriculture was strictly traditional until early 1980s. Since 1980, the agricultural sector in Kerala underwent structural changes from multiple angles. These changes are in cropping pattern, use of inputs, production strategies etc. Farmers started cultivation of non-food crops which include plantation crops and horticultural crops. Parallel to this, the conceptual meaning of agricultural sector was broadened to include agri-allied sectors and the popularity and spread of agribusiness provided more opportunities. In short, agribusiness consisting of crops, fisheries, livestock and dairying started to flourish in the state. In one way we can argue this as innovations in agriculture and its road towards professional agriculture.

Still, the number of agribusiness enterprises in the state are few and the reasons are many. A few most important reasons are lack of professional business management awareness, inaccessibility of latest technology for value addition and

processing, stiff competition, poor quality of products, lack of standardisation, low shelf life, easy contamination due to unhygienic handling, wastage due to improper post-harvest management, widening price spread, inadequate infrastructure for storage and cold chain management, lack of credit and marketing facilities. The farmers are doubtful about the financial and economic feasibility of these types of enterprises. No serious study is available on these issues taking all sub sectors together. Hence this study is a novice attempt in this direction.

1.5 OBJECTIVES OF THE STUDY

The overall objective of the study is to analyse the opportunities of agribusiness ventures in Kerala with the following specific objectives:

1. To assess the pattern and trends in the performance of agriculture sector in Kerala.
2. To evaluate the financial and economic feasibility and viability of selected agribusiness ventures.
3. To examine the forward and backward linkages of agribusiness and also to identify the opportunities and challenges faced by the agri-entrepreneurs.

1.6 HYPOTHESES

Agribusiness is the off-farm link in agri-food value chains. It provides inputs to agriculture and allied sectors, and it links these sectors to consumers through handling, processing, transporting, marketing and distribution of processed and value-added products.

1. Utilization of the untapped agribusiness potential in the agriculture and allied sectors augment the economic wellbeing of rural agricultural households.
2. Financially and economically feasible and viable agribusiness ventures strengthen the forward and backward linkages between farm and non-farm sectors.
3. Promotion of agribusiness stimulates agri-entrepreneurship especially among educated unemployed youth.

So, it is hypothesized that agribusiness is positively associated to local and regional economic development.

1.7 METHODOLOGY OF THE STUDY

The study is based on both primary and secondary data. Analytical tools consist of feasibility analysis from various perspectives.

Source of Data: Primary data to analyse the financial and economic feasibility and viability of selected Model Agribusiness Ventures are collected from the following four experimental units.

1. One unit located at Thrissur in the private sector produces and export a wide variety of traditional and organic processed and value-added rice and wheat products. The present study considered 3 value added rice products namely, steamed puttupodi, avalose podi and idli/dosa podi based on the cash flow analysis.
2. Experimental unit at Kochi in the government sector produces and export a number of fresh, processed and value-added fish and fish products. The present study considered 3 value added fish products namely, fish pickle, cutlet and prawns pickle based on the cash flow analysis.
3. The selected meat technology unit at Mannuthy in Thrissur produces a variety of animal based processed and value-added products. The present study considered 3 value added beef products namely, beef cutlet, keema and pickle based on the cash flow analysis.
4. Dairy plant at Mannuthy in Thrissur produces a variety of milk based processed and value-added products. The present study considered 3 value added milk products namely, milk peda, paneer and ghee based on the cash flow analysis. (For exact address of the units, refer appendix 1).

Even though it is a Kerala based study, due to the presence of limited number of agribusiness units in each of these products, it is only possible to consider the experimental units confining only to Thrissur and Ernakulam districts which is a major limitation of the study.

The linkage effect of agribusiness and the opportunities and challenges faced by Agri-entrepreneurs are analysed based on the information collected through the discussions with farmers, processors, distributors, local shop owners and exporters. The research scholar very well admit that this is only a flimsy attempt to assess the

linkages. A comprehensive discussion on forward and backward linkages is restricted in this work because discussions on linkage is only one of the objectives of the study. A more insight will be available only with a detailed input output framework. The scholar suggests the future researchers to move in this direction. Interactions with agricultural, veterinary, fishery and dairy scientists, researchers and experts working in the study region contributed to make reasonable assumptions on technical parameters.

Relevant secondary data to analyse the crop, livestock, dairy and fishery sector potential in the post liberalization period between 1990-91 and 2018-19 are compiled from Food and Agriculture Organisation (FAO) and World Bank Database, RBI Handbook on Indian Statistics, Land Use Statistics, Pocket Book of Agricultural Statistics, Annual Employment-Unemployment Reports, Agricultural and Processed Food Products Export Development Authority (APEDA) Database, Marine Products Export Development Authority Database, Directorate General of Commercial Intelligence and Statistics (DGCI&S) Database, Basic Animal Husbandry Statistics, Handbook of Fisheries Statistics, National Fisheries Policy Report, Agriculture Census, Livestock Census, Indian Economic Survey, Kerala Economic Review and official government websites.

Analytical Tools: The study focuses on the financial and economic feasibility of different agribusiness investment ventures in Kerala. As a first step, financial feasibility of the project is identified based on the cash flows of the projects and the Net Cash Flow (NCF) is calculated for three years. The discount rate is estimated based on the prevailing interest rates on Mudra loans given to Marginal Small and Medium Enterprises (MSME) by banking institutions. Appropriate investment evaluation criteria are used to measure the economic worth of the investment, by considering all cash flows to determine the profitability of the project, and help to rank projects according to their profitability. The various investment evaluation criteria used in this study are as follows.

Net Present Value (NPV): NPV explicitly recognises the time value of money and is calculated by subtracting present value of cash outflows from present value of cash inflows. The NPV calculation formula is:

$$\mathbf{NPV = [C_1/ (1+r)^1 + C_2/ (1+r)^2 + \ldots + C_n/ (1+r)^n] - C_0}$$

Where C_1, C_2, C_3 …. C_n represent net cash flows in year 1, 2, 3…n, r is the discount rate, C_0 is the initial cost of the investment and n is the expected life of the investment. NPV is computed and the result is illustrated using tables and charts. The NPV Acceptance Rule is:

- Accept the project when NPV is positive (NPV > 0)
- Reject the project when NPV is negative (NPV < 0)
- Accept or reject the project when NPV is 0 (NPV = 0)

The result summary of NPV analysis is illustrated in tabular and graphical form.

Profitability Index (PI) or Benefit Cost Ratio (BCR): BCR is the ratio of the present value of cash flows, at the required rate of return, to the initial cash outflow of the investment. PI or BCR calculation formula is:

$$\mathbf{BCR = [C_1/ (1+r)^1 + C_2/ (1+r)^2 + \ldots + C_n/(1+r)^n] \div C_0}$$

PI or BCR Acceptance Rule is:

- Accept the project when BCR> 1
- Reject the project when BCR< 1
- Accept or reject the project when BCR = 1

The result summary of BCR analysis is illustrated in tabular and graphical form.

Payback (PB): PB is the number of years required to recover the original cash outlay invested in a project. PB calculation formula is:

$$\mathbf{PB = Initial\ Investment\ (C_0) \div Annual\ Cash\ Flow\ (C)}$$

PB Acceptance Rule is:

- Accept the project if PB < maximum or standard payback period set by the management.

- Reject the project if PB > maximum or standard payback period set by the management.

The result summary of PB analysis is illustrated in tabular and graphical form.

Regression Analysis for DCF Breakeven: A simple linear regression model study (Fitted Line Plot) has been conducted for each product to estimate the DCF Break-even point of NPV with respect to each variable after ensuring the data normality using Anderson Darling Test in Minitab. The study result of break-even analysis of one product each from four units is graphically illustrated. Further, the result summary of 48 such equations with respect to break-even volume, price, variable cost and fixed cost of three products each from four model units are illustrated in a tabular form. It tells us how much the sales volume and unit selling price can go down and unit variable cost and fixed cost can go up by maintaining profit in each of these twelve products. DCF Break-even point differs from Accounting Break-even Point since the latter is estimated as fixed costs divided by the contribution ratio. It excludes opportunity cost of capital and fixed costs covering both cash and non-cash costs (depreciation).

Sensitivity Analysis: To understand the risk and uncertainty of the investment projects, the financial analysis is further extended to sensitivity analysis. It analyses the risk as well as the desirable changes in the investment decision due to change in key variables independently. In the evaluation of the four model investment units, the study work with the forecast of several variables that influence the NPV like price of output, volume of production and sales, fixed and variable costs and discount rate. It is difficult to arrive at an accurate unbiased forecast of each of these variables. Hence, the study analysed the change in the project's NPV for a given change in one of these variables. It indicates how sensitive a project's NPV is to changes in particular variables. It is calculated by examining the impact of a variable from different 'scenarios' (optimistic, highly optimistic, base, pessimistic and highly pessimistic). The result summary of sensitivity analysis is illustrated in tabular and graphical form.

Scenario Analysis: The study also makes use of scenario analysis to measure the risk and uncertainty in investment decisions and the desirable changes due to change in key variables in combination under different situations or scenarios. The sensitivity analysis assumes that variables influencing NPV are independent of each other. But in practice, these variables are interrelated and they may change in combination. Therefore, the study examined the impact of alternative combinations of variables (volume, price, cost and discount rate), from different 'scenarios' (optimistic, highly optimistic, base, pessimistic and highly pessimistic), on the project's NPV. The scenario result summary is illustrated using tables.

Expected Monetary Value (EMV) Analysis: The sensitivity and scenario analyses are extended to EMV analysis to compare the risk and feasibility of investment in different agribusiness units and products. EMV calculates the expected outcomes of each product and Unit by assigning a probability and impact for identified risks under each pessimistic and optimistic scenario. Formula for calculating EMV is:

EMV = Chosen Level of Probability x Impact

As a first step, the impact of changing variables on Net Cash Flows (NCF) of each agribusiness product under different scenarios is to be calculated. The study assumed that under normal situations, there is a possibility for a 5 to 10 per cent change (usual experience) in the volume of output, selling price, variable cost, annual fixed cost and discount rate from the base case scenario as assumed in the sensitivity and scenario analysis. A tabular and Graphical presentation of EMV helps to identify the best unit and product which highlights safer investment opportunities.

1.8 THE SCHEME/PLAN OF THE STUDY

The study is organised in seven chapters. The introductory chapter is followed by Chapter 2 - Agribusiness: A Synoptic View, Chapter 3 - Agriculture Sector Enterprises, Chapter 4 - Livestock Sector Enterprises, Chapter 5 - Dairy Sector Enterprises, Chapter 6 - Fisheries Sector Enterprises and Chapter 7 - Summary, Findings and Policy Implications.

CHAPTER II

AGRIBUSINESS: A SYNOPTIC VIEW

2.1 INTRODUCTION

Agriculture and allied sectors play a significant role in the growth of Indian economy by contributing nutritional food, income, employment, exports and raw materials to agri-based industries. It provides 14.6 per cent of Gross Value Added (at constant prices), 43.2 per cent (26 million) of employment and 11.9 per cent of national exports in 2018-19. Agriculture and allied sectors are the main source of livelihood, employment and food security for the 52.18 percent (rural) population of Kerala. Hence, the economic development of Kerala lies in the prosperity of its rural sector and agriculture growth has a rural focus. This necessitates a discussion on the off-farm linkages in agri food value chains for the agricultural and economic development of an economy. Agribusiness is an emerging sunrise sector that connects agriculture and business for economic development. It is a term originated in the 20th century that links the farm and non-farm sector through producers and consumers. It develops strong inter sectoral linkages that enhances the performance of agriculture for economic development. Its rural-urban linkages pave the way for the development of rural areas especially of developing agrarian countries like India. In this context, it is relevant to explore the historical and conceptual evolution of agribusiness through various definitions, features, goals and objectives, components and functioning and types of agribusiness activities. This leads to a further discussion on the scope, significance and government policy framework of agribusiness for economic development.

2.2 HISTORICAL AND CONCEPTUAL EVOLUTION OF AGRIBUSINESS

The discussion on the historical evolution of agribusiness date back to the Mexican experiment. Commercialisation of agriculture along with the application of new technology and hybrid varieties boosted the production of wheat

in Mexico. This necessitated the development of agri-processing and value addition in wheat for the optimal utilisation of marketable surplus. The initiation of agriculture industry interface in Mexico laid the foundation for the development and promotion of agribusiness and agri-entrepreneurship for agricultural and economic development on a world-wide basis.

Traditionally the concept of 'agribusiness' is confined only to business of producers and manufacturers of inputs for agricultural output. But in the modern view, it is a broad term which accommodates all activities that come under agriculture and allied sectors. To understand what agribusiness is, we need to discuss its conceptual evolution through various definitions.

The purpose of this discussion is to elaborate the concept of agribusiness since 1950s and to identify the changes in the meaning of the concept over time. The word agribusiness was born in a speech of John Herbert Davis, the Professor at Harvard Business School, on the topic "Business Responsibility and the Market for Farm Products" before the Boston Conference on Distribution on 17th October 1955 (Fusonie, 1955). Davis referred the term agribusiness as the "sum-total of all operations involved in the production and distribution of food and fibre".

Later the term agribusiness was coined by Davis and Goldberg in 1957 with an extended meaning to include "all operations involved in the manufacture and distribution of farm inputs, production operations of the farm and storage, processing and distribution of farm output". These early traditional definitions identified agribusiness as an agriculture-industry relationship to explore the farm problems relating to inputs and output.

Subsequently, the study and practice of agribusiness was extended to "agriceuticals" (Goldberg 1999), "agro-industrialization" (Boehlje, 1999, Cook and Chaddad 2000), and "value or net chains" (Lazzarini, Chaddad and Cook 2001). These definitions expanded the concept beyond input-output relationships to processing and marketing.

Modern definitions widened the spectrum of agribusiness to include "input and output supply and services through backward and forward linkages between the

suppliers and consumers including the storage, processing, marketing, transporting and distribution" (Ricketts and Ricketts 2009, Schmitz et.al 2010).

More recently the concept of agribusiness was expanded beyond the farm as "business related to agriculture including marketing of farm products such as warehouses, wholesalers, processors, retailers and more" (Chait, 2019). Thus, all those companies dealing with the economics of farm management, educational and research institutions focusing on the science of agricultural management comes under the purview of agribusiness.

Various updated dictionary definitions of agribusiness began to widen the area and coverage of agribusiness as "farming engaged in as a large-scale business operation embracing the production, processing and distribution of agricultural products and the manufacturing of farm machinery, equipment and supplies" (American Heritage Dictionary).

Commercial production of cash crops and branding of products further extended the definition of agribusiness as "agriculture operated by business; specifically, that part of a modern national economy devoted to the production, processing, and distribution of food and fibre products and by-products" (Britannica Concise Encyclopaedia).

During a period of mergers and acquisitions of agricultural organisations, agribusiness tends to be "a large-scale business operation that earns most or all of its revenues from agriculture and may dabble in farming, processing and manufacturing and/or the packaging and distribution of products" (Online Business Dictionary). Therefore, "agribusiness is the various businesses that produce, sell, and distribute farm products, especially on a large scale" (Collins English Dictionary).

The institutionalisation of agriculture relates agribusiness as "the different types of businesses that are involved in farming such as growing crops, supplying seeds, manufacturing farm equipment and marketing farm products" (Cambridge Business Dictionary). Thus, agribusiness is "the business or industry of farming or agriculture of a large business or a company engaged in agribusiness" (Learner's Dictionary).

With the advent of contract farming, agribusiness is defined as "the business of agricultural production that includes agrichemicals, breeding, crop production, distribution, farm machinery, processing, and seed supply, as well as marketing and retail sales" (Wikipedia, the free Encyclopaedia).

All agents of the food and fibre value chain and those institutions that influence it are part of the agribusiness system. In short agribusiness is defined as "an industry engaged in the producing operations of a farm, the manufacture and distribution of farm equipment and supplies, and the processing, storage, and distribution of farm commodities" (Merriam Webster Dictionary).

It is evident from these definitions that the concept and meaning of agribusiness has changed over time. But all these definitions clearly focus on the interrelationships and linkages of agriculture and industry through production, processing, distribution, marketing and consumption of agriculture and related business. Thus, present definition of agribusiness encompasses transactions in inputs, output or service.

2.3 CHARACTERISTIC FEATURES OF AGRIBUSINESS

The above discussion on the definitions of agribusiness clearly points out one or the other characteristic features of agribusiness. These characteristics shows the unique value chains from production to distribution, marketing and consumption of agriculture and allied sector resources that make agribusiness something different from other activities. In recent years, influenced by changes in consumer demand, urbanization and rapid technological and institutional innovations, the global characteristics of agribusiness has changed drastically and its performance has been highly dynamic.

The characteristics of Agribusiness in India in general and Kerala in particular are based on the pillars of competitiveness and small holder participation which are complementary to each other. These characteristics of agribusiness give priorities for the development of Kerala with a rural focus. Hence, it is relevant to discuss the important characteristic features of agribusiness from the perspective of a modern developing economy.

Agribusiness in Kerala is a small holder enterprise that is family oriented and community based and largely dependent and partly independent. Secondly, agribusiness is market oriented because it provides a tremendous and infinite variety of products. Thirdly, it has a close network between persons and institutions and the decision at firm level is the basis for development in future.

Fourthly, it has an approach towards a free market system with healthy competition. Fifthly, it is seasonal in nature but deals with the vagaries of nature and supported by government programmes and policies. Sixthly, agribusiness is customer centric by understanding the needs, wants and suitability of products. Seventhly, agribusiness is characterised by entrepreneurs with commitment, ownership and innovation.

Eighthly, small holder agribusiness requires less capital but generates large employment since most of them are labour intensive. Finally, small agri-enterprises in crop, meat, fish and dairy resources are located in rural areas while a few medium and large agri-enterprises are in urban areas.

To sum up, majority of the agribusiness activities in Kerala are small and mostly confined to rural areas. These activities are operated by households that often have wage employment and farming as other sources of income. Medium agribusiness activities are mainly urban based because of the requirements for economies of scale and modern infrastructure. The large enterprises are often owned by MNCs. As mentioned above, agribusiness takes various forms, but the present study is limited to value addition in selected products of rice, beef, milk and fish in Kerala. Kerala state has been selected for the present study considering the importance of agriculture and allied sectors for Kerala's economy. Fairly a large number of small and marginal farmers and landless households in rural Kerala derive their livelihood from this sector.

2.4 GOALS AND OBJECTIVES OF AGRIBUSINESS

In the modern era of 21st century, agribusiness is an emerging sunrise industry that links the farm sector to consumers through handling, processing, transporting,

marketing and distributing agri-food products of milk, meat, fish and crop variants. There exist strong synergies between the goals of agribusiness and the objective of agricultural growth for economic development. The goals of dynamic and efficient agribusiness are the outcomes or results such as creation of additional market for farm output, additional income and employment opportunities especially for women and youth, nutritional food security, export potential, reduce post-harvest losses and sustainable agricultural growth leading to the economic development of the economy. The goal of agribusiness in agrarian developing economies like India is to reduce rural poverty where agriculture and allied sectors are concentrated in rural areas. Agribusiness aims to identify and develop technical and functional capabilities and solutions to boost smart agri-food production, smart agri-logistics and smart food awareness. In a more detailed way, following are the objectives of agribusiness in the modern world.

Agribusiness aims at smart farming of plants and animals at the right place and right time to improve, efficiency, productivity, quality and profitability. Secondly, it aims at the optimum utilization of unutilised resources and avoidance of wastage of agri-food products through smart agri-logistics. Thirdly, agribusiness aims at a detailed professional organization, planning, management, direction, coordination, execution and handling of harvesting, processing, value addition, storage, distribution and transportation of farm output. Fourthly, agribusiness aims at smart food awareness to cater the needs of the dynamic consumers through relevant information about the availability, quality, food safety, health and welfare of consuming agri-food products. Fifthly, agribusiness aims at professional agri-related activities to attract the educated youth towards agribusiness. Sixthly, agribusiness establish inter-sectoral and urban-rural industry linkages to provide employment to the rural poor especially women to achieve women empowerment, better standard of living, and reduce poverty. Seventhly, agribusiness aims to promote the export of value added agri- products to spur agricultural growth and economic development. Eighthly, it aims to attract investment to develop a competitive and sustainable private sector led agribusiness in high potential sectors like horticulture, livestock, dairy and fisheries. Finally, it encourages farmers to

cultivate diversified crops and modernise production system to ensure a better return and to develop strong linkages in the agri-value chain.

The above discussion pinpoints the unique goals and objectives of agribusiness in a developing agrarian economy. In Kerala, with a large number of educated unemployed youth and women are searching for jobs, small holder agri-entrepreneurship is an opportunity to utilise the untapped crop, livestock, fishery and dairy resources for the sustainable development especially of rural areas. Agribusiness can be utilised as an opportunity to mitigate the long-term impact of the present Covid 19 pandemic on nutritional food security and to reallocate the reverse unemployed migrants in gainful employment with the support of local self-government.

2.5 COMPONENTS AND FUNCTIONING OF AGRIBUSINESS

To have awareness on what constitute agribusiness, a clear understanding about the components and its functioning is required. The agribusiness sector comprises of "all organizations, large and small, profit-seeking and eleemosynary (charitable), that engage in the production, distribution, marketing, or utilization of food, fiber, forest products, or biofuel, including those that supply water to and collect waste" (Fleet, 2016). A visual description of agribusiness as shown in the Flow Chart 2.1 helps to identify the major components and understand the detailed functioning of agribusiness.

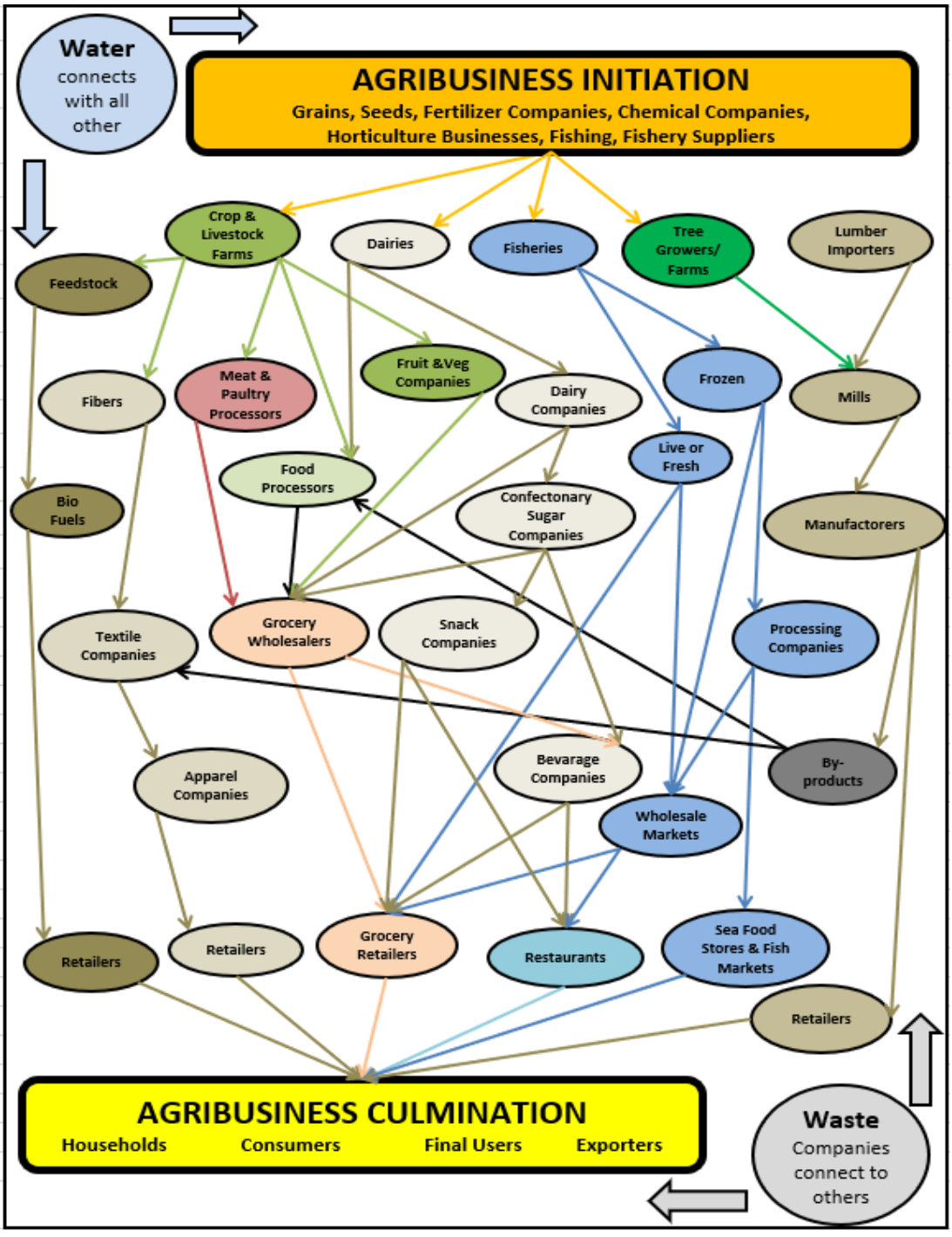
The components of agribusiness can generally be grouped under the following heads.

Food: Food is the central component of agribusiness. It includes crop variants like grains, seeds, and vegetables, and fruits etc, livestock resources like varieties of meat and poultry, different types of fish and dairy resources. Farms, livestock owners, dairies, fisheries and tree farms/ growers are connected through the value chain initiated by grains and seeds suppliers, fertiliser companies, chemical companies, horticulture business, fishing and fishery suppliers.

Raw food produced in agricultural farm and livestock farm goes to meat and poultry processors, food processors, fruit and vegetable companies. After

processing and grading the value-added products goes to grocery wholesalers. Grocery wholesalers distribute it to grocery retailers, restaurants, beverage companies and snack companies. Final domestic marketing is done through hyper and super markets, cooperatives, retailers and restaurants to households, consumers, final users and export marketing through export dealers.

Flow Chart 2.1: A Visual Description of Agribusiness



Raw milk produced in dairy sector goes to dairy companies and food processors for producing value added and processed dairy products. After processing the value-added products goes to grocery wholesalers and confectionary and sugar companies. They distribute it to grocery retailers, restaurants, beverage companies and snack companies.

Final domestic marketing is done through hyper and super markets, cooperatives, retailers and restaurants to households, consumers, final users and export marketing through export dealers.

Raw live/fresh and frozen fish from fisheries sector goes to wholesalers, retailers and processing companies respectively. After processing the value-added products goes to wholesalers and sea food stores and fish markets. Final domestic marketing is done through hyper and super markets, cooperatives, retailers and restaurants to households, consumers, final users and export marketing through export dealers.

The above discussion gives a clear idea on the food components of agribusiness and the functioning of production, distribution, processing and marketing supply chain. This will help us to understand the direct and indirect, farm and non-farm, backward and forward linkages of agribusiness and its effects on the agricultural and economic development of an economy. Apart from this, public and private organisations and institutions of scientific and technical research, training and incubation centres, Export Development Authorities, local self-government institutions, Kudumbasree and banking institutions also contribute to the functioning of the agribusiness system.

Fibre, Forest Products and Biofuels: Fibre, forest products and bio fuels are the peripheral components of agribusiness. Fibre produced in agricultural farms goes to textile companies and apparel companies for value addition and processing. These products are distributed and marketed through wholesalers and retailers to households, consumers, final users and export marketing through export dealers.

Lumber from forestry or from imports goes to mills and then to manufacturers for processing to produce furniture, paper and by-products to textile companies. These value-added products are distributed and marketed through hyper

and super markets, wholesalers, and retailers to households, consumers, final users and export marketing through export dealers.

Feedstock from agriculture and livestock farms goes bio fuel companies to produce bio fuels. It is distributed and marketed through wholesalers and retailers to households, consumers, final users and export marketing through export dealers.

Water and Waste: Water and waste are regarded as the universal components of agribusiness. Water is a very important and essential component used in all agribusiness activities. Waste is the material left over in liquid, solid or gaseous form during the agribusiness production process. The collection and disposal of waste must be based on scientific standards and norms as it influences the quality of agribusiness products.

From the above discussion it is very clear that agribusiness is the business of agriculture and allied sectors in inputs, output or service. Agribusiness transaction of input includes seed, feed, fertiliser, pesticide, insecticide, equipment, machinery, implements, energy, fuel etc. Agribusiness transaction of output may involve raw or processed crop, livestock, dairy and fish food products, fibre, forest products, bio fuels etc. Agribusiness transaction of services include processing, value addition, packing, storage, transportation, distribution, marketing, insurance, credit, consultancy, soil testing, food quality testing etc. In brief, agribusiness refers to the practice and application of business administration theories to organisations, institutions and companies engaged in the agriculture and allied sector related products and services.

2.6 TYPES OF AGRIBUSINESS ACTIVITIES

The discussion on the components of Agribusiness leads to the various types of agribusiness starting from input supply to agriculture and allied sectors, to production, processing, value addition, storage, distribution, marketing, advertising and exporting. The different types of agribusiness activities include:

- Agribusiness in inputs/farm supplies of quality seed, feed, machinery, fuel, chemicals and credit.
- Hybrid and genetically modified crops and grafting, budding and plant nurseries.

- Barns and ranches for storing, sorting, drying and housing.
- Repair and hiring of agricultural machinery and implement.
- Micro and minor irrigation systems and labour-saving farm equipment.
- Production of bio fertilizers and bio pesticides.
- Provision of livestock health cover, setting up of veterinary dispensaries, and other services including frozen semen banks and liquid nitrogen supply.
- Hatcheries and production of fish or fingerlings for aquaculture.
- Agribusiness in the production of crop, livestock, fisheries, dairy and forest products.
- Bee keeping, sericulture, hatcheries and aviaries.
- Processing/manufacturing of agri-products from producers and process them into value added products desired by consumers.
- Apiaries and honey products processing units.
- Value added products like fryums, jam, pickles, cutlets, sweets, sausages etc.
- Marketing in cold chain facilities from the farm level onwards.
- Post-harvest centres for sorting, grading, storage and packing.
- Wholesale and retail marketing outlets for processed agri-products.
- Rural marketing dealership of farm inputs and outputs.
- Agribusiness research in seed processing, vermiculture units and tissue culture labs.
- Pest and insect diagnostic, control and consulting services.
- Soil, water, feed and food quality testing laboratories.
- Agri-biotechnology applications to make and modify agri-products.
- Government Support and Extension services in credit, insurance and logistic support services.
- IT units in rural areas for the easy access to agriculture related portals.
- Waste treatment and water purification plants.

In short, agribusiness consists of all activities that come under the sector "agriculture and allied activities". It provides input to the farm sector, links the farm sector to consumers through postharvest handling, value addition, processing, storage, transportation, marketing and distribution of agriculture related products.

2.7 AGRIBUSINESS POLICY FRAMEWORK

Next question to be discussed is why do we do research on agribusiness? We can find an answer to this question by analysing the various national and state level agriculture policies from time to time.

Since independence, India has witnessed significant progress in agriculture and allied sectors due to the application of science and technology, positive policy support and hard work of Indian farmers. But the physical loss and quality deterioration in agricultural and allied sector resources are alarmingly high and the extent of processing and value addition are very low compared to advance nations. Hence, both the national and state level agricultural policies are designed to stimulate agri-entrepreneurs to develop agribusiness.

National Commission on Agriculture of 1976 encouraged the growth of small-scale agri-based industries as a result of the shift in the policy from large scale to small scale industries to create more employment opportunities. The implementation of New Economic Policy (NEP) of 1991 and the signing of World Trade Organisation (WTO) Agreement in 1995 led to the establishment of Special Economic Zones (SEZs) and Agri-Export Zones AEZs) to harness the export potential of agriculture and allied sectors. Small Farmers' Agribusiness Consortium (SFAC) was established in 1994 as an autonomous body under the Ministry of Agriculture and Farmers' Welfare for the development of agribusiness to increase the income of small and marginal farmers. SFAC suggested policy measures to encourage institutional and private investment in infrastructure like cold storage chains, transportation and marketing.

In the initial years of the post-reform period, agriculture and allied sector activities in the country become less profitable due to the soaring input costs, exploitation by intermediaries, removal of import restrictions, low price of output, lack of proper infrastructure, marketing and credit facilities. In this context, the National Agricultural Policy of 2000 suggested measures to promote technically sound, economically viable, environmentally non-degrading and socially acceptable use of country's natural resources for sustainable development of agriculture. The policy aims to accelerate the growth of agribusiness by utilizing the vast untapped

potential of agriculture and allied sectors of India. It aims to promote value addition, create agri-entrepreneurship in rural areas, secure a fair standard of living for the farmers and agricultural workers and their families, discourage migration to urban areas and face the challenges arising out of economic liberalization and globalisation.

National Horticulture Mission (NHM), launched by the Government of India on July 8, 2004 was absorbed as a part of Mission for Integrated Development of Horticulture (MIDH) in 2014-15. It aims to provide holistic growth of the horticulture sector by enhancing horticulture production, doubling farmers' income, strengthening nutritional security, helping farm level productivity, providing technology support through scientific knowledge and creating opportunities for employment generation for skilled and unskilled persons, especially unemployed youth and women in rural areas.

The National Commission on Farmers (NCF) chaired by Professor M. S. Swaminathan, submitted five reports between 2004 and 2006 and recommended a holistic national policy for farmers by proposing methods for enhancing productivity, profitability, stability and sustainability of the major farming systems. It suggests measures to attract and retain educated youth in farming, policy reforms to enhance investment, promotion of commodity-based farmers' organizations, promote grading, branding, packaging and development of domestic and international markets for local produce and move towards a single Indian market. The Commission has seen some value in public-private partnership (PPP) initiatives as a remedy for agrarian crisis. The commission recommends that farmer has to be assured of control over resources, credit, technology, knowledge of management and markets.

Based on the above recommendations, National Policy for Farmers (NPF) was formulated in 2007 which aims to introduce measures which can help, attract and retain youths in farming and processing of farm products for higher value addition by making it intellectually stimulating and economically rewarding. The policy found that the widening gap between scientific know-how and field level do-

how affects farm productivity and profitability. It suggests Krishi Vigyan Kendras (KVKs) to take up training and lab-to-land demonstrations in the area of post-harvest technology, agri-processing and value addition to primary products to provide skilled jobs in villages. This can provide appropriate opportunities in adequate measure for non-farm employment for the farm households.

Confederation of Indian Industry (CII) sponsored national conference on agriculture in 2012 proposed Public Private Partnership (PPP) in agriculture that seeks a paramount role for the corporate sector in production and all the way up to retail marketing as the answer to the country's agrarian crisis. Small Farmers agribusiness Consortium (SFAC) is considered as the nodal agency for advancing PPP initiatives. It suggests the integration of farmers and agricultural supply chain with financial assistance through Rashtriya Krishi Vikas Yojana (RKVY) under the direct supervision of state governments and supported by national level agencies. The overall and collaborative effort between the government, farmers and corporate in agriculture is likely to raise the rate of agricultural Gross Domestic Product growth leading to reduction in rural poverty.

Indian Council of Agricultural Research (I.C.A.R) placed a high research priority during the XII Five Year Plan (2012-2017) to 'secondary agriculture' that concerns with pre-production and post-harvest management to reduce crop losses, to facilitate the processing of the produce into value-added products by developing multi-commodity processing technologies, to explore avenues to engage the rural youth to prevent from migrating to cities and to revamp agriculture education not only to produce farm graduates and postgraduates but also farm entrepreneurs.

M.S. Swaminathan and Ashok Khosla in the 7th International Agriculture Leadership Summit in 2014 expressed their opinion that, as the population is growing and agricultural land is shrinking, there is a need to shift our focus to feed more and reduce wastage of food. They suggested that zero wastage of food and increasing food processing make farming more profitable and can uplift the farmers. They identified the need for effective post-harvest management system as a result

of mismatch in production and post-harvest storage technology. They emphasised the need to convert agriculture into agri-business because globally agriculture is linked to agri-business and the purpose of agriculture is predefined by agri-business.

The National Intellectual Property Rights (IPR) Policy of 2016 aims at strengthening the national initiatives like, 'Make in India', 'Skill India', 'Start up India', 'Smart Cities', and 'Digital India'. "Start-up India" initiative aims at fostering entrepreneurship and promoting innovation by creating an ecosystem that is conducive for growth. Delicious fruits need preservation because they are highly perishable and highly seasonal. Processing and value addition provide convenient, delicious and enjoyable food products that strengthen the bonds, bind the benefits of nature's bounty with the everyday lives of people everywhere. Training should be given to rural farmers and small entrepreneurs who want to process their surplus crops into acceptable and marketable food items. Simple and low-cost food processing technologies can readily be introduced in rural areas to reduce spoilage, improve quality and processing hygiene.

Considering the significance of agriculture and allied sectors in the post-Covid phase of Indian economy in attaining nutritional food security and the goal of doubling the income of farmers by 2022, it is essential to discuss some of the recent policy initiatives taken by the national government. In May 2020, government launched Animal Husbandry Infrastructure Fund (AHIDF) of Rs.15, 000 crore for livestock infrastructure development. During the same year, government allocated Rs.13,343 crore under National Animal Disease Control Programme (NADCP) to eliminate foot and mouth diseases in livestock. Pradhan Mantri Samman Nidhi Yojana introduced under 2019-20 Union budget, announced Rs.3000 as the minimum fixed pension to eligible small and marginal farmers above the age of 60 years. At present only 10 percent of agriculture produce is processed and under the Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters (SAMPDA), government aims to triple the food processing sector capacity by investing Rs.6000 crore. In 2019, NABARD allocated Rs.700 crore as venture capital fund for equity investment for start-ups in agriculture and allied sectors in rural areas. The new Agriculture Export Policy of 2018 aims to increase the export

of agri-products with a stable international trade policy regime. To boost agri-exports, the government provides financial assistance through Transport and Marketing Assistance (TMA) scheme.

Recently, the government of India took a further step in agri reforms through three Agriculture Bills under the Farmers Bill 2020.

The Essential Commodities Amendment Bill, 2020: The bill aims to make amendments to the Essential Commodities Act of 1955, with respect to the strict regulations on the stock, movements and price control of agricultural commodities. Farmers and traders are free from any levy, cess or fee by respective state governments. The bill intendents to enhance private investment in transportation, storage, processing and marketing to reduce marketing cost and offer a better price to farmers. It also aims to increase farmer's income by creating a suitable competitive environment to do agribusiness without the fear of frequent statutory regulations.

The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm services Bill 2020: It is a bill to provide a national framework on farming agreements. It aims to protect and empower the farmers to develop farm service relations with agribusiness firms, exporters, wholesalers, large retailers and processors. Hence, the bill gives freedom to farmers to sell their future farm products at a mutually agreed remunerative price in a fair and transparent manner by avoiding intermediaries. This will reduce the risk of farmers with respect to market price fluctuations of agri products and easy access to quality seeds, modern technology and efficient marketing networks.

The Farmers' Produce Trade and Commerce (Promotion and Facilitation) Bill, 2020: It is a bill to create a free environment for farmers and traders for the sale and purchase of farm products at a remunerative price through competitive trading channels. The bill intends to promote transparent and efficient inter-state and intra-state agriculture produce trade without market restrictions. It also aims to facilitate an electronic trading framework outside the physical premises of various state agriculture markets.

The above discussion proves that the major thrust of the national agriculture policy lay down by the Ministry of Agriculture and Farmers' welfare aims to achieve nutritional food security, doubling farmer's income by offering remunerative prices and quality products at affordable prices to consumers. This urges the need to do research on competitive small holder agribusiness which has a strong synergy with the agricultural and economic development of the country. The broad policy framework of agribusiness and the necessary interventions especially in the post liberalisation period requires professionalism in agribusiness to attract educated youth and women and prevent migration to cities. Secondly, to develop backward and forward agribusiness linkages for sustainable development. Thirdly to enhance post-harvest technology to reduce wastage, avoid intermediaries and offer better price to producers. Fourthly, to promote agribusiness for utilising marketable surplus for economic development. Fifthly to increase the quantum of processing and value addition in agriculture and allied products. Sixthly, to widen the demand for processed and value-added products. Seventhly, for the easy accessibility to credit for agribusiness start-ups especially in rural areas. Eighthly, to provide incentives, subsidies and tax concessions for emerging agribusiness ventures. Ninthly, to ensure quality of agribusiness products by recruiting food technologists. Tenthly, to enhance storage, warehousing and marketing facilities for agribusiness. Finally, to launch agribusiness clusters and incubators to strengthen agriculture industry interface.

Kerala State Agribusiness Policy Framework: Coming to the discussion on the agribusiness policy framework in Kerala, the first agriculture development policy of Kerala was announced in March, 1992 which gave guidance to various schemes beneficial to the state. The condition of farmers in Kerala at that time was very poor due to the low return since they continue to be as a producer and supplier of raw materials which is being sold to the middlemen at a low price as against high cost of production. Hence the policy makers suggested schemes to promote infrastructure facilities for storage, processing, value addition, marketing and exports. Policy measures include soft loans, tax concessions and up gradation of technology for enhancing entrepreneurship in value added products.

World Trade Organisation trading agreements on agriculture had its adverse impact on domestic as well as foreign trade of developing countries like India. The post-WTO regime of Kerala economy witnessed income loss to farmers due to a decline in agriculture and allied sector commodity prices along with the existing low productivity and high cost.

Kerala is the pioneering state to implement Land Reform measures in India. Considering the importance and contributions of plantation agriculture in Kerala economy, land under plantation was exempted from land ceiling laws. Considering the suggestions and guidelines of National Policy of Farmers (NPF) of 2007, Kerala Government incorporated allied sectors of livestock, dairy and fisheries in the State Agriculture Policy. Kerala Conservation of Paddy Land and Wetland Act was passed in 2008 to preserve farm lands from conversion. Later, Government of Kerala amended the Organic farming Policy in 2010 to promote organic farming in the state. To utilise the fallow land for cultivation, Kerala Government adopted appropriate land legislation to promote "Rent a land for Farming" programme.

Agriculture Development Policy (2015) envisioned sustainable agriculture with a professional touch which gives dignity and status to farmers in agriculture and allied sectors. With this aim, the policy suggested government intervention to assure institutional credit in times of emergency. In the wake of increasing farmers' suicides policy suggests the opening of counselling centres for the release of stress. The policy also suggested the formation of Panchayat level Labour banks to meet the labour shortage and high cost of labour.

National Institute of Agricultural Marketing (NIAM) recommended that Kerala has to develop an efficient infrastructure for marketing to minimise post-harvest losses. Cost effective marketing requires efficient infrastructure for wholesale and retail markets with cold storage facilities for fruits, vegetables, meat, milk, fish etc. The policy also aims to enhance the income of farmers through the production of diversified processed and value-added products and development of agri-entrepreneurship.

Department of Agriculture, Animal Husbandry, Dairy and Fishery aims to develop human resource for agricultural extension personnel of the state to meet the skill and knowledge requirement of agriculture and allied sectors as self- sufficient agri-entrepreneurs. These skills include production techniques, soil and water management, organisation and management of Farmer Producer Organisations (FPO), analysis of cost and benefit, marketing, value addition, handling information technology tools and expertise in credit management. The policy proposed to strengthen FPOs as the single platform to connect the farmers, processors, retailers and wholesalers.

To facilitate a single point common service centre for credit support, soil testing, weather advisory services and other technology-based services, 20 new Block level Agro Service Centres (ASC) were proposed under the Cooperation Department during 2018-19 with the support of the panchayat raj institutions.

The Kerala state agriculture policy aims to make Krishi Bhavans of Kerala "paperless offices" for the timely delivery of services through online. This will assure services with 100 per cent accuracy and fastness in the post-Covid phase development of agriculture and allied sectors. Hence the functioning of call centres will be strengthened for the effective delivery of services to the farmers.

Online Conferences, Webinars and Google classes can effectively be used to disseminate knowledge and skills. New Agriculture Extension Policy aims to increase the cooperation between extension agencies and research institutes to link the lab to the farmer. Hence, the sustainable development of agriculture and allied sectors of Kerala requires government policy support through efficient schemes, programs, services, institutions, investment and credit.

2.8 CONCLUSION

To sum up, household and family based small scale agribusiness play a vital role in the sustainable growth of agriculture and allied sectors leading to the economic development of Kerala. Agribusiness broadens the opportunities for production, processing, distribution and marketing in crop, livestock, dairy, and

fishery and forest products. It enhances professionalism in agriculture and attracts the educated unemployed youth and women towards this sector. In order to tap the potential of this sector, we have to establish forward and backward linkages in which prospects of processing and value addition plays a significant role. Realising the importance of agribusiness to mitigate the long-term impact of Covid pandemic on nutritional food security, hope that the state's agricultural policies in the post Covid 19 phase will accommodate inclusive agribusiness.

CHAPTER III

AGRICULTURE SECTOR ENTERPRISES

3.1 INTRODUCTION

Agriculture and allied sectors play a vital role in the growth of Kerala economy in terms of nutritional food, raw materials, income, employment and exports. A shift in the cropping pattern of Kerala and the consequent structural transformation from subsistence to commercial agriculture paved the way to value addition and processing. Agribusiness can effectively be used as an instrument to utilize the untapped income, employment and export potential of crop, livestock, dairy and fishery sectors especially in rural areas. Direct and indirect inter-sectoral, inter-industry and urban-rural agribusiness linkages help to achieve the goal of inclusive and sustainable development of the economy in this ongoing Covid-19 pandemic scenario. It is important to minimise the long-run impact of this pandemic on the nutritional food security of the state. Dynamic and efficient agribusiness can reduce poverty by increasing income and standard of living of small and marginal farmers and landless agricultural workers. It can also be a solution to unemployment among the youth and women by attracting them to Agri-entrepreneurship

Agri-entrepreneurship emerged to meet the challenges faced by crop, livestock, dairy and fishery sectors with respect to low yield and profits, increased cost of production, wastage, lack of credit, scientific knowledge, technical knowhow, inefficient logistics, supply chain and marketing management. It attracts private investment, utilize marketable surplus, create additional market, and reduce post and pre-harvest loss, offers reasonable price to farmers and a fair price to consumers.

3.2 PERFORMANCE OF AGRICULTURE SECTOR IN INDIA

As of 2017, India occupies only 2.44 per cent of world's land area but has to support 17.74 per cent of the world's human population. India has the highest percentage of rural population (26.08 per cent) where agriculture and allied sectors are the main source of livelihood (FAO, 2020). Around 43 per cent Indians earn their livelihood from agriculture sector out of which 55 per cent are males and 73.2

per cent females. Thus, crops, livestock, forestry and fishery sectors play a vital role in the development of Indian economy especially of rural areas. Let us begin our discussion on the performance of Indian agriculture with an international comparison.

India's Position in World Agriculture Scenario: Table 3.1 sows India's position in world agriculture.

Table 3.1: India's Position in World Agriculture, 2017

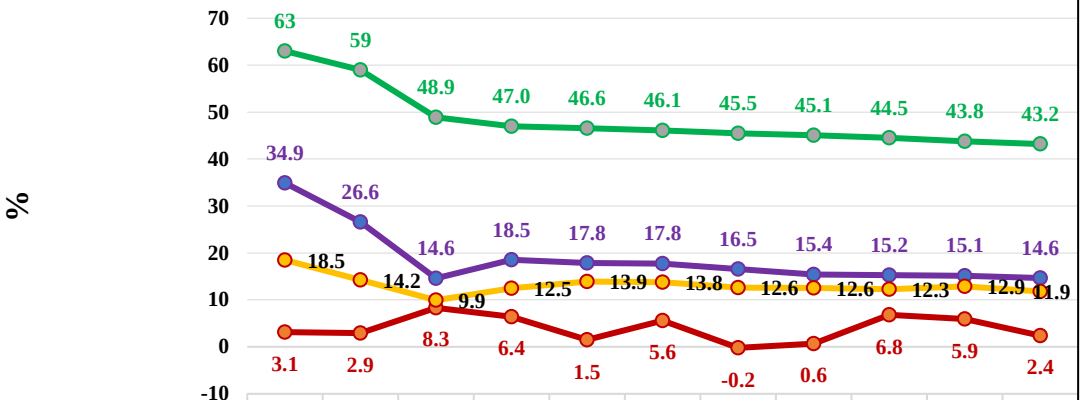
Particulars	World	India	India's share (%)	India's Rank
Arable Land (Million Hectares)	1390.7	156.46	11.25	2
Crop Production (Million Tonnes)				
Pulses	95.98	23.24	24.21	1
Jute	3.53	1.97	55.69	1
Wheat	771.72	98.51	12.77	2
Rice	769.66	168.5	21.89	2
Groundnut (with shell)	47.1	9.18	19.49	2
Sugarcane	1841.53	306.07	16.62	2
Tea	6.1	1.33	21.72	2
Cotton (lint)	24.77	6.05	24.43	2
Tobacco Unmanufactured	6.5	0.8	12.3	2
Vegetables Primary	1094.34	127.14	11.62	2
Fruits Primary	865.59	92.3	10.66	2
Potatoes	388.19	48.61	12.52	2
Onion (Dry)	97.86	22.43	22.92	2

Source: Statistics, F. A. O. (2020). World Food and Agriculture Statistical Pocketbook. FAO: Rome, Italy

India ranks first in the world with respect to production of pulses, jute and second in arable land, rice, wheat, groundnut, sugarcane, tea, cotton, tobacco, fruits, vegetables, potatoes and onion. FAO states that as of 2017, Argentina and New Zealand bags the first and second positions in crop and food production in terms of gross per capita monetary value, while China and India lead in terms of absolute monetary value. In spite of the outstanding position in the production front, why individuals and households employed in agriculture sector of the economy continue to be economically and socially vulnerable sections of the society? To find an answer, let us analyse the performance of agriculture and allied sectors in the growth of Indian economy over the years.

Trends in the Share of Agriculture and Allied Sectors in the Economy: Graph 3.1 illustrates the trend in the growth rate of agriculture sector, share in Gross Domestic Product (GDP), employment and exports of Indian economy.

Graph 3.1: Share of Agriculture and Allied Sectors in India (%)



	1990-91	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Share in GDP/GVA	34.9	26.6	14.6	18.5	17.8	17.8	16.5	15.4	15.2	15.1	14.6
Agri-growth Rate	3.1	2.9	8.3	6.4	1.5	5.6	-0.2	0.6	6.8	5.9	2.4
Share in Employment	63	59	48.9	47.0	46.6	46.1	45.5	45.1	44.5	43.8	43.2
Share in Exports	18.5	14.2	9.9	12.5	13.9	13.8	12.6	12.6	12.3	12.9	11.8

Source: CSO 2019, World Bank, 2019, DGCIS

Agriculture Growth Rate: The average growth rate of agriculture declined from 3.1 per cent to 2.4 per cent between 1990-91 and 2018-19. The low growth can be directly attributed to the deficient monsoon rainfall but there are many other equally significant factors like changes in the land utilization and cropping pattern, price policy, trade policy, absence of adequate and timely supply of inputs like quality seeds, fertilizers, pesticides, credit, irrigation etc. and insufficient availability of infrastructure and marketing facilities.

Share of Agriculture in GDP: Agriculture sector contributes 14.6 per cent of GVA (at constant prices) in 2018-19 as against 34.9 per cent in 1990-91 (Central Statistical Office (CSO), 2019). The declining trend can be an expected outcome of a fast growing and structurally changing economy in the post-reform period. An international comparison reveals this argument because Agri-GDP of Indonesia (12.81 per cent), China (7.19 per cent), Brazil (4.36 per cent), Russia (3.39 per cent) and European Union (1.51 per cent) are lower than India.

Share of Agriculture in Employment: Agriculture and allied sectors account for about 43.2 per cent (26 million) of employment in the country (World Bank, 2019). The prosperity of the rural economy is directly linked to agriculture sector since

about 55 per cent of the males and 73.2 per cent of the females are engaged in the agriculture (Periodic Labour Force Survey, 2017-18). As the economy develops, share of agricultural employment in total employment declines. An international comparison supports this argument because the percentage of agri-employment in total employment in Indonesia (30.53 per cent), China (26.77 per cent), Brazil (9.39 per cent), Russia (5.84 per cent), European Union (4.15 per cent), Canada (1.5 per cent) and United States of America (1.42 per cent) are lower than India. It is also found that the average age of the farmers is going up indicating that the younger generation is withering away from agricultural operations.

Share of Agriculture in Exports: Since 1991, India remains as a net exporter of Agri-products and the value of its exports and imports reached Rs.2.74 and Rs.1.37 lakh crores respectively in 2018-19. Agriculture sector accounted for 11.9 per cent of national exports in 2018-19 compared to 18.49 per cent in 1990-91. An international comparison reveals that leading exporters of agricultural products in the world are European Union (37.4 per cent) followed by United States of America (9.8 per cent) and India's share is only 2.15 per cent (Directorate General of Commercial Intelligence and Statistics). It is a remarkable achievement that India has transformed itself from a predominantly primary goods exporting country into a non-primary goods exporting country. However, despite the convincing significance of this sector, its full potential is not utilized in India because of various reasons. Thus, an attempt is made to examine the growth trends in agriculture and allied sectors in the planning era.

Growth Trends in Agriculture and Allied Sectors under Five Year plans: The growth performance of agricultural sector and the economy as a whole since 1951 is summarized in Table 3.2 under the following different time periods.

Pre-Green Revolution Period (1951 to 68): The traditional phase of Indian agriculture from First Five-Year Plan (FYP) was the golden period of Indian agriculture with an average agricultural growth rate of 3 to 3.5 per cent. In the second Five Year Plan, priority given to agriculture declined due to the diverted government attention towards industries. The problems started from the Third Five

Year Plan onwards due to the Chinese aggression together with bad monsoon and the worst climatic conditions. India moved towards a famine due to the huge shortage in agricultural production especially in food production. The government initiated several measures to revive the situation and one of the strong policy interventions was the launching of the Public Distribution System.

Table.3.2: Average Growth Rates in GDP & Agriculture Since 1951

Period	Agriculture Sector Growth Rate (%)	GDP/GVA Growth Rate (%)
1. Pre-Green Revolution (1951 to 1968)	2.54	3.69
2. Green Revolution Period (1968 to1981)	2.44	3.52
3. Pre-Reform Period (1981 to 1991)	3.52	5.4
4. Early Reforms Period (1991 to 1997)	3.66	5.69
5. IX to XII FYP Period (1997 to 2017)		
IX Five Year Plan Period (1997 – 2002)	2.5	5.52
X Five Year Plan Period (2002 – 2007)	2.47	7.77
XI Five Year Plan Period (2007 – 2012)	3.3	6.5
XII Five Year Plan Period (2012-2017)	1.68	6.5

Source: Government of India. (2020). Ministry of Finance Department of Economic Affairs, Indian Economic Survey. New Delhi, India

Green Revolution Period (1968 to 1981): To revive the economy, government initiated Green Revolution initially in the selected districts of Punjab. It is a package given to farmers that includes High Yielding Variety (HYV) seeds, chemical fertilizers and pesticides, irrigation, marketing, storage and credit facilities. Government started agricultural universities and research institutions, new irrigation projects and nationalization of commercial banks in 1969 and 1980 increased the credit availability. The average growth of agriculture sector and national GDP during this period declined from 2.54 to 2.44 per cent and from 3.69 to 3.52 per cent respectively compared to the previous period.

Pre-Reform Period (1981 to 1991): This period is marked with some noticeable shifts in Indian agriculture. Dominance in agricultural production by Punjab and Haryana is shifted to the north-eastern states like Bengal, Bihar and Odisha. Area under food crops declined as a result of shift in cropping pattern in favour of commercial/horticultural/cash crops. Agricultural growth rate remained at 3.52 per cent while the GDP of the country achieved 5.4 per cent growth rate during this period due to the increased contribution of the service sector.

Early Reform Period (1991 to 1997): The period of early reform is marked by the structural adjustments and macro- stabilization policies necessitated by the worsening Balance of Payment, high fiscal deficit and unsustainable rate of inflation. During this period, as the economy moved towards liberalization, the rate of growth of the economy stood at 5.69 per cent and agricultural growth at 3.66 per cent due the favourable weather and climatic conditions.

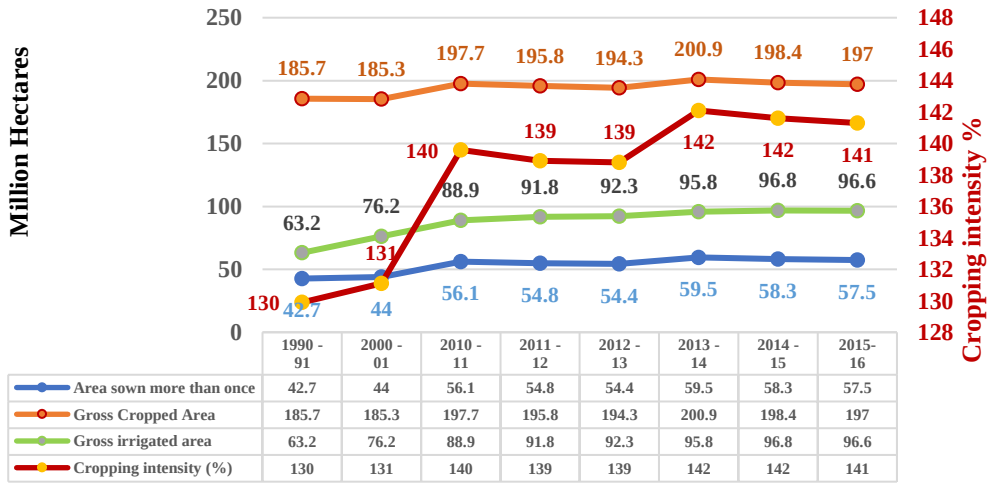
IX to XII Five Year Plan Period (1997 to 2017): This period is consistent with the era of globalization and the agriculture strategy is export-led growth. During Ninth Five Year Plan (1997-2002) agricultural growth rate declined to 2.5 per cent while the GDP of the country achieved 5.52 per cent growth rate. Tenth Five Year Plan (2002-2007) declared agriculture as the prime moving force of the economy due to the low agricultural growth rate of 2.47 per cent while the GDP growth rate of the country improved to 7.77 per cent during this period. Eleventh Five Year Plan (2007-2012) emphases the idea of "inclusive growth" and agriculture growth rate improved to 3.3 per cent which is slightly higher than the previous period. During Twelfth Five Year Plan (2012 - 2017), as against 8 per cent targeted growth in Gross Value Added (GVA), the average GVA growth rate was only 6.5 per cent and in agriculture and allied sectors it was only 1.68 per cent.

The above analysis reveals that agriculture sector faces multifarious issues and the following measures need to be taken to step up productivity and transform this sector. a) The low and skewed distribution of irrigated area need to be corrected. b) Effective supply fertilizers, pesticides, quality seeds and irrigation are required to reap the optimal agricultural potential. c) Diversification of agriculture and allied sectors by encouraging value added products to offer remunerative price to farmers. d) Reduce wastage, increase investments in transportation, storage and processing facilities to ensure food security. e) Finally, the low competitive strength of agricultural commodities due to outmoded technology, high cost of cultivation and diseconomies of scale need to be rectified. In short, our main concern today is how to make Indian agriculture remunerative and globally competitive. Any discussion on the strategies for achieving the targeted 4 per cent agricultural growth rate should begin from the land utilization pattern.

Trends in Land Utilization in India (1990-91 to 2015-16): Out of the total geographical area of 328.73 million hectares, 304.9 and 328.7 million hectares are reported for agricultural land use in India during 1990-91 and 2015-16 respectively. The trends in the reported land use in India between 1990-91 and 2015-16 is illustrated in Graph 3.2.

The gross cropped area increased from 185.7 to 197 million hectares with an increase of 60.9 to 64 per cent of the reported land. Cropping intensity as a percentage of gross cropped area to net area sown increased from 130 to 141 per cent. The gross irrigated area increased from 63.2 to 96.6 million hectares that shows an increase of 20.73 to 31.38 per cent of the reported land and from 34 to 49 per cent of the gross cropped area which is due to the institutional support by local self-governments. The area sowed more than once increased from 42.7 to 57.5 million hectares due to the availability of irrigation.

Graph 3.2: Trends in Gross Cropped Area & Gross Irrigated Area

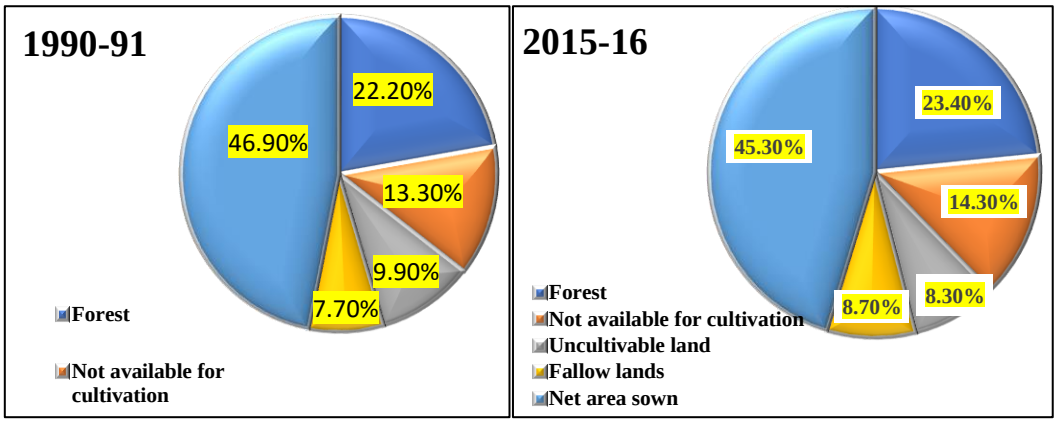


	1990 - 91	2000 - 01	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015- 16
Area sown more than once	42.7	44	56.1	54.8	54.4	59.5	58.3	57.5
Gross Cropped Area	185.7	185.3	197.7	195.8	194.3	200.9	198.4	197
Gross irrigated area	63.2	76.2	88.9	91.8	92.3	95.8	96.8	96.6
Cropping intensity (%)	130	131	140	139	139	142	142	141

Source: G. O. I. Directorate of Economics and Statistics, (Various years). Agricultural Statistics at a Glance.

The changes in the agricultural land by use in India between 1990-91 and 2015-16 are illustrated in Graph 3.3. Both net area sown and uncultivable land declined from 46.90 to 45.30 per cent and from 9.9 to 8.3 per cent of the reported land respectively. This reflects the lack of investment initiatives by farmers due to lack of credit support and low profitability. The area under forests increased from 22.2 to 23.4 per cent of reported land but is still less than the ideal forest cover of 33.3 per cent.

Graph 3.3: Agricultural land by use in India (1990-91 & 2015-16)

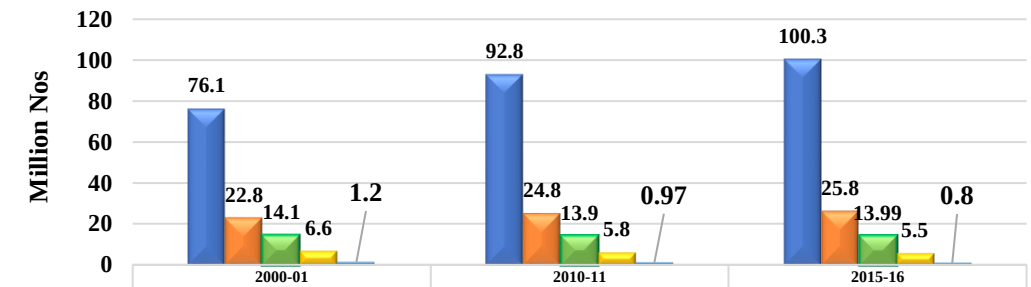


Source: G. O. I. Directorate of Economics and Statistics, Land Use Statistics 2015-16.

Land area not available for cultivation increased from 13.3 to 14.3 per cent which can be attributed to increasing population and urbanization. The above analysis reveals that the investment base of agriculture is to be strengthened for the optimum utilization of available land resources. Any discussion on the growth performance of agriculture should begin with the changes in the land holding pattern of the country over the years.

Trends in Land Holding Pattern in India (2000-01 to 2015-16): The performance of agricultural sector is greatly influenced by the pattern of land holdings. The changes in the land holding pattern in India from 2000-01 to 2015-16 illustrated in Graphs3.4 and 3.5 show that the number and percentage share of marginal holders (less than 1 hectare) in total holdings increased from 76.1to 100.3 million numbers and 63 to 68.4 per cent respectively. The number of small holders (1 to 2 Hectare) increased from 22.8 to 25.8 million but their share in total holdings declined from 18.9 to 17.6 per cent. The number and percentage share of semi-medium holders (2 to 4 Hectare) in total land holdings declined from 14.1 to 13.99 million and 11.7 to 9.6 per cent respectively. The number and percentage share of medium holders (4 to 10 Hectare) in total land holdings declined from 6.6 to 5.5 million and 5 to 3.8 per cent respectively.

Graph 3.4: Trends in Number of Land Holdings in India

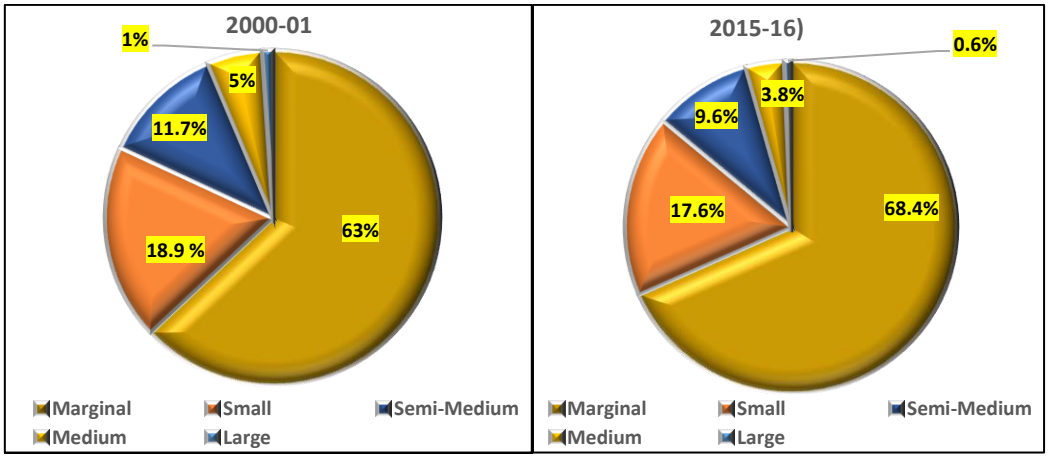


	2000-01	2010-11	2015-16
Marginal	76.1	92.8	100.3
Small	22.8	24.8	25.8
Semi-Medium	14.1	13.9	13.99
Medium	6.6	5.8	5.5
Large	1.2	0.97	0.8

Source: Government of India. Compiled from Agriculture Censuses

In the case of large owners (10 Hectares & above), the proportion of ownership holdings and area are rapidly declining from 1.2 (1 per cent) to 0.8 (0.6 per cent) million numbers which indicates the influence of land ceiling legislation. State-wise analysis shows that out of 146.45 million operational holdings in 2015-16, the highest number of operational holders belong to Uttar Pradesh (23.82 million) followed by Bihar (16.41 million), Maharashtra (15.29 million) and Kerala ranks 9th with 7.58 million.

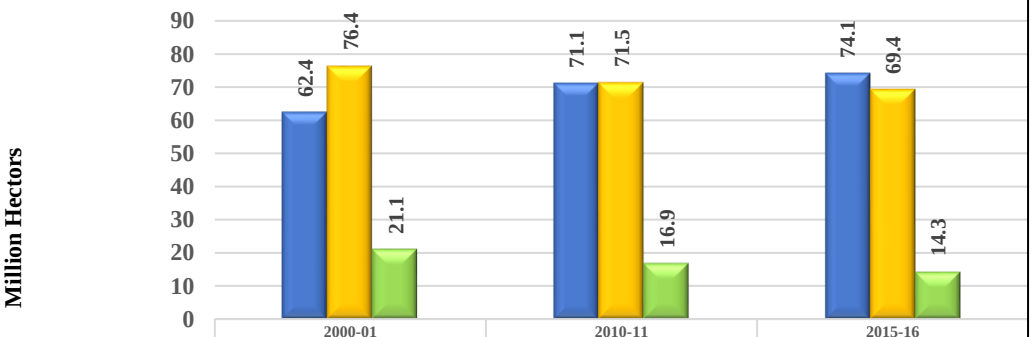
Graph 3.5: Change in Land Holding Pattern in India (2000-01 & 2015-16)



Source: Government of India. Compiled from Agriculture Censuses

The inferences based on the analysis of area of land holdings by different groups of farmers during 2000-01 and 2015-16 illustrated in Graph 3.6 and 3.7 can be summarized as follows.

Graph 3.6: TREND IN AREA OF LAND HOLDINGS IN INDIA

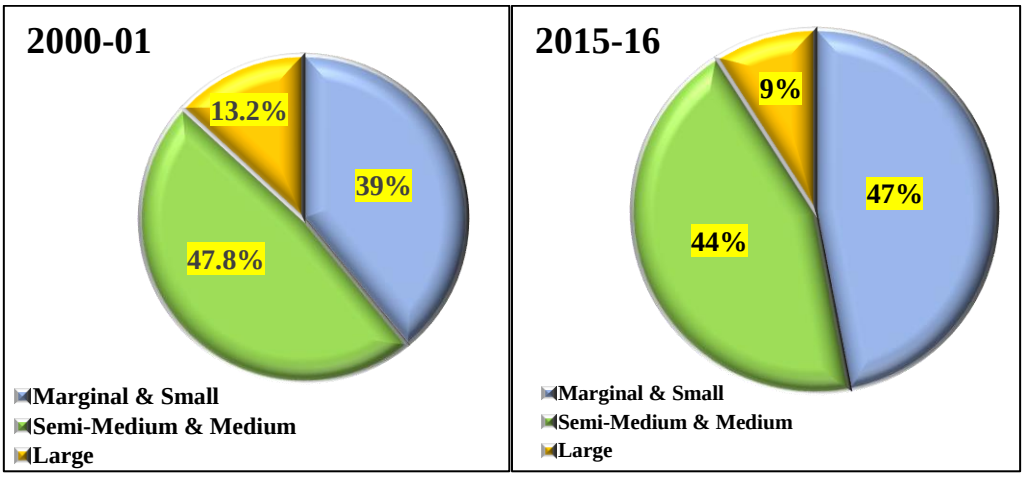


	2000-01	2010-11	2015-16
Marginal & Small	62.4	71.1	74.1
Semi-Medium & Medium	76.4	71.5	69.4
Large	21.1	16.9	14.3

Source: Government of India. Compiled from Agriculture Censuses

Both the area and percentage share in total operational holdings of marginal and small holders increased from 62.4 (39 per cent) to 74.1 (47 per cent) million hectares. This trend is due to the growing division of land holdings as a result of increase in rural population, law of inheritance in ancestral property and decline of joint family system.

Graph 3.7: Change in Area of Operational Holdings in India (%)



Source: Government of India. Compiled from Agriculture Censuses

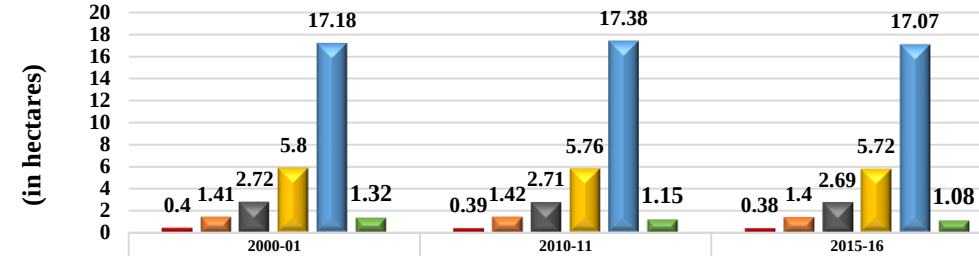
The semi-medium and medium land holders with 76.4 (47.8 per cent) and 69.4 (44 per cent) million hectares emerged as the most powerful group of farmers in rural India. With regard to large holdings, the area and share declined from 21.1

(13.2 per cent) to 14.3 (9 per cent) million hectares. This is a welcome trend because the surplus after ceiling legislation is distributed to marginal and small farmers and the concentration of land with very large land owners is coming down.

State-wise analysis shows that out of 157.82 million hectares in 2015-16, the highest operated area is contributed by Rajasthan (20.87 million hectares) followed by Maharashtra (20.51 million hectares) and Kerala has only 1.395million hectares.

Analysis on the average size of operational holdings between 2000-01 and 2015-16 is illustrated in Graph 3.8. The average size of land holdings of marginal and small farmers shows a declining trend from 0.4 to 0.38 and 1.41 to 1.4 hectares respectively. Small farmers may be able to manage a subsistence income but the large number of marginal farmers with very little land lives in poverty since the land is too less to earn out a living. Semi-medium and medium farmers are the gainers with an average farm size range of 2.72 to 2.69 and 5.8 to 5.72 hectares respectively.

Graph 3.8: Trends in Average Size of Operational Holdings in India



	2000-01	2010-11	2015-16
Marginal	0.4	0.39	0.38
Small	1.41	1.42	1.4
Semi-Medium	2.72	2.71	2.69
Medium	5.8	5.76	5.72
Large	17.18	17.38	17.07
All Holdings	1.32	1.15	1.08

Source: Government of India. Compiled from Agriculture Censuses

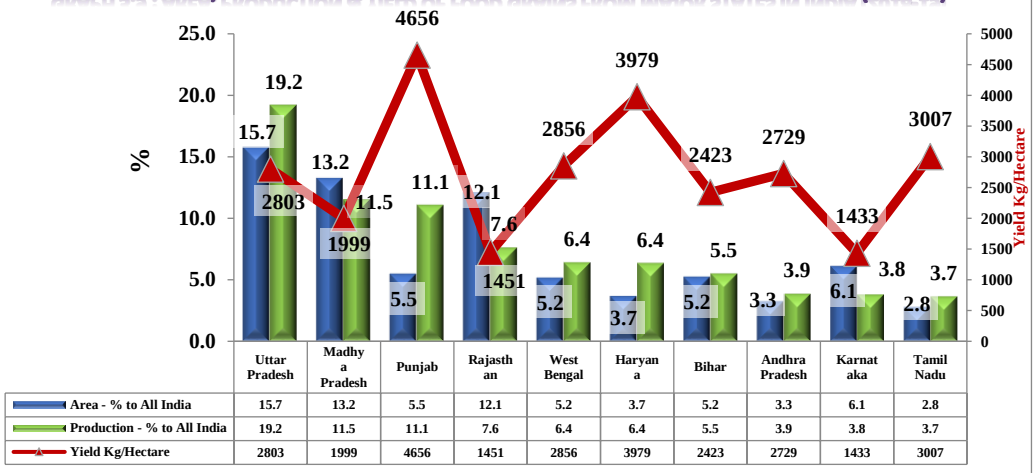
The large farmers with an average farm size of about 17 hectares who constitute less than 1 per cent are able to enjoy all the economies of large-scale production and objective of doubling of farmer's income is a reality only for them.

Comparison with Chinese agriculture reveals that with a large size operational holding, active land rental markets, enhancing of machine services and rising agriculture wages induced Chinese farmers to go for mechanization (Xiaoping, 2016). This underlines the fact that unless marginal farmers are provided alternative non-farm employment by starting small agribusiness ventures, the rural India will continue to remain poor. The above analysis on land holding pattern

prompts us to discuss on the trends in area, production and productivity of various crops in the country.

Trends in Area, production and Yield of Major Crops in India: The area, production and yield of food grains from major states of India in 2018-19 are illustrated in Graph 3.9. Out of 124 million hectares of land under food grains, Uttar Pradesh occupies the largest area of 15.7 per cent followed by Madhya Pradesh (13.2 per cent) and Rajasthan (12.1 per cent). India's food grains production reached 285 million tonnes in 2018-19 which is very close to the production target of 290 million tonnes. The major contributing states are Uttar Pradesh (19.2 per cent), Madhya Pradesh (11.5 per cent) and Punjab (11.1 per cent).

GRAPH 3.9 : AREA, PRODUCTION & YIELD OF FOOD GRAINS FROM MAJOR STATES IN INDIA (2018-19)



	Uttar Pradesh	Madhya Pradesh	Punjab	Rajasthan	West Bengal	Haryana	Bihar	Andhra Pradesh	Karnataka	Tamil Nadu
Area - % to All India	15.7	13.2	5.5	12.1	5.2	3.7	5.2	3.3	6.1	2.8
Production - % to All India	19.2	11.5	11.1	7.6	6.4	6.4	5.5	3.9	3.8	3.7
Yield Kg/Hectare	2803	1999	4656	1451	2856	3979	2423	2729	1433	3007

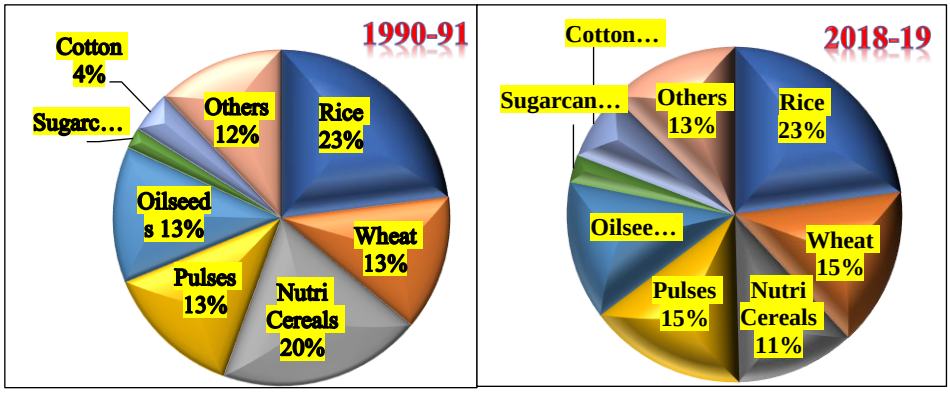
Source: Government of India. Directorate of Economics & Statistics

The leading states with respect to the yield of food grains are Punjab (4656kg/hectare) followed by Haryana (3979 kg/hectare) and Tamil Nadu (3007 kg/hectare) as against the all-India yield of 2299Kg/hectare. The above analysis on the state-wise performance of food grains lead to a general discussion on the trends in the cropping pattern of the country.

Trends in the Area of Various Crops in India: Crop-wise change in area between 1990-91 and 2018-19 is illustrated in Graph 3.10. A shift in the cropping pattern of the country towards cash crops is evident from the decline in area under food grains from 68.8 per cent in 1990-91 to 64.8 per cent in 2018-19. Among food crops, the share of nutri-cereals in the gross cropped area declined from 20 per cent (36.32

million hectares) to 10 per cent (21.98 million hectares). Among cash crops, the increase in percentage share is visible for cotton, sugarcane and jute. This shift may be due to the higher price of cash crops and a change from subsistence to commercial farming.

Graph 3.10: Changes in Percentage Share of Area under Major Crops



Source: Government of India. Directorate of Economics & Statistics

Shift in the cropping pattern necessitates a comparative production analysis of the various crops in the country.

Trends in the Production of Various Crops in India: Production of food grains shows a steep rising trend from 1990-91 to 2011-12 (Table 3.3).

Table3.3: Trends in Production of Various Crops in India (Million Tonnes)

Crops	1990 -91	2000 -01	2010 -11	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18	2018 -19
Food grains	176	197	244	259	257	265	252	252	275	285	285
Rice	74	85	96	105	105	107	105	104	110	113	116
Wheat	55	70	87	95	94	96	87	92	99	100	102
Nutri Cereals	33	31	43	42	40	43	43	39	44	47	43
Pulses	14	11	18	17	18	19	17	16	23	25	23
Oilseeds	19	18	32	30	31	33	28	25	31	31	32
Sugarcane	241	296	342	361	341	352	362	348	306	380	400
Cotton	10	10	33	35	34	36	35	30	33	33	29
Jute & Mesta	9	11	11	11	11	12	11	11	11	10	10

Source: Government of India. Directorate of Economics & Statistics

Due to bad weather in the years 2012-13 and 2014-15, there was a decline but, further it increased and reached 285 million tonnes in 2018-19. More

spectacular is the rising trend in the output of rice, wheat, pulses, oilseeds, sugarcane, cotton and jute. This increasing production performance of various crops placed India in the first two positions in the world crop production scenario. During 2018-19, rice and sugarcane production of 116 and 400 million tonnes exceeded the targeted production of 114 and 385 million tonnes respectively. Wheat production reached the targeted output of 102 million tonnes.

Table 3.4 shows the state-wise production status of various crops in India in 2018-19. Uttar Pradesh leads in the production of wheat and sugarcane. West Bengal is the largest producer of rice and jute. Madhya Pradesh ranks first in the production of oil seeds and pulses. Maharashtra and Rajasthan are the largest producers of cotton and nutri-cereals.

Table 3.4: Three Largest Producing States of Major Crops in India (2018-19)

Crops	States	% share in India	Crops	States	% share in India
Rice	West Bengal	14	Oilseeds	Madhya Pradesh	21
	Uttar Pradesh	13		Rajasthan	15
	Punjab	11		Maharashtra	
Wheat	Uttar Pradesh	32	Sugarcane	Uttar Pradesh	45
	Punjab	18		Maharashtra	23
	Madhya Pradesh	15		Karnataka	11
Nutri-cereals	Rajasthan	16	Cotton	Maharashtra	25
	Karnataka	13		Gujarat	21
	Madhya Pradesh	12		Telangana	14
Pulses	Madhya Pradesh	33	Jute & Mesta	West Bengal	79
	Rajasthan	16		Bihar	10
	Uttar Pradesh	10		Assam	9

Source: Government of India. Directorate of Economics and Statistics

The above discussion on the production performance necessitates the discussion on the crop-wise yield in the country.

Trends in the Yield of Various Crops in India: Table 3.5 shows the trends in yield of various crops in India. The performance of the food grain crops is comparatively better than cash crops. Among food crops, yield is better for rice, wheat and nutria-cereals but, pulses increased only at a slow pace.

Table 3.5: Trends in Yield of Various Crops in India (Quintal/hectare)

Crops	1990 -91	2000 -01	2010 -11	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18	2018 -19
Food grains	14	16	19	21	21	21	20	20	21	22	23
Rice	17	19	22	24	25	24	24	24	25	26	27
Wheat	23	27	30	32	31	31	28	30	32	34	35
Nutri Cereals	9	10	15	16	16	17	17	16	18	19	20
Pulses	6	5	7	7	8	8	7	7	8	9	8
Oilseeds	8	8	12	11	12	12	11	10	12	13	13
Sugarcane	654	686	701	717	683	705	715	707	690	802	782
Cotton	2	2	5	5	5	5	5	4	5	4	4

Source: Government of India. Directorate of Economics and Statistics

The yield of sugarcane and cotton is better than oilseeds among cash crops. An international comparison of the per hectare yield of various crops in the country during 2017 shows that in spite of the prime positions in the production front, the productivity of major crops except groundnut is lower than world average yield (Table 3.6).

Table 3.6 International Comparison of Yield (Quintal/hectare) of Crops in 2017

Crop	Country with Highest Yield		World	India
Rice	China	69.17	46.02	38.48
Wheat	China	54.81	35.31	32.19
Pulses	Russia	20.08	10.09	6.64
Sugarcane	Guatemala	1210.12	708.91	697.35
Groundnut	USA	45.66	16.86	17.32
Tobacco	USA	24.76	18.43	17.11

Source: Food and Agriculture Organisation Statistics (as on 08.01.2020)

China has the highest productivity in rice and wheat, while United States of America has the highest yield in groundnut and tobacco. Russia and Guatemala tops in the yield of pulses and sugarcane respectively. The use of low-grade technology, traditional farming, small and fragmented land holding, insufficient manure, defective land tenures etc are the major reasons for low agriculture productivity in India. Productivity can be enhanced by offering a higher remunerative price to farmers. This can be possible through diversification of agriculture and allied

sectors by encouraging value added products. Increasing the availability of quality agricultural inputs and investments in the post-harvest value chain can reduce wastage; increase productivity and can ensure food security for the population. The low competitive strength of agricultural commodities in the international market due to outmoded technology, high cost of cultivation and diseconomies of scale need to be rectified by adopting appropriate policy measures to increase agriculture productivity.

3.3 PERFORMANCE OF AGRICULTURE SECTOR IN KERALA

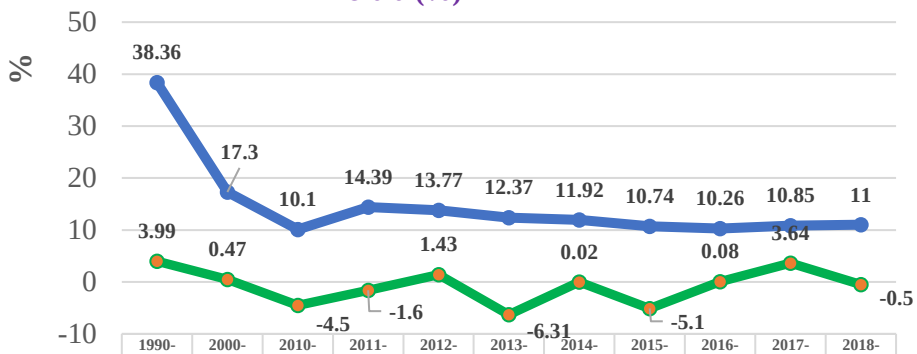
The economic transformation of Kerala economy depends on the performance of its agriculture and allied sectors. Agriculture has a prominent role in rural livelihood, employment and food security. The rural population of Kerala accounts for 52.18 per cent where agriculture and allied sectors are the main source of livelihood. Development of Kerala lies in the prosperity of its rural sector and agriculture growth has a rural focus. Thus, let us start the discussion on Kerala's position in Indian Agriculture scenario.

Kerala's Position in Indian Agriculture Scenario: Kerala with 38.86 million hectares of land occupies 1.2 per cent of India's total geographical area. The economy has to support 3.4 crore people accounting about 2.7 per cent of India's human population. During 2017-18, Kerala occupies the largest area in the cultivation of rubber (67 per cent), pepper (64 per cent), cardamom (47 per cent) and coconut (37 per cent). India's 27 per cent of the area of plantation crops comprising coconut, areca nut, cashew and cocoa belongs to Kerala and the state tops among the plantation producing states by contributing 33.48 per cent of national output. Kerala is the largest producer of rubber (78 per cent), cardamom (64 per cent), pepper (58 per cent) and coconut (32 per cent). The productivity of majority of the crops grown in Kerala is low compared to the leading producing states as well as at the national level. The above observation leads us to a discussion on the major trends in the contribution of agriculture sector towards the state economy.

Trends in the Share of Agriculture Sector in Kerala: This section analyses the share of agriculture and allied sectors of Kerala in the state income, employment and export earnings.

Share & Growth of Agriculture & Allied Sectors in GSDP/GSVA: The contribution and growth rate of agriculture and allied sectors in Gross Value Added (GVA) of India and Gross State Value Added (GSVA) of Kerala show a declining trend over the past few decades (Graph 3.11).

Graph 3.11 : Share & Growth of Agriculture & Allied Sectors of Kerala (%)



	1990-91	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Share in GSDP/GSVA	38.36	17.3	10.1	14.39	13.77	12.37	11.92	10.74	10.26	10.85	11
Growth Rate	3.99	0.47	-4.5	-1.6	1.43	-6.31	0.02	-5.1	0.08	3.64	-0.5

Source: Government of India. Central Statistics Office, Directorate of Economics and Statistics

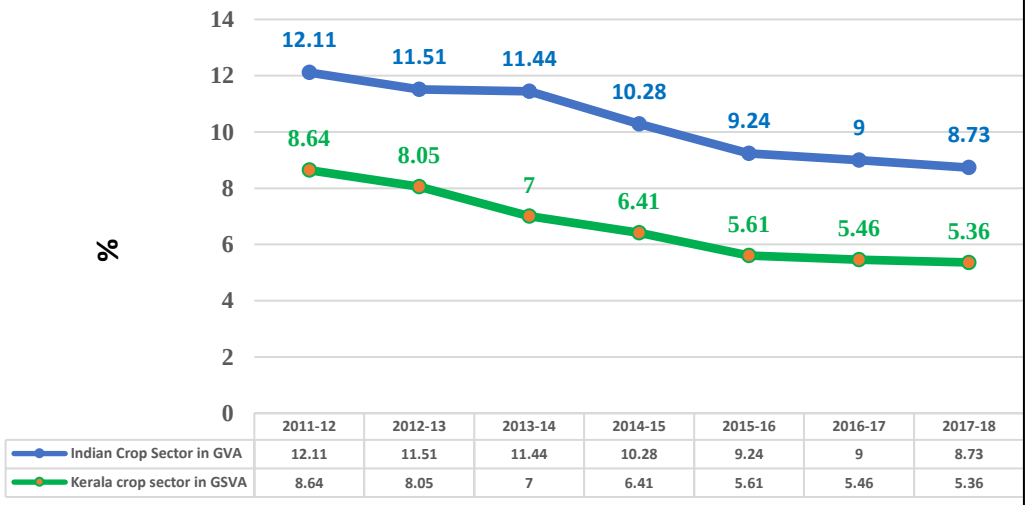
The share and growth rate of agriculture sector decreased from 38.36 per cent to 11 per cent and from 3.99 per cent to -0.5 per cent respectively during 1990-91 to 2018-19. It is observed that the share and growth rate of agriculture and allied sectors of Kerala in GSVA is always lower than its share at national GVA. Kerala contributes only 11 per cent to the Gross State Value Added (GSVA) which is lower than the national share of 14.6 per cent in 2018-19. Kerala has a negative agriculture growth rate of -0.5 per cent as against 2.4 per cent at the national level in 2018-19.

The uncertainty in agriculture is visible from the negative growth rate in many years. The reasons for the low share and poor growth rate in recent years can be analysed on the ground that, from 2016-17 onwards Kerala economy is badly affected by the shocks of Ockhi cyclone, Nipah virus, unexpected floods and Corona virus. These challenges were met with untiring efforts, courage and determination by the government and the people. But these disasters have an adverse impact on the economy as a whole and especially on the livelihoods of the people depending on agriculture and allied sectors in rural areas.

Similar observation is also found in the share of crop sector where the share in GSVA of Kerala is always lower than the share in GVA of the country (Graph

3.12). Between 2011-12 and 2017-18 share of crop sector in the GVA of the country declined from 12.11 per cent to 8.73 per cent compared to the corresponding share of crop sector to the GSVA of Kerala from 8.64 per cent to 5.36 per cent.

Graph 3.12: Trends in Share of Crop Sector of India & Kerala (%)



	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Indian Crop Sector in GVA	12.11	11.51	11.44	10.28	9.24	9	8.73
Kerala crop sector in GSVA	8.64	8.05	7	6.41	5.61	5.46	5.36

Source: Government of India. Central Statistics Office, Directorate of Economics and Statistics

The low share of crop sector can be attributed to the climatic uncertainties, inadequacy of credit, irrigation, quality seeds, mechanisation, value addition and processing, marketing and storage, low farm prices, wastage and post-harvest losses, and high cost of production. More focussed attention is required to increase the area production and productivity of agricultural crops in the state.

Share in Employment: The percentage of people employed in agriculture and allied sectors in the total employment of Kerala is always less compared to all India level. But both Kerala and India are experiencing a declining trend in the share of employment in primary sector. As per the 55th NSSO round in 1990-00, the share of employment in primary sector is 33.1 per cent in Kerala compared to 60.32 per cent in India. Later the share declined and as per the 5th Annual Employment-Unemployment Survey in 2016, about 29.8 per cent are employed in agriculture and allied sectors of Kerala. The increasing trend in the number of marginal holdings and reduced size of average holdings in the state show that the objective of inclusive growth and doubling farmer's income can be possible through a rural agricultural focus.

Share in Export Earnings: Let us continue our discussion on the performance of agriculture in Kerala based on its contribution towards national exports. The share of agri-products of Kerala in national export earnings accounts for 6.65 per cent in 2017-18 (Kerala Economic Review, 2018). The major crop products from Kerala in the export basket of India are cashew, tea, coir and coir products and spices. The export of cashew kernels from Kerala in value terms amounts to Rs.2580 crores and 36930 tonnes in terms of quantity in 2017-18 compared to Rs.2296 crores and 68655 tonnes in 2011-12. Share of Kerala in the export of cashew kernels in India shows a declining trend from 52 to 44 per cent (Graph 2.13). The export of coir and coir products from Kerala in 2017-18 accounts for 2.47 lakh tonnes compared to 1.24 lakh tonnes in 2013-14. Kerala's share in the export of coir and coir products in India reduced to 16 percent from 23 per cent between 2013-14 and 2015-16 but increased to 24 per cent in 2017-18.

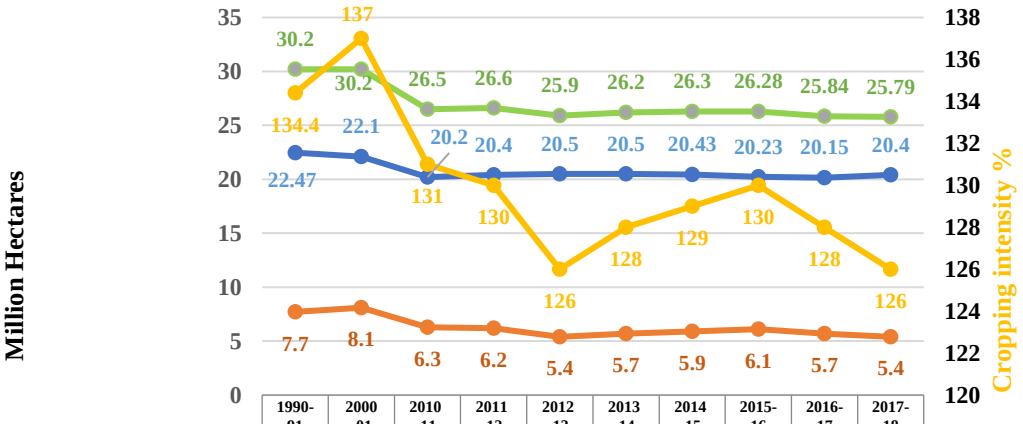
Exports of tea from Kerala reached 75741 tonnes worth of Rs.123294 lakhs in 2017-18 compared to 71784 tonnes worth Rs.74287 lakhs in 2011-12. Kerala's share in the export of tea in India increased from 21.7 to 34.8 per cent between 2011-12 and 2014-15 but reduced to 29.5 per cent in 2017-18. Export of coffee from Kerala accounts for 54220 tonnes in 2017-18 constituting a share of 13.7 per cent of Indian coffee exports.

Exports of spices from Kerala reached 95456 tonnes worth of Rs.415296 lakhs in 2017-18 compared to 81413 tonnes worth Rs.325340 lakhs in 2013-14. Kerala's share in the export of spices in India increased from 9.96 to 11.87 per cent between 2013-14 and 2015-16 but reduced to 9.29 per cent in 2017-18. In value terms, the share reduced from 23.69 to 23.1 per cent between 2013-14 and 2017-18. The major spices items exported from Kerala are cardamom, chilli, pepper, turmeric, coriander, ginger, nutmeg, garlic, spice oils, curry powder etc.

The above analysis shows that there exist untapped agriculture resources to contribute towards the state's income, employment and exports. To identify ways to improve the performance of the sector, let us continue our discussion based on the trends in the land utilisation pattern of the state over the years.

Trends in Land by Use in Kerala Since 1990-91: The trends in the land utilisation pattern of Kerala during 1990-91 to 2017-18 are illustrated in Graph 3.13 and Graph 3.14.

Graph 3.13: Trends in Gross Cropped Area (million hectares) & Cropping Intensity (%) - Kerala

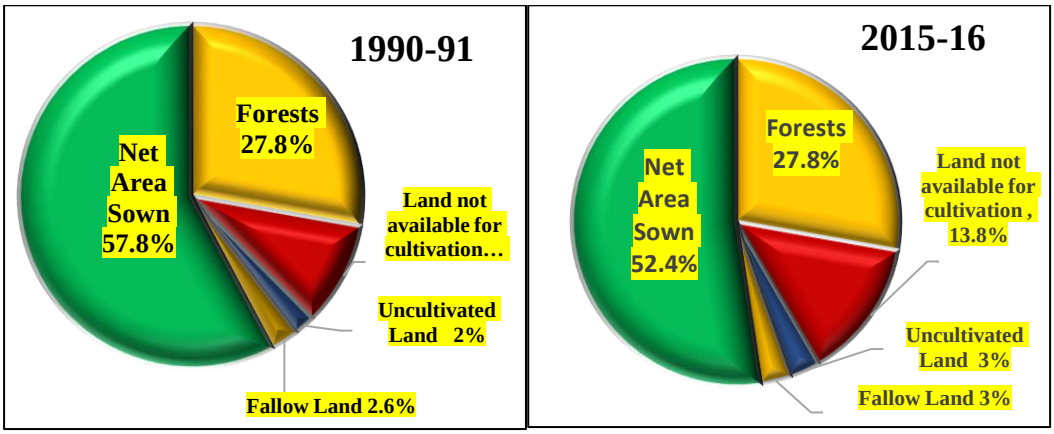


	1990-91	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Net Area Sown	22.47	22.1	20.2	20.4	20.5	20.5	20.43	20.23	20.15	20.4
Area sown more than once	7.7	8.1	6.3	6.2	5.4	5.7	5.9	6.1	5.7	5.4
Gross Cropped Area	30.2	30.2	26.5	26.6	25.9	26.2	26.3	26.28	25.84	25.79
Cropping intensity (%)	134.4	137	131	130	126	128	129	130	128	126

Source: Government of India. Directorate of Economics & Statistics

Out of the total reporting land area of 38.86 million hectares in the state, the area of forest cover is stagnant over the years with 10.8 million hectors constituting about 27.8 per cent of the reported area for land use statistics. Measures to be taken to increase the area of forests to attain the ideal forest cover of 1/3rd of the land area of the state. The land not available for cultivation increased from 3.8 to 5.4 million hectares constituting a change of 9.8 to 13.8 per cent of the reported area. There is a slight increase in the uncultivable and fallow land to the extent of 0.7 (1.8 per cent) to 1.2 million hectares (3.1 per cent) and 1(2.6 per cent) to 1.2 million hectares (3.1 per cent) respectively. The net area sown declined from 22.47 to 20.4 million hectors constituting a reduction from 57.8 per cent to 52.5 per cent of the reported are. Area sowed more than once decreased from 7.7 to 5.4 million hectares. The same decrease is also visible in the gross cropped area from 30.2 to 25.79 million hectares constituting a change from 77.7 per cent to 66. 4 per cent. The cropping intensity also declined from 134 to 126 per cent. On the other hand, gross irrigated area increased from 3.85 to 5.4 million hectors. The source-wise classification of irrigated area shows that 41 per cent is from wells followed by 22 per cent from canals, 12 per cent from tanks and the rest from other sources.

Graph 3.14: Changes in Land Use Pattern in Kerala (1990-91 & 2015-16)



Source: Government of India. Directorate of Economics and Statistics. Land Use Statistics (Various years)

The above discussion reveals that the net sown area is declining and can be due to scarcity of inputs like water, quality seeds, credit etc. Transfer of agricultural land for non-agricultural purposes like house construction is greatly influenced by increased foreign remittances from migrant population (Prakash 1998; Zacharia and Rajan, 2004). Changes in land use statistics necessitate the discussion on changes in the land holding pattern of the state which has a direct impact on the performance of this sector.

Trends in the Land Holding Pattern of Kerala (2000-01 to 2015-16): The performance of agriculture is greatly influenced by the pattern of land holdings in the state. A summary of the trends in the number of land holdings between 2000-01 and 2015-16 is illustrated in Table3.7.

Table 3.7: Trends in Number of Land Holdings in Kerala since 2000-01

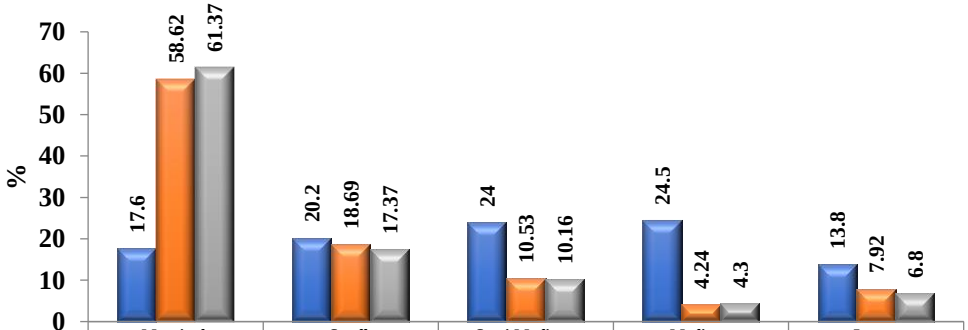
Category (Hectare)	2000 -01	%	2010 -11	%	2015 -16	%
Marginal (below 1)	59.2	94	65.8	96.32	73.33	96.7
Small (1 to 2)	2.6	4.15	1.8	2.64	1.81	2.39
Semi-Medium (2 to 4)	0.94	1.49	0.57	0.83	0.56	0.74
Medium (4 to 10)	0.19	0.31	0.12	0.18	0.11	0.15
Large (10 and above)	0.03	0.05	0.02	0.03	0.02	0.03
All Holdings	62.97	100	68.31	100	75.83	100

Source: Government of Kerala. Agricultural Census (Various years)

The number of marginal holdings increased tremendously from 59.2 (94 per cent) to 73.33 lakhs (96.7 per cent) while small, semi-medium and medium category holdings declined from 4.15 per cent, 1.49 per cent and 0.31 per cent to 2.39 per

cent, 0.74 per cent and 0.15 per cent respectively. The number of large holders remains stagnant around 0.03 per cent. Graph 3.15 shows the trends in area of land holdings in Kerala between 2000-01 and 2015-16.

Graph 3.15: Trends in Area of Land Holdings in Kerala



	Marginal	Small	Semi-Medium	Medium	Large
2000-01	17.6	20.2	24	24.5	13.8
2010-11	58.62	18.69	10.53	4.24	7.92
2015-16	61.37	17.37	10.16	4.3	6.8

Source: Government of Kerala. 10th Agricultural Census 2015-16 2015-16

The total area of land holdings in Kerala showed a declining trend from 1524 thousand hectares in 2000-01 to 1511 thousand hectares in 2010-11 and to 1395 thousand hectares in 2015-16. The same increasing trend is visible in the area of marginal holdings from 17.6 per cent to 61.37 per cent while the area of small, semi-medium, medium and large holdings shows a declining trend from 20.2 to 17.37 per cent, 24 to 10.16 per cent, 24.5 to 4.3 per cent and 13.8 to 6.8 per cent respectively.

The average size of all operational holdings has declined from 0.24 hectares in 2000-01 to 0.18 hectares in 2015-16 (Table3.8). Even though the number of large holding is almost stagnant, the average size of large holdings is as high as 51.04 hectares in 2015-16. In the case of marginal holdings as the numbers are increasing, the average size of holding is decreasing from 0.14 to 0.12 hectares.

Table 3.8: Trends in Average Size (Hectare) of Land Holdings in Kerala since 2000-01

Category	2000-01	2010-11	2015-16
Marginal	0.14	0.13	0.12
Small	1.32	1.57	1.34
Semi-Medium	2.51	2.79	2.54
Medium	5.3	5.33	5.32
Large	37.31	64.58	51.04
All Holdings	0.24	0.22	0.18

Source: Government of Kerala, Agricultural Census (Various Years)

From the above analysis it is very clear that the number of marginal farmers is increasing and the average size of land holdings is decreasing. An important explanation for this change is the high density of population of the state along with the division of ancestral property based on laws of inheritance. The changes in the land use and holding pattern led to changes in cropping pattern. Thus, the following session discusses the trend in the area, production and yield of different crops in the state.

Trends in Area, Production & Yield of Major Crops in Kerala: Kerala produces different types of crops due to diverse Agri-climatic conditions. Factors such as land size, soil fertility, climatic conditions, monsoon behaviour, irrigation facilities, application of fertilizers, marketing facilities, prices, availability of agricultural labourers etc decides the cropping pattern of the state.

Trend in the area of major crops in Kerala during 1990-91 to 2017-18 is presented in Table 3.9. An analysis of the trends in the area of major crops shows that Kerala economy is undergoing a structural transformation by shifting from subsistence food crops to remunerative cash crops.

Table 3.9: Trends in Share of Gross Cropped Area under Major crops in Kerala (%)

Sl. No.	Crop	1990-91	2000-01	2010-11	2017-18
1	Coconut	27.1	25.7	25.22	29.5
2	Rubber	16.2	19.93	27.56	21.4
3	Rice	16.1	11.21	8.8	7.3
4	Areca Nut	1.98	5.49	4.18	3.7
5	Pepper	8.1	5.6	2.78	3.3
6	Coffee	2.69	3.59	3.29	3.3
7	Tapioca	5.08	2.43	1.64	2.7
8	Banana	5.65	1.25	1.91	2.4
9	Cashew	3.47	3.43	1.74	1.5
10	Tea	1.55	1.42	1.3	1.2

Source: G. O. I. Directorate of Economics and Statistics. (Various years).

*Rubber Board, **Coffee Board, ***Tea Board

Among the plantation producing states, Kerala tops with 6054.79 thousand tonnes constituting 34 per cent of national output. The changes in the cropping pattern towards cash crops in Kerala pose a challenge not only to food security but also to the ecological sustainability of the State.

Table 3.10: Trends in the production of major crops in Kerala (Tonnes)

Sl. No.	Crop	1995-96	2000-01	2010-11	2017-18
1	Coconut (Million nuts)	5906	5496	5287	5230
2	Rubber	474555	579866	770580	540775
3	Rice	953026	7511328	522739	521310
4	Areca Nut (Million nuts)	17603	84527	99909	108516
5	Pepper	59934	47479	45267	37955
6	Coffee	42600	70550	65650	66465
7	Tapioca	2406036	2512154	2360081	2697319
8	Banana	351508	399785	483667	565829
9	Cashew	96778	62058	34752	25629
10	Tea	64794	69132	57107	62230

Source: G. O. I. Directorate of Economics and Statistics. (Various years).

*Rubber Board, **Coffee Board, ***Tea Board

Trend in the Production of major crops in Kerala during 1995-96 to 2017-18 is presented in Table 3.10. A decreasing trend in production is visible with respect to crops like Arecanut, Coffee, Tapioca and Banana while a downward trend in production is seen in crops like Coconut, Rubber, Rice, Pepper, Cashew and Tea. This indicates the slow progress of agriculture production in the state.

Trend in the yield of major crops in Kerala during 1995-96 to 2017-18 is presented in Table 3.11.

Table 3.11: Trends in the yield of major crops in Kerala (Kg/Ha)

Sl. No.	Crop	1995-96	2000-01	2010-11	2017-18
1	Coconut (Nuts/Ha)	6014	5870	6862	6878
2	Rubber*	1057	1222	1442	2757
3	Rice	2023	2162	2452	2757
4	Areca Nut (Nuts/Ha)	229	990	1001	1147
5	Pepper	314	238	263	446
6	Coffee**	517	833	773	782
7	Tapioca	20263	22595	32650	38427
8	Banana	14216	10173	8244	9111
9	Cashew	843	720	793	645
10	Tea***	1849	1876	1545	2060

Source: G. O. I. Directorate of Economics and Statistics. (Various years).

*Rubber Board, **Coffee Board, ***Tea Board

Let us now examine the performance of each of these crops to the world, country and state in terms of area, production and yield.

Coconut: India is the third largest coconut producing country in the world after Indonesia and Philippines. Products like activated carbon, dry coconut, virgin coconut oil, copra, desiccated coconut, tender coconut etc. have a great demand in the international market and a source of export earnings to the economy. Coconut cultivation boosts the growth of coir industry in Kerala. Coconut occupies the largest area of 29.5 per cent of the cultivated area of Kerala in 2017-18. The area under coconut cultivation in the state was tremendously declining over the past few decades from 27.1 per cent in 1990-91 to 25.7 per cent in 2000-01 to 25.22 per cent in 2010-11. But, due to the continuous efforts from the part of the Coconut Development Board, Kerala regained the top position among Indian states in 2017-18by contributing 37.23 per cent of coconut cultivation area of the country followed by Karnataka and Tamil Nadu.

Between 1995-96 and 2017-18, state's coconut production shows a decreasing trend from 5906 to 5230 million nuts (Coconut Development Board). But Kerala regained the status of largest coconut producing state with 31.72 per cent of the national coconut output. Kozhikode is the leading coconut producing district in 2016-17 with 17 per cent of the total coconut production in the state followed by Malappuram (16 per cent) and Kasaragod (12 per cent).

The decline in the area and production is not reflected in the per hectare yield of coconut from 6014 to 6878 nuts between 1995-96 and 2017-18. Even though Kerala was able to regain the top slot in the coconut cultivation and production, the state is far behind Andhra Pradesh (13759nuts/ha), Tamil Nadu (13423nut/ha) and Karnataka (9744 nuts/ha) with respect to per hectare yield. The decline in area, production and productivity is attributed to the poor quality of seedlings, presence of unproductive and senile palms, root wilt disease, high labour cost, decrease in the land for agricultural use etc. Thus, measures to be taken for scientific management practices to set nurseries for quality seedlings, eliminate diseased, senile and unproductive palms, proper distribution and replant of elite palms are required.

Rubber: India is sixth in production (5.3 per cent) and second in consumption (8.2 per cent) of natural rubber in the world in 2017. Rubber occupies the second largest area in the state with 551.1 thousand hectares in 2017-18 with an increasing trend from 407.8 thousand hectares in 1990-91 (Rubber Board). The area under rubber cultivation as a percentage of gross cropped area of the state was gradually increasing over the years from 16.22 to 21.4 per cent between 1990-91 and 2017-18. Kerala is the largest natural rubber cultivating and producing state with 67 per cent of national cultivated area and 78 per cent of national rubber output followed by Tripura and Karnataka.

The production of rubber showed an increasing trend from 474555 to 540775tonnesbetween 1995-96 and 2017-18. Kottayam district leads in the area and production of natural rubber followed by Ernakulam, Kollam and Pathanamthitta. The yield of rubber is 2757Kg/hectare in 2017-18 compared to 1057Kg/hectare in 1990-91. Rubber Board and Rubber Research Institute were set up to provide incentives to farmers and to improve the yield of natural rubber. The unexpected flood together with low rubber price adversely affected rubber output in recent years.

Rice: Rice, the major food crop of Kerala occupies only third position in area under cultivation with 194 thousand hectares of which 189.1 was wet land in 2017-18. Rice cultivating area of the state shows a declining trend over the past years from 16.08 per cent in 1990-91 to 11.21 per cent in 2000-01 to 8.8 per cent in 2010-11 and to 7.3 per cent in 2017-18. The same decreasing trend is visible in the production of rice from 953026 to 521310tonnesbetween1995-96and 2017-18.The productivity of rice increased from 2023 to 2757 Kg/hectare between1995-96 and2017-18 but less compared to other rice growing states as well as at the national level.

District-wise area, production and yield of rice show that Palatka has the largest area of rice cultivation followed by Alappuzha. Palakkad contributes the greatest share of 39.8 per cent to the total rice production of the state followed by Alappuzha (19.2 per cent) and Thrissur (11.5 per cent). Thrissur has the highest per hectare yield of rice followed by Malappuram. The area, production and productivity of rice is badly

affected by the climatic vagaries and it is urgent to take measures to promote rice cultivation by giving assistance to utilise the fallow land, upland and urban areas and encourage double crop instead of single crop through the extension of irrigation facilities. Agribusiness in rice products can give a boost to farmers to ensure market, fair price and reduce wastage.

Tapioca: Tapioca is a traditional healthy food of Kerala that plays a vital role to the food security of the state. Tapioca production in Kerala increased from 2406036 to 2697319 tonnes between 1995-96 and 2017-18. The state tops in the per hectare yield of tapioca with 38427Kg/ha compared to 20443Kg/ha at the national level. District-wise analysis of tapioca production during 2016-17 in Kerala shows that Thiruvananthapuram, Kollam, Kottayam and Idukki are the major districts of tapioca production. But the area of tapioca cultivation is showing a decreasing trend from 5.08 to 2.7 per cent of the gross cropped area of the state between 1990-91 and 2017-18. Reduction in demand and profitability can be the major reasons for the shift from tapioca cultivation.

Cardamom: India is the second largest producer and exporter of cardamom in the world after Guatemala. Kerala is the largest cardamom cultivating and producing state in India by occupying 47 per cent of national cardamom cultivating area and contributing 64 per cent of national cardamom output in 2017-18. The area of cardamom cultivation in the state accounts for 39.7 thousand hectares in 2017-18. Cardamom production in Kerala is only 18.4 thousand tonnes in 2017-18 compared to 24.24 thousand tonnes in 1992-93. The yield of cardamom in the state is high with 470Kg/ha compared to national yield of 343Kg/ha in 2017-18. The major cardamom producing areas of the state such as Udumbanchola, Peerumede and Devikulam are situated in the largest cardamom producing district of Idukki.

Pepper: India slips to fourth position in global black pepper production after Vietnam, Indonesia and Brazil and to fifth in global exports with the emergence of Sri Lanka in the fourth position in 2018. Kerala is the largest pepper cultivating and producing state in India by occupying 64 per cent of the area under all India cultivation and contributing 58 per cent to national production in 2017-18. But the area under pepper cultivation in the state is showing a declining trend from 8.1 to

3.3 per cent of the gross cropped area of the state between 1990-91 and 2017-18. Similar decreasing trend is visible in the production of black pepper in the state from 59934 to 37955tonnes between 1995-96 and 2017-18. Even though the per hectare yield of pepper in the state increased from 314 to 446 Kg/hectare between 1995-96 and 2017-18, compared to the yield at international level, the yield is low in the state. District-wise analysis of pepper production during 2016-17 in Kerala shows that Idukki leads with 54.97 per cent of the total pepper production in the state followed by Wayanad (12.14 per cent) and Kannur (7.18 per cent). Pepper rehabilitation programmes of the state has to be rejuvenated to develop new and existing pepper nurseries and gardens to for the expansion of pepper cultivating areas and pepper production in the state.

Areca Nut: India is the largest areca nut producing country in the world. Kerala is the second largest areca nut producing state after Karnataka with 108516tonnes of production in 2017-18 contributing 13 per cent of the national production compared to 46.8 thousand tonnes in 1990-91. The area under areca nut cultivation in the state shows an increasing trend from 1.98 to 3.7 per cent of the gross cropped area. The per hectare yield of areca nut in the state is 1147 Kg/ha in 2017-18 compared to 229 Kg/ha in 1995-96. Areca nut is grown almost in all the districts of Kerala and Malappuram tops in area and Kasaragod tops in production.

Cashew: India is the third largest producer of cashew in the world after Vietnam and Nigeria. It contributes 15 per cent to world cashew production in 2016. Cashew kernels from Kerala contribute to the export earnings of the country worth of Rs.2580 crores in 2017-18. Cultivation of cashew boosts the cashew industry of the state where large number of female workers is employed. Kerala occupies 92.8 thousand hectares of cashew 2017-18 which accounts for 8.7 per cent share in the national cashew cultivation area. Between 1990-91 and 2017-18 the area of cashew cultivation reduced from 3.47 to 1.5 per cent of the gross cropped area of the state. Kerala is slipped to fourth position in cashew production by contributing 10.8 per cent of the national cashew output of25629 tones in 2017-18 compared to 96778tonnes in 1995-96. The yield of cashew in the state shows a decreasing trend from 843 to 645 Kg/Hectare between 1995-96 and 2017-18. The simultaneous

decline in area, production and yield of cashew in the state over the past three decades is a serious issue and measures to be taken to promote cashew cultivation.

Coffee: India is the seventh largest coffee producing country in the world. Kerala contributes 13.7 per cent of coffee exports from India. Kerala is the second largest coffee producing state in India after Karnataka contributing 21 per cent of national coffee production in 2017-18. The area under coffee cultivation as a percentage of gross cropped area of the state was gradually increasing over the years from 2.69 to 3.3 per cent between 1990-91 and 2017-18. The area under coffee cultivation increased from 75.05 to 85.1 thousand hectares between 1990-91 and 2017-18. Coffee production in the state shows a n increasing trend over the years from 42600 to 66465tonnes between 1995-96 and 2017-18. The yield of coffee in Kerala is 782Kg/hectare in 2017-18 which is lower than Karnataka. Coffee is largely grown in Wayanad, Travancore and Nelliyampathi in Palakkad which is distributed across 77475 small holdings and above 44 thousand people are employed in these plantations.

Tea: India is the second largest producer of tea in the world after China and the largest consumer of tea in the world by consuming 80 per cent of the domestic production. India occupies fourth position in the exports of tea contributing 7.5 per cent of total world tea exports in 2017. Kerala is the fourth largest producer of tea in India after Assam, West Bengal and Tamil Nadu. The area under tea cultivation as a percentage of gross cropped area of the state was gradually declining over the years from 1.55 to 1.2 per cent between 1990-91 and 2017-18. Tea Production in Kerala decreased to 62230tonnes in 2017-18 compared to 64794tonnes in 1995-96. The yield per hectare of tea is 2060Kg/ha in 2017-18 which was 1849Kg/ha in 1995-96. The challenges faced by tea industry are labour shortage, high cost of production and inadequate machinery.

These broad trends in the growth performance of various crops of the state are directly or indirectly linked to a series of related issues. Growth rate in area under different crops is not compensated by changes in population growth. The influence of technological advancement on crop-wise yield is confined only to cash crops. These changes are reasonable and in tune with the state's strategy of export

led growth. But a disproportionate growth in cash crops without an adequate base of food crops increase the dependency of Kerala on other states and countries which retard the sustainable development of the economy. To keep the prominent role of agriculture in the economy agriculture productivity is to be enhanced through greater investments and the application of modern technology. This necessitates the need for agribusiness in value added and processed agriculture products which will be clear from the forthcoming discussions.

As mentioned in the previous sections, Kerala agriculture underwent structural changes and the prospects of agriculture mainly depend on secondary agriculture which is currently at a low rate. Hence, this study is an attempt to examine the feasibility of agribusiness in Kerala with a special reference to processing and value addition.

3.4 FEASIBILITY OF AGRIBUSINESS IN RICE PRODUCTS

From the above discussion it is very clear that agribusiness can give a further boost to the growth of the crop sector of Kerala. Rice is the staple food of Keralites and with the emergence of nuclear family system, high literacy, increase in the number employed women and urbanisation, the demand for nutritious processed and value-added rice products increased along with raw rice. Contrary to this, the changing cropping pattern of Kerala towards cash crops reduced the importance of rice with respect to area, production and yield. Growing rice profitably becomes difficult for farmers of Kerala with small land size, high production and harvesting cost, moderate yield and low market price. The reduction in paddy fields has an adverse impact on economic and ecological sustainability, water conservation and food security.

Demand supply gap exists in rice since Kerala needs over 4 million tonnes of rice a year compared to 0.56 million tonnes it produces today (2018-19). The gap is filled by subsidised rice grains from Centre and the rest from other states. Hence, Kerala must have a critical minimum grain production in the wake of possible blockage of free grain flow from other states due to natural calamities like flood (K.P. Kannan). The ongoing Covid-19 pandemic also compels the state to increase the production of rice to ensure the long-term supply of this staple food. As a long-

term policy, production of rice is to be boosted and the earlier discussions reveal that growth of agribusiness in rice products can stimulate rice cultivation. Emerging agribusiness creates greater demand, offer higher price to farmers, reduce post and pre-harvest losses, create employment opportunities and export potential through the optimal utilisation of untapped paddy resource potential. Thus, present study explores the investment opportunities, technical and financial feasibilities of agribusiness in rice products of Kerala.

Agribusiness in Rice Products: A variety of traditional and modern healthy and tasty processed rice products are available in the retail, wholesale, super markets and Malls of Kerala to meet the diversified requirements of different generations. They include ready to use, ready to cook and ready to fry products like raw rice, boiled rice, biriyani rice, sooji and rava, roasted rice powder, avalose, red and white aval, broken rice, rice powder to make traditional dishes like puttu, pathiri, palappam, velleppam, vateppam, idli, dosa, canned products like rice bran oil, baby food, rice-milk pudding, noodles, soup, etc. These products have greater demand due to traditional touch, greater shelf-life, simple and easy to cook, healthy and tasty and easily transportable to longer distances. Thus, present study develops a micro model rice unit that produces three selected processed rice products based on data collected from the Base rice Unit located in Thrissur district of Kerala state.

Model Rice Unit: The Model Rice Unit produces Steamed Puttu Podi, Avalose Podi and Idli/Dosa Podi. The initial investment, quantity and cost of raw materials, labour, packaging and processing materials, annual fixed cost, volume of production and sales, selling price etc. are computed based on the data collected from the experimental Base Rice Unit located in Thrissur District.

Assumptions: Valid and reasonable assumptions on the technical parameters of the Model Rice Unit is made after face-to-face discussions with owners, technicians, teachers, researchers, input suppliers, entrepreneurs, office staff in retail outlets and other experts related to the Base Rice Unit. Following are the basic assumptions on which the Model Rice Unit is constructed.

1. The Model Rice Unit requires an initial investment of Rs. 4, 34,100 which is equally divided among the three products to calculate product-wise cash flow which is a major limitation of the study.
2. Feasibility of the Unit is assessed by considering the cash flow for 3 years.
3. The annual production of the Unit consists 7168Kg Steamed Puttu Podi, 2560Kg Avalose Podi and 3072Kg Idli /Dosa Podi.
4. The discount rate of 11 per cent is based on the interest rate charged by bankers.
5. The annual fixed cost of Rs.54, 000 is the rent for land and building which is equally divided among the three products to calculate product-wise cash flow.
6. Study analysis is based on average values of the variables in the initial year.
7. Wastage during production process is assumed to be zero.
8. Excluded the commission/tax in sales price.
9. Annual average sale is assumed to be 100 per cent and marketing is done through direct sales outlets.
10. Annual average working days are taken as 256 days i.e., 70 per cent of 365 days.
11. Shelf life of each final product is assumed to be constant throughout the year.
12. Annual average depreciation rate of equipment, building and vessels is kept as constant.
13. The risk of the Unit is evaluated by incorporating the possible changes in the values of key variables under different pessimistic and optimistic scenarios.

Initial Investment: The Model Rice Unit is established with an initial investment of Rs.4, 34,100 (Table 3.12) to produce steamed puttu podi, avalose podi and idli/dosa podi. It is equally divided as Rs. 144700 among the three products to calculate the product-wise initial investment for cash flow analysis.

The Model Rice Unit equipment like Double Stage Rice Pulveriser, Automatic Roasting Machine, Rice Steamer Machine, Rice Boiler, Rice Mixing Machine, Shifter, Stainless Steel Commercial Two Burner Cooking and gas cylinders together constitute 60 per cent share in the initial investment.

The share of stainless-steel tables, utensils, rent on land and building, repair work for building, equipment and vessels etc. is 40 per cent. The initial investment is financed through Mudra loans from banking institutions.

Table 3.12: Initial Investment of Model Rice Unit (2016-17 prices)

Sl. No	Particulars	Quantity (No)	Rate (Rs)	Cost (Rs)	%
1	Advance for land and building		30,000	30,000	6.9
2	Stainless Steel Tables	2	20000	40000	9.2
3	Cooking Vessels (Set 1)		75,000	75,000	17.3
4	Double Stage Rice Pulveriser	1	50,000	50000	11.5
5	Automatic Roasting Machine	1	38,000	38000	8.8
6	Rice Steamer Machine	1	19,500	19500	4.5
7	Rice Boiler	1	18,000	18000	4.1
8	Rice Mixing Machine	1	25,000	25000	5.8
9	Shifter	1	20,000	20000	4.6
10	Stainless Steel Commercial Two Burner Cooking Range	1	10000	10000	2.3
11	Gas Cylinders	3	1200	3600	0.8
12	Heavy Duty Continuous Band Sealer for Packets	1	25000	25000	5.8
13	Labelling Machine	1	50000	50000	11.5
14	Others (Unexpected Repair, Maintenance etc.)	1	30000	30000	6.9
Total				434100	100.00

Source: Data compiled from the Base Rice Unit

Financing of Initial Investment: Initial investment is financed through a bank loan with a principal amount of Rs.4, 34,100 for a tenure of 3 years. The rate of interest is 10.65 per cent including the moratorium for 6 months. The total interest paid during the moratorium period is Rs.23115/- with a monthly break up of Rs.3853/-. The total interest payable over the loan term is Rs.85379/- with an annual break up of 52 per cent, 35 per cent and 13 per cent respectively in three years (Table 3.13).

Table 3.13: Loan (Rs.) Repayment Schedule of Initial Investment

Year	EMI	%	Interest	%	Principal	%
1	122387	24	44521	52	77867	18
2	198546	38	29864	35	168683	39
3	198546	38	10995	13	187551	43
Total	519479	100	85379	100	434100	100

Source: State Bank of India

The principal is paid with an annual break up of 18 per cent, 39 per cent and 43 per cent respectively in three years. The total Equated Monthly Instalment (EMI) payments including the principal and interest made over the loan term is Rs.5, 19,479/- with an annual break up of 24 per cent, 38 per cent and 38 per cent respectively in three years.

Results of Cash Flow Analysis: The cash flow analysis shows the profitability of the Model Rice Unit based on the cash flows in the initial year (Table 3.14)

Table 3.14: Result Summary of Cash Flows (Rs.) of Model Rice Unit

Variables	Steamed Puttu Podi	Avalose Podi	Idli/Dosa Podi	Rice Unit
Initial Investment (Rs)	144700	144700	144700	434100
Volume (Kg/year)	7168	2560	3072	
Unit Selling Price (Rs/Kg)	52	111	102	
Unit Variable Cost (Rs/Kg)	38	72	58	
Annual Fixed Cost (Rs)	18000	18000	18000	54000
Discount Rate (%)	11	11	11	11
Cash Outflow (Rs)	290384	202320	196176	688880
Cash Inflow (Rs)	372736	284160	313344	970240
Net Cash Flow (NCF) (Rs)	82352	81840	117168	281360

Source: Primary Data

The Unit has an average operating profit of Rs.2,81,360 in 3 years contributed by Rs.117168 (41.6 per cent) from Idli/Dosa Podi, Rs. 82352 (29.3 per cent) from Steamed Puttu Podi, and Rs.81840 (29.1 per cent) from Avalose Podi. The per unit contribution margin of the products are calculated by taking the difference between unit sales price and unit variable cost. Idli/Dosa Podi has the highest margin of Rs.44 followed by Avalose Podi with Rs.39 and the lowest of Rs.14 for Steamed Puttu Podi. Thus, an increase in the volume of Idli/Dosa Podi with the highest contribution margin ratio (ratio of contribution margin to sales price) of 43 per cent is a good choice to increase the operating profit of the Model Rice Unit compared to Avalose Podi (35 per cent) and Steamed Puttu Podi (27 per cent) with lowest margin ratio.

The favourable cash flows indicate the ability and flexibility for product expansion through operating profits in the rice processing units in Kerala. The lockdown restrictions will minimise the dependence on other states for food articles in the post-Covid phase of Kerala economy. This will offer opportunities for agribusiness and agri-entrepreneurship in the staple rice products with longer shelf life. The Confederation of Indian industry (CII) predicted that food retail may occupy 70 per cent of the total retail market in the post-Covid period with a huge demand for ready-to-eat and ready-to-cook products.

3.5 FINANCIAL FEASIBILITY ANALYSIS

The financial feasibility is evaluated by considering the expected return from the Model Rice Unit for a period of 3 years using the Net Present Value (NPV), Benefit Cost Ratio (BCR) and Payback Period.

Results and Interpretation of NPV Analysis: The NPV analysis proves that the Model Rice Unit has an NPV of Rs.2, 53,464 in 3 years contributed by Rs.141625 (55.9 per cent) from Idli/Dosa Podi, Rs.56545 (22.3 per cent) from Steamed Puttu Podi and Rs.55294 (21.8 per cent) from Avalose Podi (Table 3.15).

Among the three products of the Model Rice Unit, Idli/Dosa Podi with highest NPV is the most profitable product followed by Steamed Puttu Podi and Avalose Podi is least profitable. The favourable expected return of the Model Rice Unit shows the financial viability of agribusiness investment in Rice products.

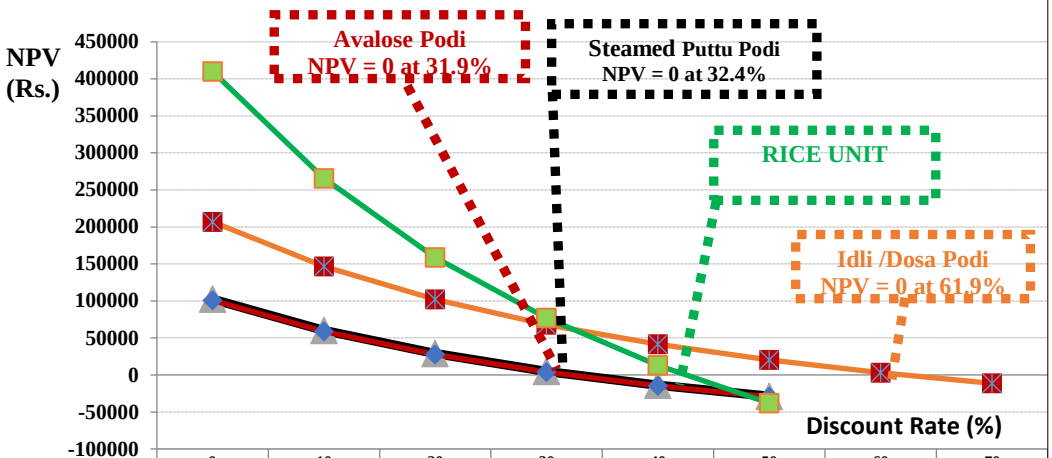
Table 3.15: Result Summary of NPV (Rs.) Calculation of Model Rice Unit

Items	$C_1/(1+r)^1$	$C_2/(1+r)^2$	$C_3/(1+r)^3$	C_0	NPV (Rs)
Steamed Puttu Podi	74191	66839	60215	144700	56545
Avalose Podi	73730	66423	59541	144700	55294
Idli/Dosa Podi	105557	95096	85672	144700	141625
Model Rice Unit	253477	228358	205728	434100	253464

Source: Primary Data

Inverse relationship between discount rate and NPV of each product and Model Rice Unit is illustrated in Graph3.16.

GRAPH 3.16: RELATION BETWEEN NPV & DISCOUNT RATE

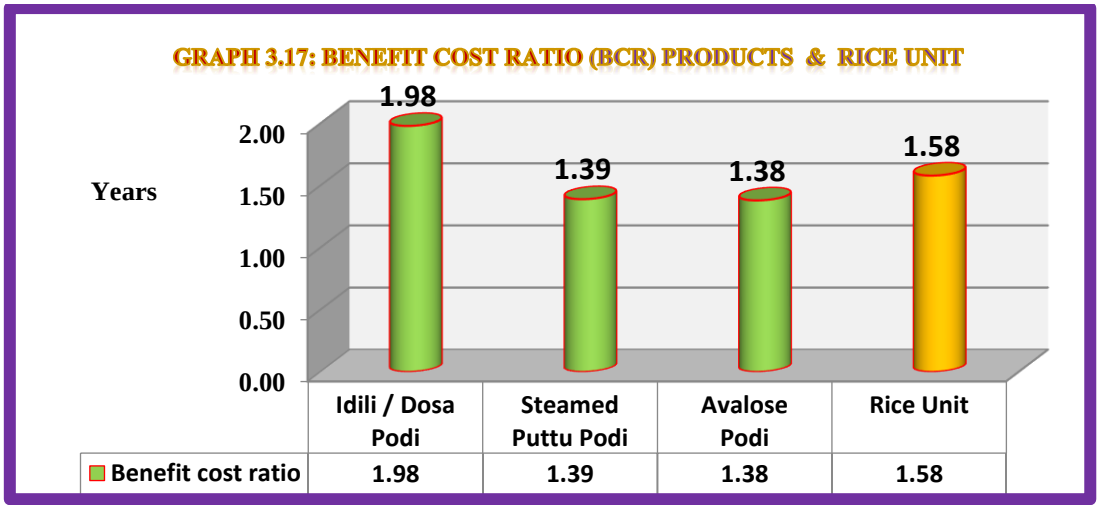


	0	10	20	30	40	50	60	70
Steamed Puttu Podi	102356	60097.23516	28772.96296	4860.527993	-13849.15452	-28797.18519		
Avalose Podi	100820	58823.96694	27694.44444	3930.678198	-14662.68222	-29517.77778		
Idili / Dosa Podi	206804	146679.4741	102112.2222	68090.31406	41470.72886	20203.11111	2904.21875	-11386.52147
Rice Unit	409980	265601	158580	76882	12959	-38112		

Source: Primary Data

The production of Avalose Podi and Steamed Puttu Podi is not profitable (NPV = 0) at a discount rate of 31.9 per cent and 32.4 per cent respectively. Idli/Dosa Podi is the most successful product since it is not profitable only at a higher discount rate of 61.9 per cent. The Model Rice Unit is not profitable at a discount rate 42.3 per cent. The summary of NPV study results prove that processing in rice products is a financially viable and promising investment venture in Kerala. The micro, small and medium enterprises (MSME) are one of the sectors which have been badly affected by the Covid-19 pandemic due to the restrictions on the movement of goods as a result of the lockdown restrictions. In the post Covid-19 phase of Kerala economy, MSMEs in rice products can be an alternative agri-entrepreneurship opportunity with location specificity and market-oriented production strategies.

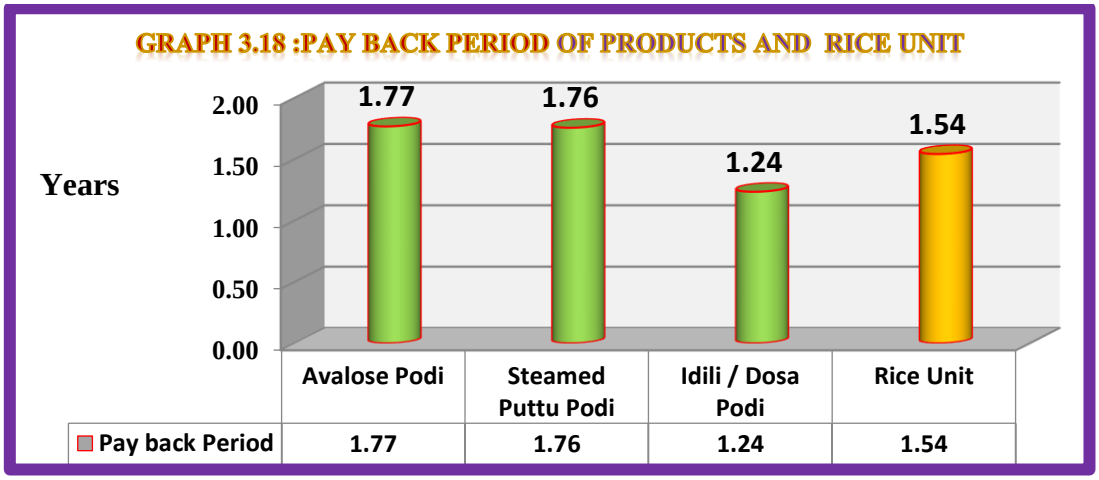
Results and Interpretation of Benefit Cost Ratio (BCR) Analysis: The BCR analysis illustrated in Graph 3.17 shows the profitability index of each product as well as the Model Rice Unit as a whole. The BCR of Model Rice Unit is 1.58 per cent contributed by Idli / Dosa Podi with the highest ratio of 1.98 per cent followed by Steamed Puttu Podi (1.39 per cent) and Avalose Podi (1.38 per cent).



Source: Primary Data

BCR result summary indicates that investment in rice processing is financially viable with a high entrepreneurial potential especially in the rural areas of Kerala. The ongoing Covid-19 pandemic adversely affected the rice cultivation in Kerala due to the shortage of labour, transportation and marketing bottlenecks. Thus, in the post Covid-19 phase, we must work hard to limit the long-lasting damages of the pandemic on food security, nutrition and livelihood by promoting innovative agribusiness in rice products by optimally utilizing the marketable surplus.

Results and Interpretation of Payback Period Analysis: The Payback period analysis illustrated in Graph 3.18 shows the time taken to recover the initial investment by each product and the Model Rice Unit. The Model Rice Unit is able to recover its initial investment of Rs.4, 34,100 within 1.54 years.



Source: Primary Data

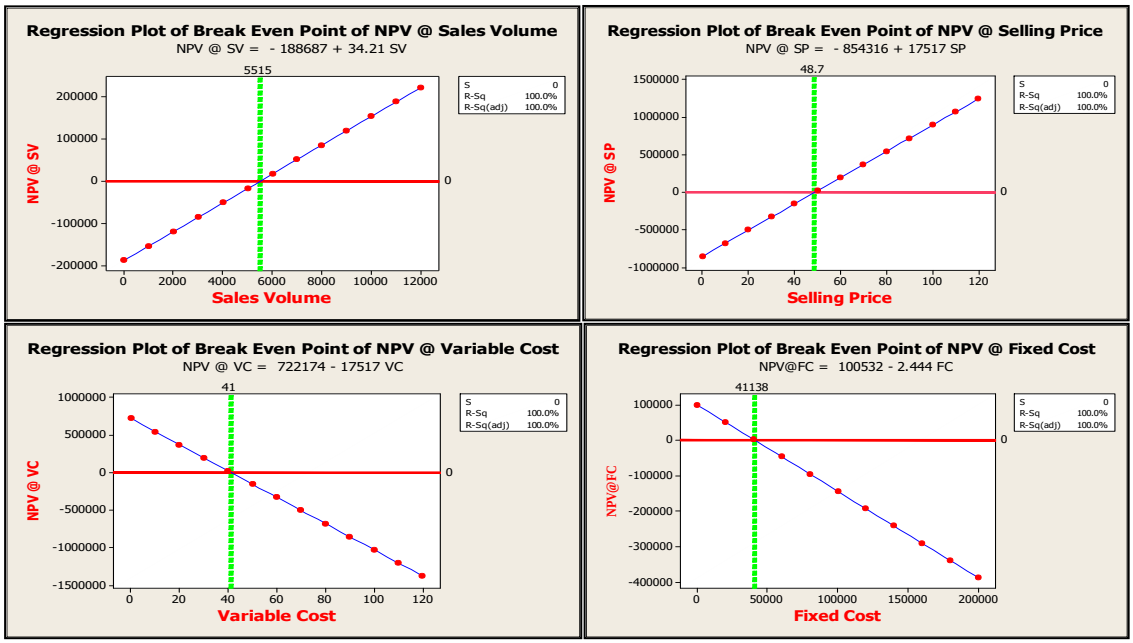
Among the products Idli/Dosa Podi performs best with a recovery period of 1.24 years followed by Steamed Puttu Podi (1.76 years) and Avalose Podi (1.77 years).

The Payback period result summary proves that the environment for starting agribusiness in rice products in Kerala is favourable due to the short time to recover the initial investment. Emerging agribusiness and Agri-entrepreneurship can also provide opportunities for livelihood to the unemployed reverse migrants with the investment support assured by the government and can avoid an escalation of the pandemic from a health crisis to food crisis (FAO).

The financial feasibility analysis presented in the previous section is based on the values of variables with certainty. But, in reality, we know that Model Rice Unit's cash flows are uncertain due to fluctuations in input/output prices, fixed /variable costs, volume of production/sales etc. Therefore, the risk analysis of the Model Rice Unit can be done using the Break-even, Sensitivity and Scenario methods of analyses.

DCF Break-even Analysis: A linear Regression Model study has been conducted for Steamed Puttu Podi as shown in Graph 3.19.

Graph 3.19: Fitted Line Plot Regression Model for Break-even (Steamed Puttu Podi)



Source: Primary Data

It estimates the DCF Break-even point of NPV with respect to variables like sales volume (SV), selling price (SP), variable cost (VC) and fixed cost (FC). Rationale behind this study is to estimate the regression line intersection point with X axis, which is the break-even point of the corresponding variable. Similar study has been conducted for all products and the break-even point of each product's volume, unit selling price, unit variable cost and annual fixed cost are summarised in Table 3.16.

Results and Interpretation of DCF Break-even Analysis: The results of DCF Break-even analysis shows how many units to be sold at what price and at what cost to break-even of each product. The Break-even volume for Steamed Puttu Podi is 23.06 per cent (1653Kg/year) less than the Base Case volume. Similar reduction in Base Case volume possible for Break-even of Idli / Dosa Podi and Avalose Podi are 42.87 per cent (1317Kg) and 22.65 per cent (580Kg) respectively.

Table 3.16: Result Summary of DCF Break-even (Rs.) of Model Rice Unit

Variables	Steamed Puttu Podi		Avalose Podi		Idli / Dosa Podi	
	Base Case	Break-even	Base Case	Break-even	Base Case	Break-even
Volume (Kg)	7168	5515	2560	1980	3072	1755
Unit Selling Price (Rs/Kg)	52	49	111	102	102	83
Unit Variable Cost (Rs/Kg)	38	41	72	81	58	77
Annual Fixed Cost (Rs)	18000	41138	18000	40627	18000	75955

Source: Primary Data

The break-even unit selling price for Idli / Dosa Podi falls at 18.62 per cent (Rs.19) less than the Base Case selling price. Similarly, the Break-even price for Avalose Podi and Steamed Puttu Podi are 8.1 per cent (Rs.9) and 6.3 per cent (Rs.3) less than the Base Case respectively. The production will turn away from profit only if its unit variable cost increases by 32.7 per cent (Rs.19) for Idli / Dosa Podi, 12.5 per cent (Rs.9) for Avalose Podi and 7.8 per cent for (Rs.3) for steamed Puttu Podi than the Base Case. The production will turn away from profit if its annual fixed cost increases by 321.9 per cent (Rs.57955) for Idli / Dosa Podi, 128.54 per cent

(Rs.23138) for Steamed Puttu Podi and 125.71 per cent (Rs.22627) for Avalose Podi than the Base Case.

DCF Break-even analysis result summary reveals that agribusiness in rice products is a financially feasible venture in Kerala since the break-even volume and selling price of each product is much lower and the break-even variable and fixed cost is much higher in the Model Rice Unit than the Base Case. Thus, agribusiness in rice products can mitigate the long-term impact of Covid-19 pandemic on nutritional food security and by contributing to income and employment in the rural areas of Kerala.

Sensitivity Analysis: The study makes use of sensitivity analysis to measure the risk and uncertainty of investment in the Model Rice Unit. The analysis helps to make desirable changes in investment decisions due to changes in the key variables independently.

Results and Interpretation of Sensitivity Analysis for Idli/Dosa Podi: Table 3.17 shows the sensitivity analysis for Idli/Dosa Podi.

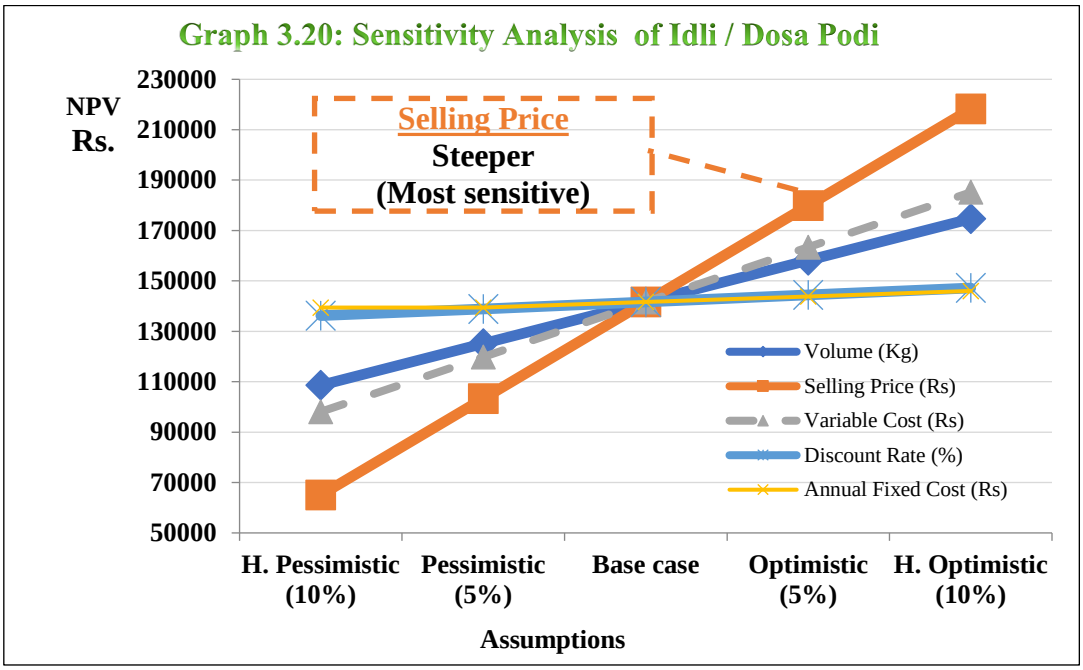
Table 3.17: Sensitivity Analysis for Idli/Dosa Podi

Changing Variables	H. Pessimistic Assumptions	Pessimistic Assumptions	Base Case Assumptions	Optimistic Assumptions	H. Optimistic Assumptions	% Change
Volume (Kg)	2764.8	2918.4	3072	3225.6	3379.2	5
NPV (Rs)	108594	125110	141625	158141	174656	12
Selling Price (Rs)	91.8	96.9	102	107.1	112.2	5
NPV (Rs)	65053	103339	141625	179911	218198	27
Variable Cost (Rs)	63.8	60.9	58	55.1	52.2	5
NPV (Rs)	98084	119855	141625	163396	185166	-15
Discount Rate (%)	12.1	11.55	11	10.45	9.9	5
NPV (Rs)	136235	138908	141625	144386	147193	-2
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200	5
NPV (Rs)	139426	139426	141625	143825	146024	-2

Source: Primary Data

For every 5 per cent change in volume and selling price from the Base Case, NPV response is 12 per cent and 27 per cent respectively. Sensitivity of 5 per cent change in Variable cost, discount rate and annual fixed cost results in -15 per cent,

-2 per cent and -2 per cent change in respective NPVs. Sensitivity of Idli / Dosa Podi is illustrated in Graph 3.20 with respect to the slope of the curve. Steeper the slope more sensitive are the variables to NPV and flatter the slope less sensitive are the variables to NPV. Selling price is the most sensitive variable for Idli / Dosa Podi followed by variable cost and volume.



Source: Primary Data

Results and Interpretation of Sensitivity Analysis for Avalose Podi: Sensitivity analysis for Avalose Podi is illustrated in Table 3.18.

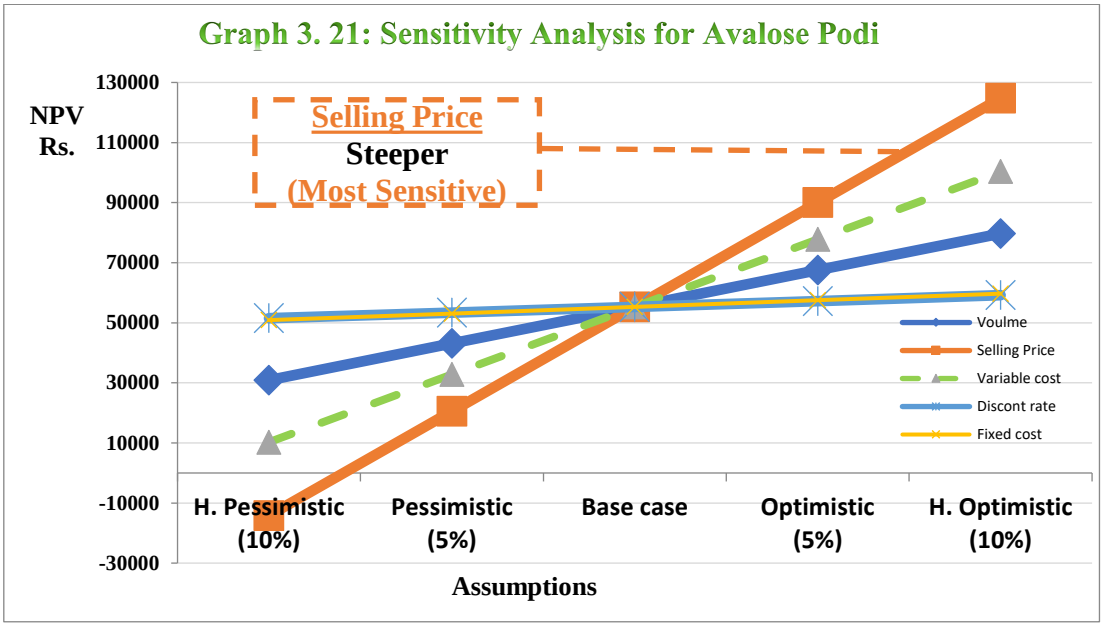
Table 3.18: Sensitivity Analysis for Avalose Podi

Changing Variables	H. Pessimistic Assumptions	Pessimistic Assumptions	Base Case Assumptions	Optimistic Assumptions	H. Optimistic Assumptions	% Change
Volume (Kg)	2304	2432	2560	2688	2816	5
NPV (Rs)	30896	43095	55,294	67493	79692	22
Selling Price (Rs)	99.9	105.45	111	116.55	122.1	5
NPV (Rs)	-14147	20573	55,294	90014	124734	63
Variable Cost (Rs)	79.2	75.6	72	68.4	64.8	5
NPV (Rs)	10251	32772	55,294	77815	100336	-41
Discount Rate (%)	12.10	11.55	11	10.45	9.90	5
NPV (Rs)	51529	53396	55,294	57222	59183	-3
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200	5
NPV (Rs)	50895	53094	55,294	57493	59692	-4

Source: Primary Data

For every 5 per cent change in volume and selling price from the Base Case, NPV change is 22 per cent and 63 per cent respectively. The Sensitivity of 5 per cent change in variable cost, discount rate and annual fixed cost from the Base Case results in a change of -41 per cent, -3 per cent and -4 per cent respectively in NPV.

The Sensitivity Graph 3.21 for Avalose Podi shows that Selling price is the most sensitive variable followed by variable cost and volume.



Source: Primary Data

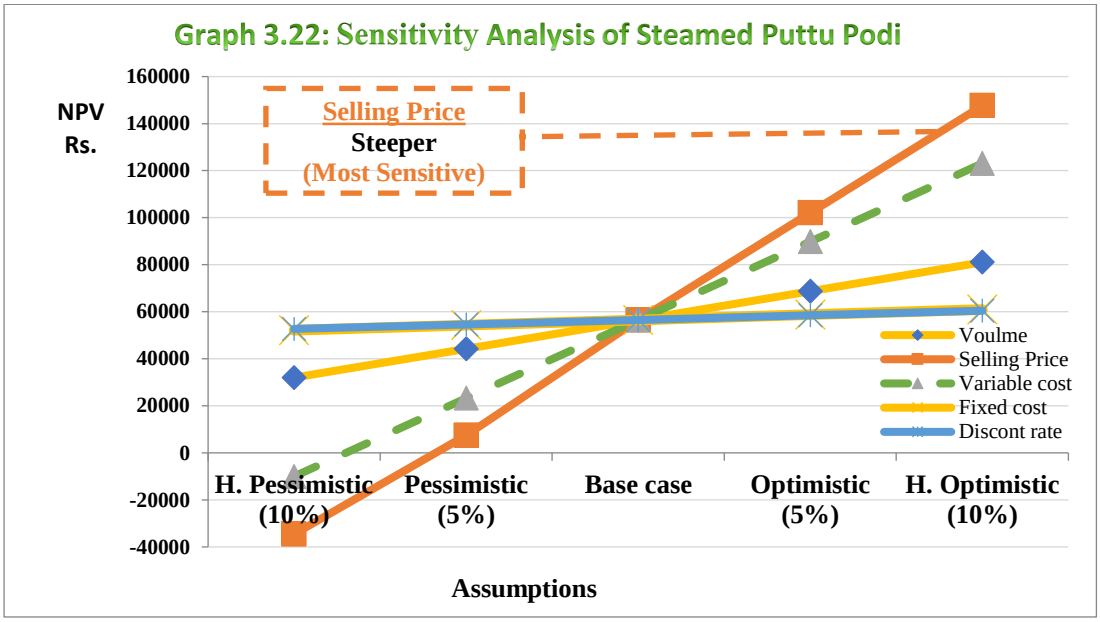
Results and Interpretation of Sensitivity Analysis for Steamed Puttu Podi: Sensitivity analysis for Steamed Puttu Podi is shown in Table 3.19.

Table 3.19: Sensitivity Analysis of Steamed Puttu Podi

Changing Variables	H. Pessimistic Assumptions	Pessimistic Assumptions	Base Case Assumptions	Optimistic Assumptions	H. Optimistic Assumptions	% Change
Volume (Kg)	6451	6810	7168	7526	7885	5
NPV (Rs)	32015	44297	56545	68793	81075	22
Selling Price (Rs)	46.8	49.4	52	54.6	57.2	5
NPV (Rs)	-34541	7498	56545	102088	147631	87
Variable Cost (Rs)	41.8	39.9	38	36.1	34.2	5
NPV (Rs)	-10018	23263	56545	89826	123108	-59
Discount Rate (%)	12.10	11.55	11	10.45	9.90	5
NPV (Rs)	52722	54635	56545	58486	60458	-3
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200	5
NPV (Rs)	52146	54345	56545	58744	60943	-4

Source: Primary Data

For every 5 per cent change in volume and selling price from the Base Case, NPV change is 22 per cent and 87 per cent respectively. The Sensitivity of 5 per cent change in variable cost, discount rate and annual fixed cost from the Base Case results in a change of -59 per cent, -3 per cent and -4 per cent respectively in NPV. The Sensitivity Graph 3.22 for Steamed Puttu Podi shows that Selling price is the most sensitive variable followed by variable cost and volume.



Source: Primary Data

To summarise, the sensitivity analysis shows that rice processing units in Kerala are more sensitive to selling price and variable cost which are mostly decided by the market forces. Almost more than 50 per cent of the cost of producing rice is for the wages given to hired human labour (Department of Economics and Statistics, 2019). The sensitivity analysis of the Model Rice Unit proves that in spite of the high sensitivity to price and cost, the unit is making profits and the state has promising opportunities in agribusiness in ready to cook and ready to eat rice products especially in the post Covid-19 phase of Kerala economy.

Scenario Analysis: "Scenario Manager" in "What-If-Analysis" is used in the study to measure the risk and uncertainty of investment and to make desirable changes in investment decisions in the Model Rice unit due to changes in the key variables in combination under different scenarios.

Results and Interpretation of Scenario Analysis: Scenario summary of Idli / Dosa Podi is illustrated under five different scenarios in Table 3.20.

Table 3.20: Scenario Summary of Idli / Dosa Podi

Changing Variables	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario
Volume (Kg)	2764.8	2918.4	3072	3225.6	3379.2
Selling Price (Rs)	91.8	96.9	102	107.1	112.2
Variable Cost (Rs)	63.8	60.9	58	55.1	52.2
Discount Rate (%)	12.10	11.55	11	10.45	9.90
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Result - NPV (Rs)	**-6,557**	**63,858**	**1,41,625**	**2,26,950**	**3,20,045**

Source: Primary Data

The Base Case scenario NPV of around Rs.1.41 lakhs range between a profit of Rs.63.8 thousand under pessimistic and Rs.3.2 lakhs under highly optimistic scenario. Under highly pessimistic scenario, the product will incur a loss of Rs.6557.

Scenario summary of Avalose Podi is shown in Table 3.21. The Base Case scenario NPV of around Rs.55 thousand declines to a loss of Rs.14 and Rs.77 thousands under pessimistic and highly pessimistic scenarios respectively.

Table 3.21: Scenario Summary of Avalose Podi

Changing Variables	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario
Volume (Kg)	2304	2432	2560	2688	2816
Selling Price (Rs)	99.9	105.45	111	116.55	122.1
Variable Cost (Rs)	79.2	75.6	72	68.4	64.8
Discount Rate (%)	12.10	11.55	11	10.45	9.90
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Result - NPV (Rs)	**-77,821**	**-14,729**	**55,294**	**1,32,443**	**2,16,920**

Source: Primary Data

But the product is highly profitable under optimistic (Rs.1.32 lakhs) and highly optimistic (Rs.2.17 lakhs) scenarios. Scenario summary of Steamed Puttu Podi in Table 3.22 shows that the Base Case scenario NPV of around Rs.56.54

thousand moves to a loss of Rs.33.86 thousand and 1.148 lakhs under pessimistic and highly pessimistic scenarios respectively.

Table 3.22: Scenario Summary of Steamed Puttu Podi

Changing Variables	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario
Volume (Kg)	6451.2	6809.6	7168	7526.4	7884.8
Selling Price (Rs)	46.8	49.4	52	54.6	57.2
Variable Cost (Rs)	41.8	39.9	38	36.1	34.2
Discount Rate (%)	12.10	11.55	11.00	10.45	9.90
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Result - NPV (Rs)	**-1,14,834**	**-33,861**	**56,545**	**1,56,650**	**2,66,729**

Source: Primary Data

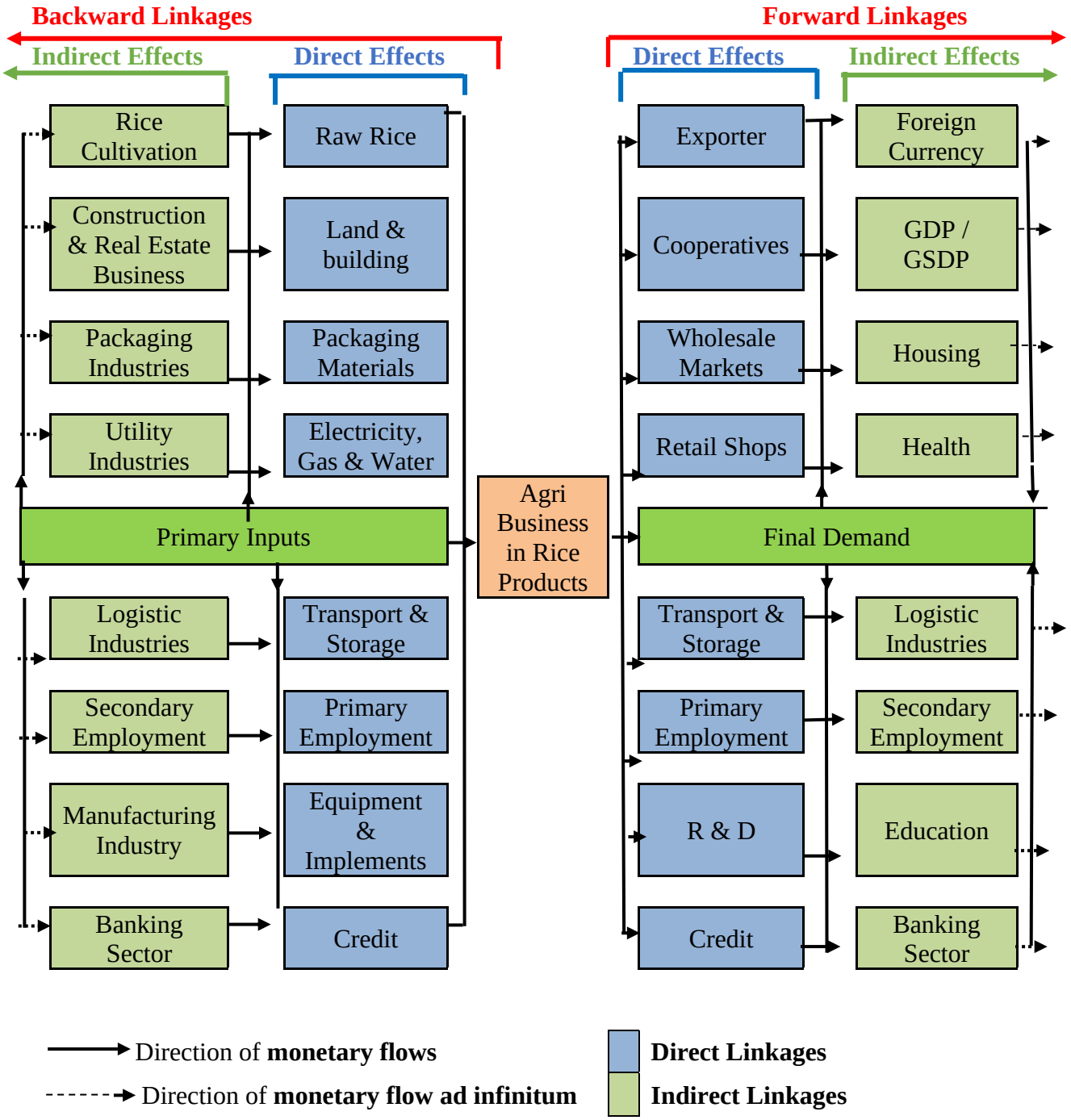
Scenario analysis assesses the risk of simultaneous changes in variables influencing the profitability under different scenarios and the study result found that production of Idli / Dosa Podi is profitable even under highly pessimistic scenario but Avalose Podi and Steamed Puttu Podi is not profitable under pessimistic and highly pessimistic scenarios. People of Kerala belonging to different parts of the world has an affinity towards traditional Kerala food which creates greater domestic as well as international demand for ready to cook and ready to eat rice products. Thus, there exists tremendous opportunity for profitable agribusiness in rice products.

3.6 LINKAGE EFFECTS OF AGRIBUSINESS IN RICE

Hirschman (1969) calls the industries with greatest linkages as 'leading sectors' and opined that investment in an economy should be focussed on such sectors to achieve economic development. Now the question arises, whether the crop sector agribusiness of Kerala is a leading sector? The analysis and discussions in the previous chapter on the performance of agriculture and allied sectors prove that crop sector plays a vital role in the economic development of Kerala in terms of nutritious food security, income, employment and export earnings. Khan (1931) argues that increased investment in crop sector agribusiness creates multiplier effect on employment directly and indirectly through its backward and forward linkages.

Thus, emerging opportunities of agribusiness in the post-Covid 19 phase of Kerala economy open up a discussion on its backward and forward linkages through the Flow Chart3.1.

Flow Chart 3.1: Agribusiness Linkages of Model Rice Unit



Direct and Indirect Backward Linkage Effects of Crop Sector Agribusiness: Agribusiness in rice products can develop direct and indirect backward linkage

effects on the primary and secondary production and supply of inputs. Let us discuss the major backward linkages.

Demand for land and building: Starting of an agribusiness rice unit has a direct backward linkage effect on the demand for land and building. The search for land by agri-entrepreneurs directly increases the rental price of land and indirectly gives a boost to real estate business. To reduce the long-term impact of Covid pandemic on food security, young entrepreneurs can be encouraged to take rent on land that is not used for cultivation. This suggestion is frequently been debated in the discussions on the post-Covid Agricultural Policy of Kerala through various workshops and webinars in 2020. Similarly, policy suggests the promotion of agribusiness start-ups which in turn increase the demand for buildings and indirectly give a boost to the construction sector.

Growth of Banking Sector: Agri-entrepreneurs approach the banking institutions for credit which indirectly enhances the credit creation capacity of banking institutions. The Model Rice Unit requires an initial investment of Rs. 4, 34,100 which is financed through the bank loans for tenure of 3 years. MUDRA (Micro Units Development & Refinance Agency) loans up to 5 lakhs are available from Commercial Banks, Regional Rural Banks, Small Finance Banks and Non-Banking Financial Companies (NBFCs) with a rate of interest of around 11 per cent including a moratorium for 6 months.

Central Government launched Pradhan Mantri MUDRA Yojana (PMMY) on April 8, 2015 to provide loans to non-farm non-corporate small/micro enterprises. MUDRA loans under the category of "SHISHU" give loans up to Rs50, 000 for start-ups and new entrepreneurs. "KISHORE" scheme provides loan from Rs.50, 000 to 5 laths to already existing entrepreneurs. Finally, under "TARUN" scheme, Rs.5 to 10 laths is provided as loan to expand the existing business. Hence, MUDRA satisfies the increased credit requirements from rice growers and entrepreneurs which necessitated the growth of banking services especially in rural areas. The banking sector reforms for financial inclusion with a thrust on the expansion of

priority sector lending, branch expansion and service area approach are giving a boot to these agri-business start-ups especially in rural areas.

Employment Generation: It is assumed that the Model Rice Unit constructed in this study requires direct full-time labour of 3 individuals to look after the day-to-day operations either as a family oriented micro business unit or by using hired labour. The demand for more inputs like land, labour, capital and entrepreneurship activities by Model Rice Units create an indirect backward employment multiplier linkage effect on primary and secondary employment in the management of rice cultivation, harvesting, storage, distribution and marketing, fertiliser and insecticides industries, transportation, water supply, Public Works Department, real estate, construction sector, banking, utility industries, packaging material industries, logistics, manufacturing industries etc. Kerala government's post-Covid agriculture development policy, focus on creating more employment opportunities especially in rural areas by promoting agri-business start-ups by educated unemployed youth and women. The present study also supports this argument for the necessity to enhance and strengthen the agribusiness linkages for agriculture and economic development.

Stimulus to Rice Farmers: Greater demand for raw rice from the Model Rice Unit enhances the negotiating ability of farmers for a higher price. This gives a stimulus to rice growers to modernize and diversify the production system. Long term contracts signed between the rice processing units, super markets, hyper markets and rice growers avoid middlemen, marketing uncertainty, and wastage and maintain better quality. To mitigate the long-run impact of present covid-19 pandemic on food security, Local Self Government (LSG) should take initiative to make use of vacant land available in the state for rice cultivation.

Better Living Standards: Model Rice Unit creates a positive impact on the standard of living of farmers and agricultural labourers in terms of higher income, nutritious food, better education, employment, health and housing. Better standard of living and opportunities of diversified production of value added and processed rice products can ensure nutritional food security even for the vulnerable sections in

the society. Development of agribusiness backward linkages can positively influence the livelihoods of people engaged in this sector with a rural focus.

Growth of Industries Manufacturing Equipment and Implements: The Model Rice Unit requires modern machines, equipment and implements for production, processing, value addition, packing, labelling, storage, distribution of agribusiness rice products. The comprehensive list and cost of the essential machines, equipment and implements are discussed in the initial capital requirement section. This gives indirect positive stimulus to the manufacturing industries supplying machines, equipment and implements to the rice agribusiness units.

Growth of Packaging Materials and Utility Industries: Model Rice Unit requires packaging materials as inputs. The products are packed in different weight measures and with different types of packing depending on the mode of distribution at local, regional, district, and state, national and international markets. The basic requirements to satisfy the food safety standards regarding license of the production unit, ingredients, price, dates of manufacturing and best before use etc. are to be labelled. This gives a stimulus to the industries supplying packaging materials like, bags, boxes, bottles, lids, covers, stickers, labels etc. The basic requirement of the Model Rice Unit is the utilities like gas, electricity and water. Growth of agribusiness in rice products increases the demand for cooking gas, electricity and water leads to the growth of utility industries.

Growth of Transport and Communication: The Model Rice Unit need to collect inputs from the input suppliers. Increased demand for raw materials requires the development of transport, storage and communication services which in turn promote the logistics industries. Adequate transportation and communication network can strengthen the supply chain linkages to reduce wastage and cost of production, supply quality inputs as per requirement, and avoid middlemen and better price to farmers.

Growth of Research and Technical Institutions: Model Rice Unit requires technical support, training and guidance from agricultural scientists, professors and researchers which led to the growth of research institutions, agricultural universities

and agribusiness incubation centres. Rice growers need knowledge about scientific cultivation which requires soil testing and this leads to the growth of soil testing labs. Research institutions develop and provide high yielding varieties of rice that can increase the yield rate, technical and professional knowhow and management for processing, value addition and marketing.

Direct & Indirect Forward Linkage Effects of Crop Sector Agribusiness: Traditional farmers sell raw rice from farm directly to agents or middlemen at a low price and forward linkages start from the farmer and continue with agents or middlemen and ends with final consumers. With the emergence of modern agribusiness, direct and indirect forward linkages of processed and value-added rice products start from the processors as discussed below.

Growth of Logistics Industries and Export: Model Rice Unit requires a well-developed storage and marketing supply chain management for the timely supply of quality products to the consumers both at the domestic and international markets. This indirectly led to the growth of modern logistics industries with efficient and professional management in transportation and communication. Production of diversified processed and value-added rice products can directly capture the export market. Export earnings can be used for importing advanced technological know-how for greater diversification, productivity and economic development.

Development of Rural-urban linkages: The marketing of the products of the Model Rice Unit in the rural areas of Kerala is taking place through the retail shops and outlets. This led to the development of professional agri-entrepreneurship among the rural unemployed youth and women. As a result of urbanization, Malls, Super and Hyper Markets are emerging in each and every small towns of Kerala. This open up and widens the opportunities for wholesale marketing facilities to the Model Rice Units located in rural areas of Kerala. Therefore, emerging rural agri-entrepreneurship promotes the development of rural areas of Kerala through rural-urban agribusiness linkage.

Growth of Cooperatives and Farmer Producer Companies: Growth of agribusiness in rice products lead to development of Cooperatives and Farmer

Producer Companies (FPC) with the support of Local Self Government (LSG). These institutions undertake professional management of multilevel activities linking production, harvesting, and procurement, grading, processing and marketing of raw and value-added rice products. Availability of Diversified quality products creates healthy competition among Agri-entrepreneurs in rice processing provides adequate profit to producers and ensure diversified and superior quality products to consumers at reasonable prices.

Employment Generation: Agribusiness growth has a direct positive linkage in creating entrepreneurial opportunities in processed rice units especially in rural areas. Emerging agribusiness also has a positive multiplier effect on secondary and tertiary employment generation in distribution and sales in retail and wholesale outlets. Professional agribusiness can attract large number of unemployed youth and women in rural areas towards rice processing and marketing. Enhancement of agribusiness can absorb excess workers from agriculture who face disguised unemployment. Fixing quality norms and safety standards for processed food products lead to the generation of employment opportunities in testing centres and labs. Greater demand for institutional credit by Agri entrepreneurs leads to the opening up of new rural branches of banks which in turn create job opportunities.

Nutritional Food Security: Agribusiness generates employment and income which lead to changes in the taste and preferences of the people. Kerala state which ranks first with respect to percentage of literacy especially female literacy is inclined towards greater demand for processed food products to save time in their fast-moving world. Kerala state is far ahead of other states in India with respect to health indicators and this health consciousness led to add a variety of quality value added products in their dietary habits. Inclusion of a variety of nutritious processed rice products in the diet ensures market for agribusiness products. All these favourable factors demand the growth and development of agribusiness start-ups with positive linkage on nutritional food security.

Inclusive and Sustainable Economic Development: Agribusiness helps to achieve the goals of sustainable economic development through women empowerment and

inclusive growth. Value addition and processing increases productivity and prevents food wastage. The innovations through the expansion of educational facilities and research and development reach the entrepreneurs. Increased credit requirements from rice agribusiness necessitate the expansion of banking services especially in rural areas with the objective of financial inclusion. Positive linkage effect of agribusiness is enhanced on banking sector through government support in the form of subsidies and tax concessions to farmers, micro and small Agri entrepreneurs.

The above discussion reveals that there is a great need for developing efficient agribusiness in rice products with its backward and forward linkages in the state. It gives a boost to rice growers, generate better marketing facilities, ensure timely supply of variety and quality processed rice products to consumers, expand employment opportunities, increase rural income, helps to achieve nutritional food security, capture export markets, reduce rural poverty and thereby achieve agriculture and economic development.

3.7 CHALLENGES FACED BY AGRI-ENTREPRENEURS OF RICE

It is very clear from the previous discussions that crop sector agribusiness can play a vital role in the economic development of Kerala. The local self-governments are looking at agribusiness as a promising opportunity for nutritional food security and reallocating the reverse migrants in the post-Covid phase of Kerala economy. In this context, it is inevitable to throw light on the main challenges faced by the agri-entrepreneurs of crop sector agribusiness in Kerala.

First and foremost, the greatest challenge faced by rice processors in Kerala is the inadequate supply of quality raw rice from the state. The import of raw rice from other states will increase the cost of production which will be reflected directly on the price of processed rice products. Secondly, majority of the rice processing units in the state are concentrated in private sector. Lack of capital is a big challenge faced by these rice entrepreneurs in the state. Thirdly, rice processing units in the state have to face stiff competition from large processors from other states with better processing and value addition techniques. Low level of investment is an

obstacle to modernize rice processing units and the state lags behind other states with respect to processing technology. Fourthly, in the export front, rice processors have to face stiff competition from advanced countries with superior processing technologies. The setting up of international and country level quality norms after the WTO agreement from production to final processing is another challenge faced by rice processors.

Fifthly, agriculture being a state subject requires integration of policies between the central and state government. Lack of synergy between Centre and State government can limit the growth agribusiness which derives its input from agriculture. Sixthly, inadequate and inefficient harvest and post-harvest management adversely affects the quality and shelf life of the processed rice products. Seventhly, lack of scientific knowledge on existing schemes and policies related to processing is another challenge. Frequent workshops with participation from farmers and processors will fill this gap where the farmer can satisfy the requirements of the processors.

From the above discussion it is very clear that success in agribusiness in rice products requires product quality enhancement through technological up gradation, quality inputs, infrastructure facilities, credit availability and government support. Measures have to be taken to enhance quality and shelf life of processed products starting from farmer awareness on scientific cultivation, hygienic management in handling, sorting, grading and packaging of the produce at pre-and-post-harvest levels and modernized techniques of processing and logistics (Agricultural and Processed Food Products Export Development Authority). The emerging agribusiness can expand markets with diversified and quality processed rice products.

3.8 CONCLUSION

Based on the above analysis, it can be concluded that crop sector agribusiness is economically and financially viable and can contribute to the state's income, employment and export earnings. Agribusiness can contribute much to attain the goals of doubling farmer's income, sustainable development of agriculture, food and

nutritional security, inclusive growth and women empowerment. Agribusiness can attract youth towards agri-related activities and reduce the rate of migration towards cities. Agribusiness can attract private investment; ensure quality in products, fair price to farmers and consumers, infrastructural development, increased urban-rural and farm-non-farm linkages. Utilization of untapped crop resource potential can be addressed and attained through the promotion of agribusiness. The expansion of agribusiness will give a spur to the growth of crop sector and boost the development of agriculture especially in the post-Covid phase of Kerala economy.

CHAPTER IV

LIVESTOCK SECTOR ENTERPRISES

4.1 INTRODUCTION

Livestock sector plays a vital role in Indian economy in terms of nutritious food, income, employment and export earnings. India is the world's largest livestock owner ranking first in the production of buffalo, second in cattle and goat, third in sheep and egg, sixth in chicken (FAO, 2019). Moreover, India ranks fifth in the production of beef and veal in the world (USDA, 2019). The total livestock population of India is 535.78 million and that of Kerala is only2899.17 lakhs (0.54 per cent) showing an increase of 4.6 per cent and 5.99 per cent respectively over the previous Census, 2012 (20th Livestock Census, 2019).

In spite of the high-ranking position and the marginal increase in production, the country is not able to utilize its livestock potential optimally. This is evident from the fact that the share of livestock sector in Gross Value Added (GVA) of the country is only 4.1 per cent and that of Kerala in Gross State Value Added (GSVA) is even lesser to the extent of 2.76 per cent (CSO, 2019). The value of export earnings from livestock sector of the country is Rs. 643692 lakhs contributing only 0.28 per cent in the total export earnings of the country (DGCI&S, 2019).

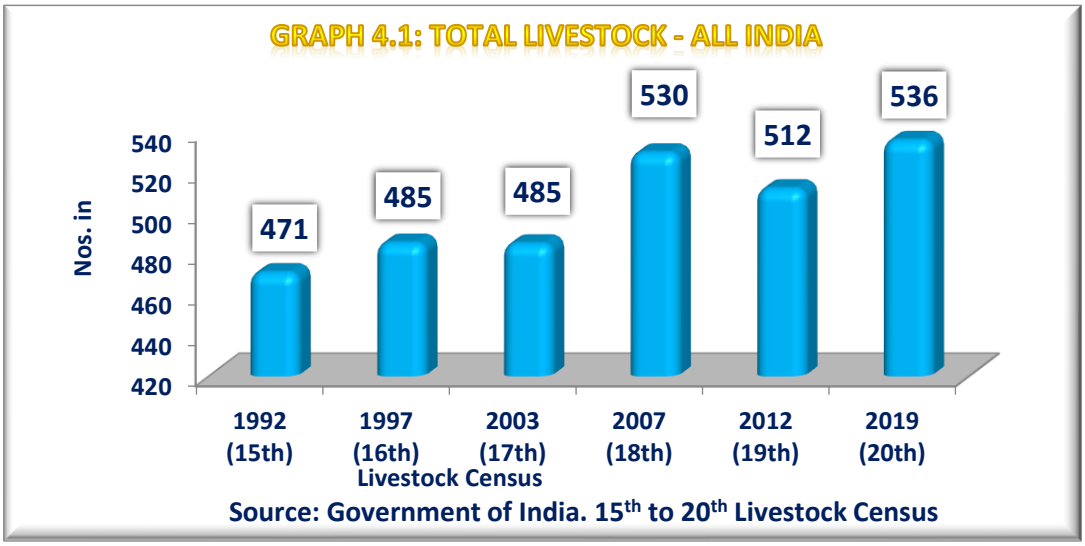
Livestock farming is a livelihood option for 2.4 per cent and 1.75 per cent of the rural households in Kerala and India respectively (NSSO 70th round). The declining profit and low social profile of the people engaged in livestock rearing keep the young generation of Kerala away from this sector. Instability in price, insufficient infrastructure, inadequate processing, value addition and marketing facilities lead to wastage and underutilization of livestock resources. Emergence of agribusiness and agri-entrepreneurship can augment this problem through its backward and forward linkage effects.

Therefore, the present study aims to analyse the feasibility of agribusiness in the livestock sector of Kerala. Introductory section is followed by an attempt to assess the performance of livestock sector in India and Kerala. Third section tries to identify the need and scope of processing and value addition in livestock products. Fourth section analyses the feasibility of agribusiness in the livestock sector of Kerala. Finally, the study identifies the linkages of agribusiness as well as the challenges faced by the emerging Agri-entrepreneurs of Kerala.

4.2 PERFORMANCE OF LIVESTOCK SECTOR IN KERALA

The performance of livestock sector can be analysed by assessing the trends in production, growth rate, contribution to national and state income, employment potential and export earnings. This analysis tries to answer the following questions: Can the livestock sector of India and Kerala has the potential to emerge as a prime provider of value-added products to the domestic as well as external markets? Is this potential optimally utilised? If not, what is the solution?

Trends in Livestock Population and Growth Rate in India (1992-2019): India is the largest livestock owner in the world ranking 1st in number of buffalo population with 56.46 per cent and 2nd after Brazil in cattle population with 12.47 per cent (FAO, 2019).



The total livestock population of India increased from 470.86 to 535.82 million numbers from 15th livestock census in 1992 to 20th livestock census in 2019

(Graph 4.1).The percentage change in livestock population during 1992 to 2019 shows that the growth rate is positive during 1992-97, 2003-07 and 2012-19 where it is highest between 2003 and 2007 to the extent of 9.22 per cent (Graph4.2).Even though the total livestock population increased by 4.6 per cent between 19th and 20th Livestock Census, a declining trend is visible during 1997 to 2002 and 2007 to 2012 where it declined largely by -3.33 per cent during 2007 to 2012.

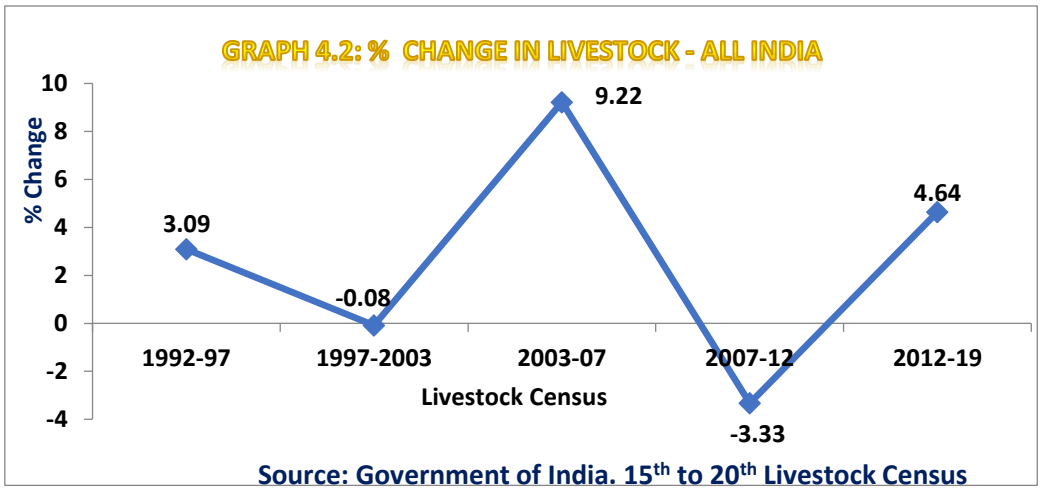


Table 4.1 shows the trends in the livestock population in India between 15th (1992) to 20th Livestock Census (2019).

Table 4.1: Livestock Population during 1992 to 2019- All India (in million)

Species	1992(15th)	1997(16th)	2003(17th)	2007 (18th)	2012(19th)	2019(20th)
Cattle	204.6	198.9	185.2	199.1	190.9	192.49
Buffaloes	84.21	89.92	97.92	105.34	108.7	109.85
Sheep	50.78	57.49	61.47	71.56	65.1	74.26
Goats	115.3	122.7	124.36	140.54	135.2	148.88
Horses & Ponies	0.82	0.83	0.75	0.61	0.63	0.34
Mules & Donkeys	1.16	1.00	0.83	0.58	0.52	0.20
Pigs	12.79	13.29	13.52	11.13	10.29	9.06
Camels	1.03	0.91	0.63	0.52	0.40	0.25
Total Livestock	470.86	485.39	485	529.7	512.06	535.82

Source: Government of India. 15th to 20thLivestock Census

The total number of cattle and buffaloes in India show an increasing trend from 204.6 to 192.49 million and from 84.21 to 109.85 million respectively during 1992 to 2019.India ranks 2nd after China in goats and 3rd after China and Australia

in sheep population in the world with 12.97 per cent and 5.27 per cent respectively (FAO, 2019). The number of goats and sheep in India increased from 115.28 to 148.88 and from 50.78 to 74.26 million respectively between 1992 and 2019.

The number of animals like Horses & Ponies, Mules & Donkeys, Pigs, Camels, Donkeys, Yaks etc. shows a declining trend. Horses & Ponies declined from 0.82 to 0.34 million, Mules & Donkeys from 0.19 to 0.08 million and 0.97 to 0.12 million respectively, Pigs from 12.79 to 9.06 million, Camels from 1.03 to 0.25 million, Donkeys from 0.97 to 0.12 million and Yaks shows a stagnant number of 0.06 million during the same period. The percentage growth rate of cattle reached a highest of 7.50 per cent during 2003-07 but it is only 0.85 per cent during 2012-19 and between all other censuses, the growth rate shows a negative trend (Table 4.2).

Table 4.2: Change in Major Livestock Species during 1992 to 2019 - All India (%)

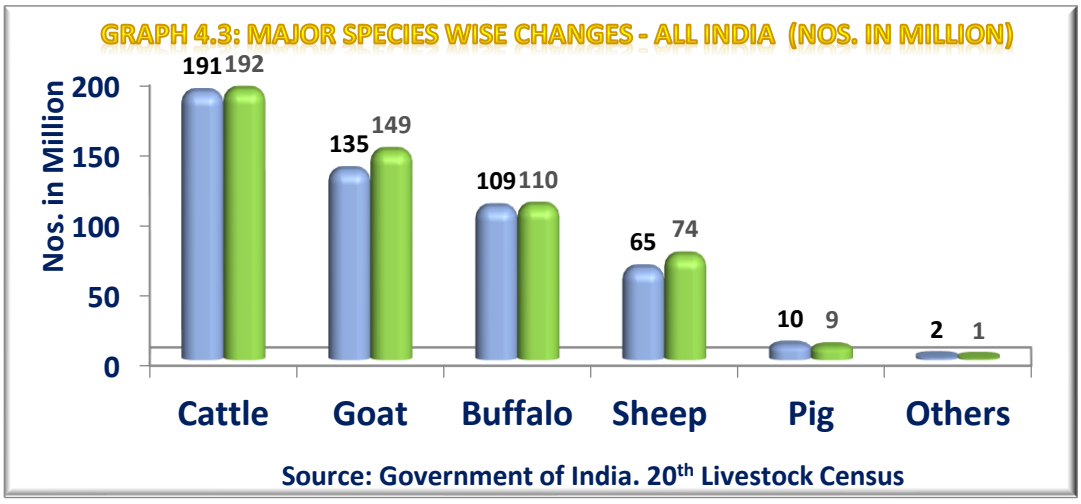
Species	1992-97	1997-2003	2003-07	2007-12	2012-19
Cattle	-2.79	-6.89	7.50	-4.10	0.85
Buffaloes	6.78	8.90	7.58	3.19	1.06
Sheep	13.21	6.92	16.41	-9.07	14.13
Goats	6.45	1.34	13.01	-3.82	10.14
Horses & Ponies	1.22	-9.64	-18.60	2.12	-45.58
Pigs	3.91	1.73	-17.66	-7.54	-12.03
Camels	-11.65	-30.77	-18.20	-22.63	-37.05
Total Livestock	3.09	-0.08	9.22	-3.33	4.64

Source: Government of India. 15th to 20th Livestock Census

Contrary to this, the growth trend of buffaloes in the country is always positive during 1992 to 2019 but the growth rate reached the lower of 1.06 per cent in 2012-19 periods. Both goats and sheep show a positive growth trend except during 2007-12. In general, between the 19th and 20th Census, the Cattle, Buffalo, Sheep and Goat, population show an increasing trend while Pig, Camel, Mules and Donkey, and Horses and Ponies show a decreasing trend. The highest percentage growth rate of 10.14 per cent and 14.13 per cent is visible for goat and sheep respectively. During 2012 to 2019 the highest decline is in the number of Donkeys

(-61.23 per cent) followed by Mules (-57.09 per cent), Horses & Ponies (-45.58 per cent), Camels (-37.05 per cent), Yaks (-24.47 per cent) and Pigs (-12.03 per cent).

Livestock Population in India – Major Species (2012-2019): The species-wise distribution of livestock population in India shows that cattle contribute the highest number followed by goat, buffalo, sheep and pig (Graph4.3).



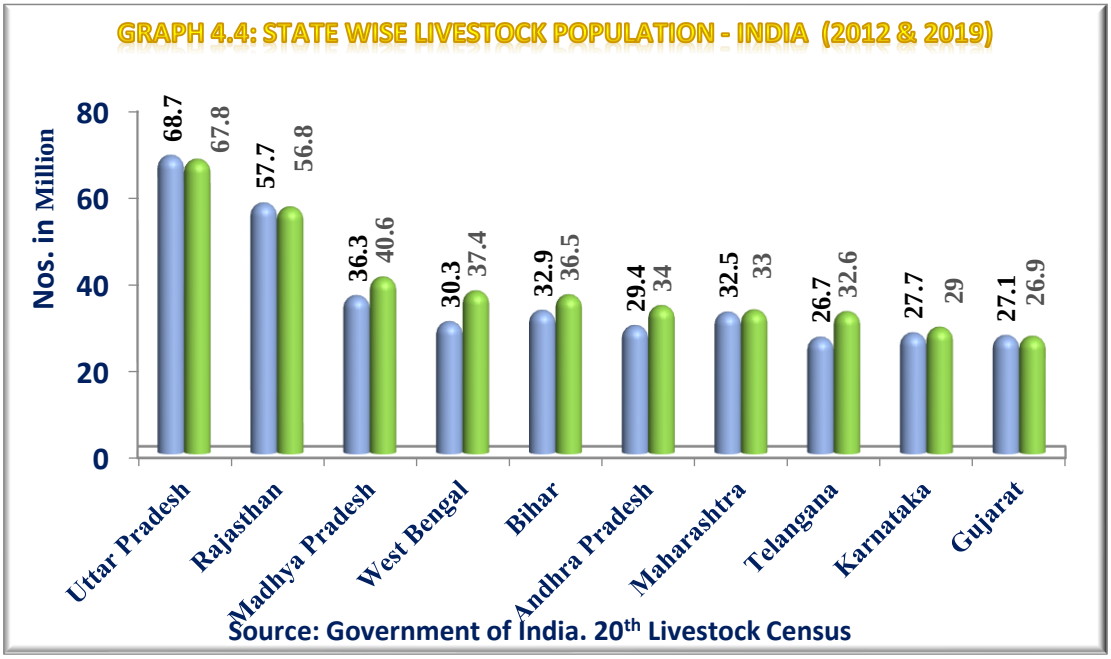
Cattle constitute the major share of total livestock population with 35.94 per cent followed by 27.8 per cent Goat, 20.45 per cent Buffaloes and 13.87 per cent Sheep (Table 4.3). Compared to the 19th Census of 2012, the percentage share of sheep and goat in all India livestock population increased while the share of cattle, buffalo and pig declined.

Table 4.3: Livestock Population: Major Species during2012 to 2019 - All India

Major Species	2012 (million)	% Share	2019 (million)	% Share
Cattle	190.90	37.28	192.49	35.93
Goat	135.17	26.40	148.88	27.79
Buffalo	108.70	21.23	109.85	20.50
Sheep	65.07	12.71	74.26	13.86
Pig	10.29	2.01	9.06	1.69
Others	1.93	0.38	1.23	0.23
Total Livestock	512.06	100.00	535.78	100.00

Source: Government of India. 20th Livestock Census, 2019

Livestock Population – Major States in India (2012-2019): State wise number of livestock shows that, as per the 20th livestock census of 2019 (Graph4.4), among the top ten ranking states, Uttar Pradesh ranks first in livestock population (67.8 million) followed by Rajasthan (56.8 million) Madhya Pradesh (40.6 million), West Bengal (37.4 million) and Bihar (36.5 million).



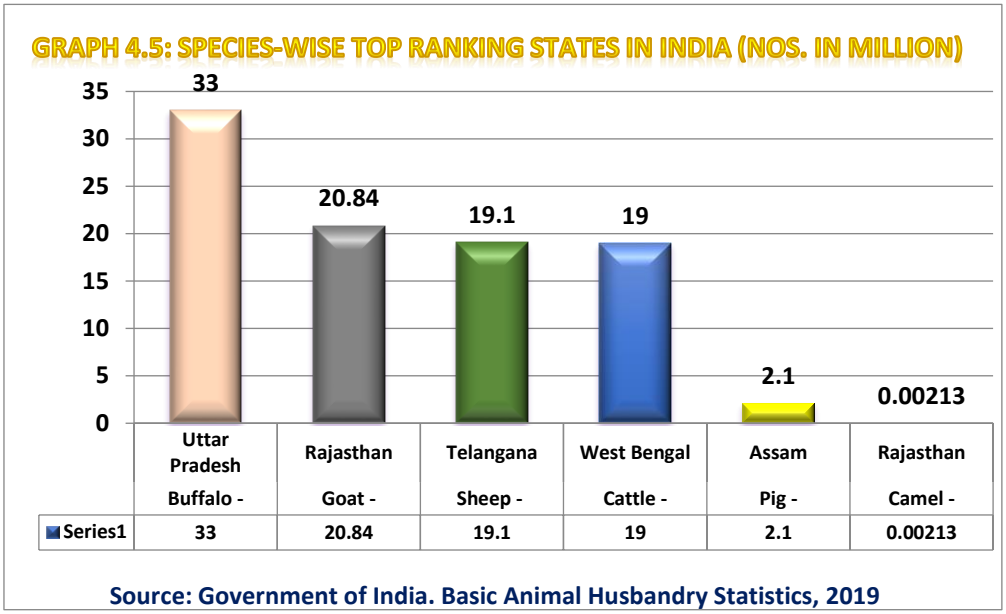
The percentage share of Uttar Pradesh and Rajasthan is 12.65 per cent and 10.60 per cent respectively (Table 4.4).

Table 4.4: Livestock Population: Major States in India (2012-2019)

Rank	State	2012 (in million)	2019 (in million)	% change (2012-19)	% share in India 2019
1	Uttar Pradesh	68.7	67.8	-1.35	12.65
2	Rajasthan	57.7	56.8	-1.66	10.60
3	Madhya Pradesh	36.3	40.6	11.81	7.58
4	West Bengal	30.3	37.4	23.32	6.98
5	Bihar	32.9	36.5	10.67	6.81
6	Andhra Pradesh	29.4	34	15.79	6.35
7	Maharashtra	32.5	33	1.61	6.16
8	Telangana	26.7	32.6	22.21	6.08
9	Karnataka	27.7	29	4.7	5.41
10	Gujarat	27.1	26.9	-0.95	5.02

Source: Government of India. 20th Livestock Census, 2019

An analysis of the top-ranking states in the country with respect to the species-wise population is shown in Graph 4.5.



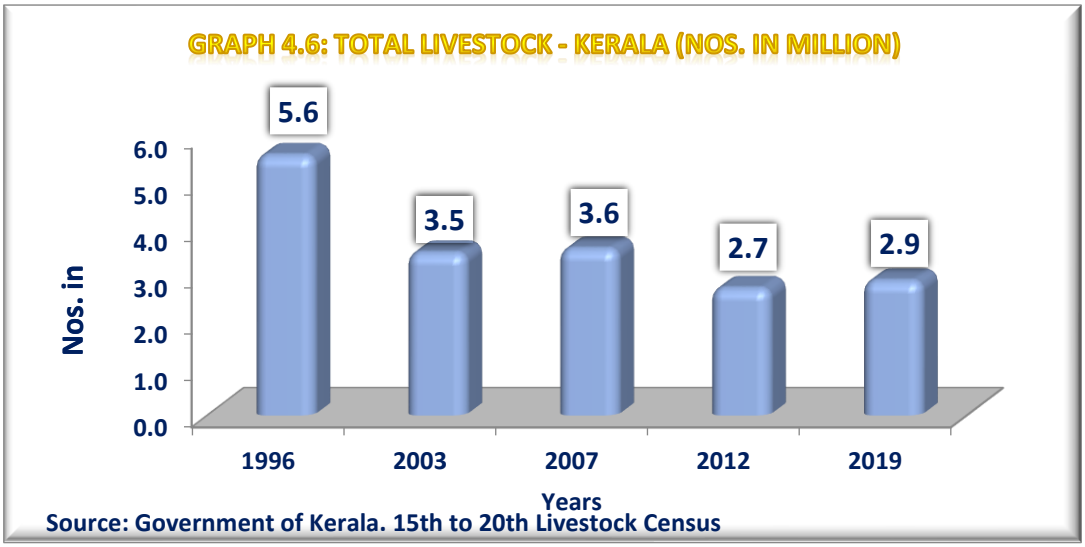
West Bengal ranks first in Cattle with 19 million (9.88 per cent), Rajasthan in Goat with 20.84 million (14 per cent), Uttar Pradesh in Buffalo with 33 million (30.06 per cent), Telangana in Sheep with 19.1 million (25.67 per cent), Assam in Pig with 2.1 million (23.17 per cent) and Rajasthan in Camel with 2.13 million (0.85 per cent) (Table 4.5).

Table 4.5: Top Ranking States of India in Major Species, 2019

Major Species	Top Ranking State	Number in million	India in million	% Share in India
Cattle	West Bengal	19.0	192.49	9.88
Goat	Rajasthan	20.84	148.88	14.00
Buffalo	Uttar Pradesh	33.0	109.85	30.06
Sheep	Telangana	19.1	74.26	25.67
Pig	Assam	2.10	9.06	23.17
Camel	Rajasthan	0.00213	0.25	0.85

Source: Government of India. Basic Animal Husbandry Statistics, 2019

Trends in Livestock Population of Kerala (1996-2019): The total livestock population of Kerala shows a declining trend from 5.6 to 2.9 million between 1996 and 2019 (Graph 4.6).



The species-wise population of livestock population of Kerala between 1996-2019 (Table 4.6) also shows a declining trend. In 2019 the total livestock population in Kerala increased by 5.99 per cent mainly due to the tremendous increase in Pig (85.71 per cent) followed by goat (9.07 per cent). The share of Kerala in the total livestock of India is very negligible (0.541 per cent) and among the different species highest share is for Pig (1.148 per cent). The declining trend can be attributed to the indiscriminate slaughter, progressive urbanization, shrinking of gracing grounds and natural calamities like floods.

Table 4.6: Trends in Livestock Population of Kerala (1996-2019 in million)

Species	1996	2003	2007	2012	2019	% change (2012 - 2019)	% share in India, 2019
Cattle	3.396	2.122	1.74	1.329	1.333	0.29	0.693
Buffalo	0.329	0.065	0.058	0.1022	0.1015	-0.75	0.092
Goat	0.1861	0.1213	0.1729	0.1246	0.1359	9.07	0.091
Pig	0.143	0.076	0.059	0.056	0.104	85.71	1.148
Total Livestock	5.6	3.5	3.587	2.735	2.899	5.99	0.541

Source: Government of India. Basic Animal Husbandry Statistics, 2019

Trends in Production and Growth of Meat in India & Kerala: The progress of livestock sector is evident from increasing trend in the production of meat (Table 4.7). The total production of meat in India and Kerala increased from 1.20 to 8.11

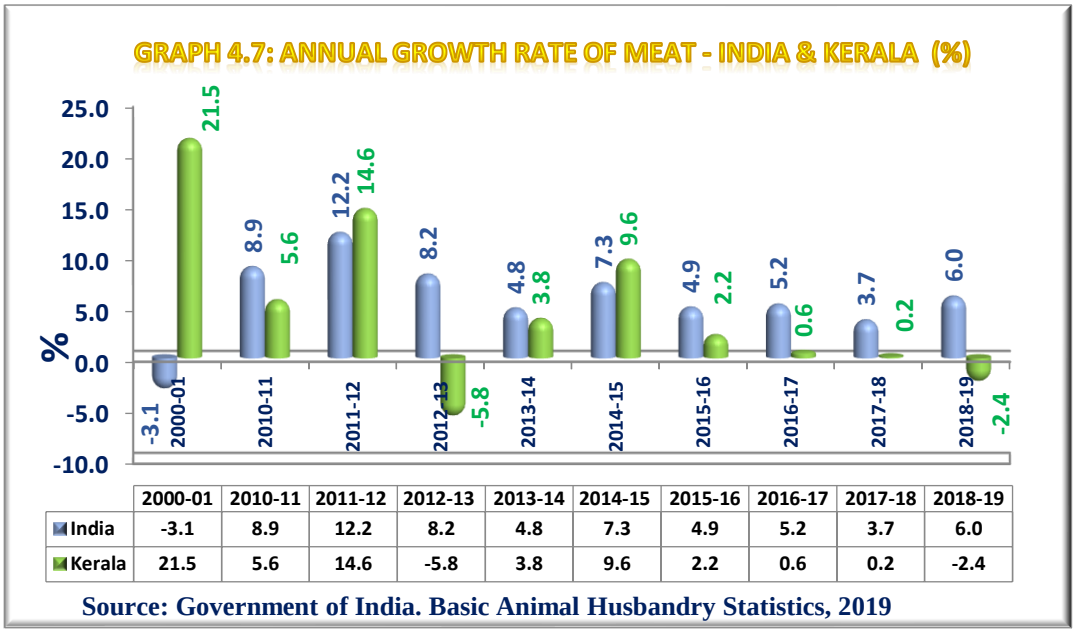
million tones and from 95 to 457.41 thousand tonnes respectively between 1990-91 and 2018-19.

Table 4.7: Trends in Annual Production& Growth of Meat in India & Kerala

Year	India		Kerala	
	Production (in million)	Growth Rate (%)	Production (in thousands)	Growth Rate (%)
1990-91	1.20	-	95	-
2000-01	1.85	-3.14	148.11	21.45
2010-11	4.9	8.89	124.38	5.63
2011-12	5.5	12.24	425.57	14.58
2012-13	5.9	8.15	400.99	-5.8
2013-14	6.2	4.83	416.06	3.8
2014-15	6.7	7.31	455.83	9.6
2015-16	7	4.92	466.04	2.2
2016-17	7.4	5.21	468.84	0.6
2017-18	7.7	3.66	468.88	0.18
2018-19	8.11	5.99	457.41	-2.4

Source: Government of India. Compiled from Basic Animal Husbandry Statistics

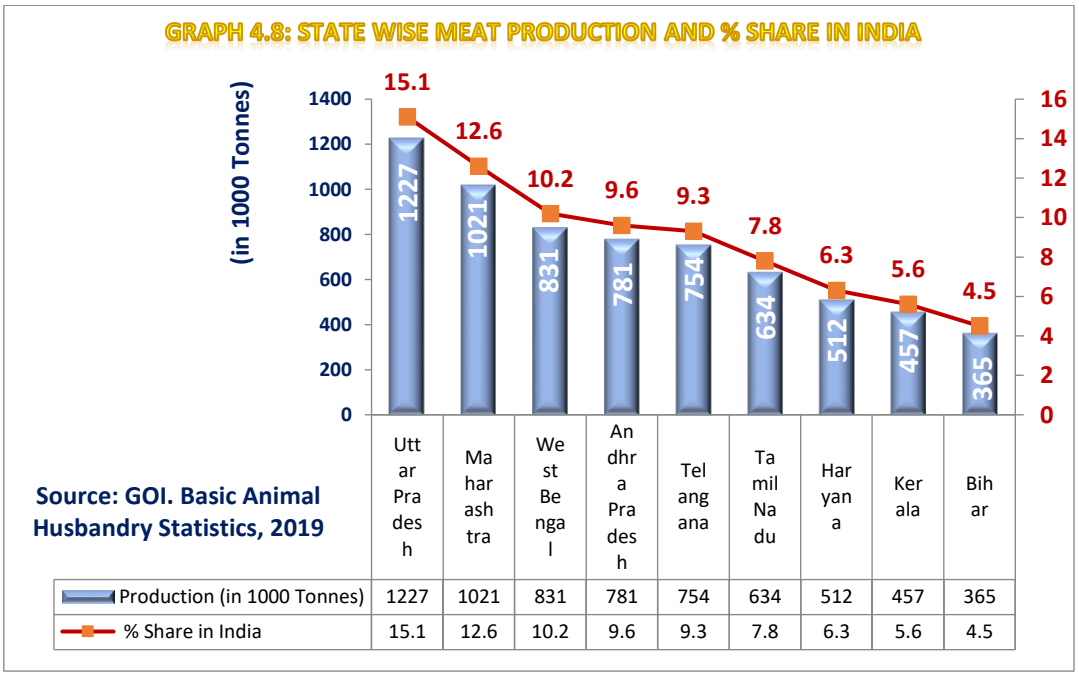
The annual growth rate of meat production in India shows a positive trend but fluctuating between 2000-01and 2018-19 except during 2000-01 with a negative growth rate of -3.1 (Graph4.7). Kerala also shows the same positive growth trend but fluctuating in between except during 2012-13 and 2018-19 with a negative growth rate of -5.8 and -2.4 per cent. During 2018-19, all India production of meat increased by 5.99 per cent. Livestock sector is badly affected due to the Kerala floods of 20018 and 2019.Graph 4.8 shows state-wise meat production in India.



	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
India	-3.1	8.9	12.2	8.2	4.8	7.3	4.9	5.2	3.7	6.0
Kerala	21.5	5.6	14.6	-5.8	3.8	9.6	2.2	0.6	0.2	-2.4

Source: Government of India. Basic Animal Husbandry Statistics, 2019

Among the Indian states, Uttar Pradesh is the largest meat producer with 1227 thousand tones followed by Maharashtra (1021 thousand), West Bengal (831 thousand), Andhra Pradesh (781 thousand) and Telangana (754 thousand). Uttar Pradesh's share is 15.1 per cent followed by Maharashtra (12.6 per cent) West Bengal (10.2 per cent), Andhra Pradesh (9.6 per cent) and Telangana (9.3 per cent). These five states together contribute 56.9 per cent of the total meat production in the country. Kerala ranks 8th by contributing 5.6 per cent of the all-India meat production.



Source: GOI. Basic Animal Husbandry Statistics, 2019

	Uttar Pradesh	Maharashtra	West Bengal	Andhra Pradesh	Telangana	Tamil Nadu	Haryana	Kerala	Bihar
Production (in 1000 Tonnes)	1227	1021	831	781	754	634	512	457	365
% Share in India	15.1	12.6	10.2	9.6	9.3	7.8	6.3	5.6	4.5

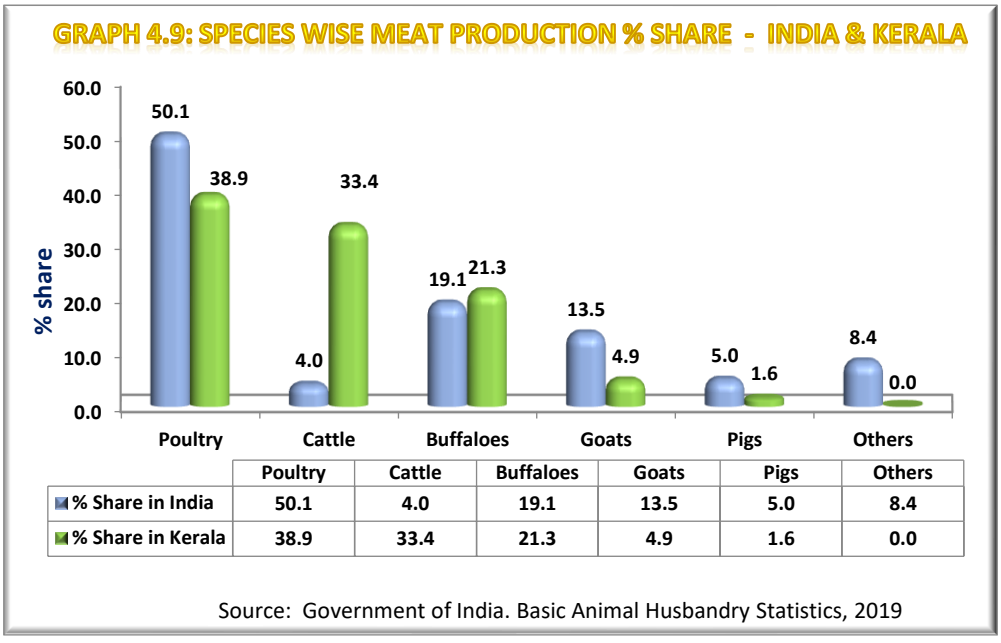
Growth rate is highest in Telangana (Table 4.8) with 16.9 per cent followed by Karnataka (11.2 per cent) and Maharashtra (10.3 per cent).

Table 4.8: Top 10 States of India in Meat Production & Growth Rate, 2018-19 (%)

Rank	States	Production ('000 Tonnes)	% Share in India	Growth Rate (%)
1	Uttar Pradesh	1227.09	15.1	6.6
2	Maharashtra	1020.60	12.6	10.3 (3rd)
3	West Bengal	831.28	10.2	7.6
4	Andhra Pradesh	780.61	9.6	10.1
5	Telangana	754.06	9.3	16.9 (1st)
6	Tamil Nadu	633.80	7.8	5
7	Haryana	511.99	6.3	8.8
8	Kerala	457.41	5.6	-2.4
9	Bihar	364.85	4.5	6.4
10	Karnataka	253.60	3.1	11.2 (2nd)
	All India	8114.45	100.00	5.99

Source: Government of India. Basic Animal Husbandry Statistics, 2019

Species-wise meat contribution in India and Kerala show that the highest share of 50.06 per cent and 38.92 per cent respectively is contributed by Poultry (Graph4.9).



Cattle and Buffaloes contribute a higher share of 33.4 per cent and 21.3 per cent in the meat production of Kerala than the national share of 4 per cent and 19.1 per cent respectively (Table 4.9).

Table 4.9: Species-wise Meat Production in India &Kerala, 2018-19

Species	India ('000)	% Share in India	Kerala ('000)	% Share in Kerala	% share of Kerala in India
Poultry	4061.79	50.06	178.03	38.92	4.38
Cattle	326.48	4.02	152.57	33.36	46.73
Buffaloes	1545.83	19.05	97.51	21.32	6.31
Goats	1097.91	13.53	22.18	4.85	2.02
Pigs	404.46	4.98	7.11	1.55	1.76
Others	677.98	8.36	0	0	0
Total	8114.45	100.00	457.41	100.00	5.64

Source: Government of India. Basic Animal Husbandry Statistics, 2019

Table 4.10 shows the number of animals slaughtered for meat in India and Kerala.

Table 4.10: Number of Animals Slaughtered for Meat in India &Kerala, 2018-19

Species	Kerala (in thousands)	India (in thousands)	% share of Kerala in India
Cattle	1255	3056	41.07
Buffaloes	856	11926	7.18
Goats	1692	97190	1.74
Pig	98	10735	0.91
Poultry	118789	2812839	4.22

Source: Government of India. Basic Animal Husbandry Statistics, 2019

The number of animals slaughtered for meat in India and Kerala show that Kerala contributes 41. 07 per cent of cattle slaughtered for meat in India. This is mainly because of the great demand and the absence of government regulations against cow slaughter in the state compared to other states of India.

Trends in Contribution to National and State Income: An analysis of the trend in the sector-wise share in total GDP/GVA of the country at constant prices from 1990-91 to 2017-18show that among the allied sectors, livestock is the second contributor to GVA after the crop sector (Table 4.11).

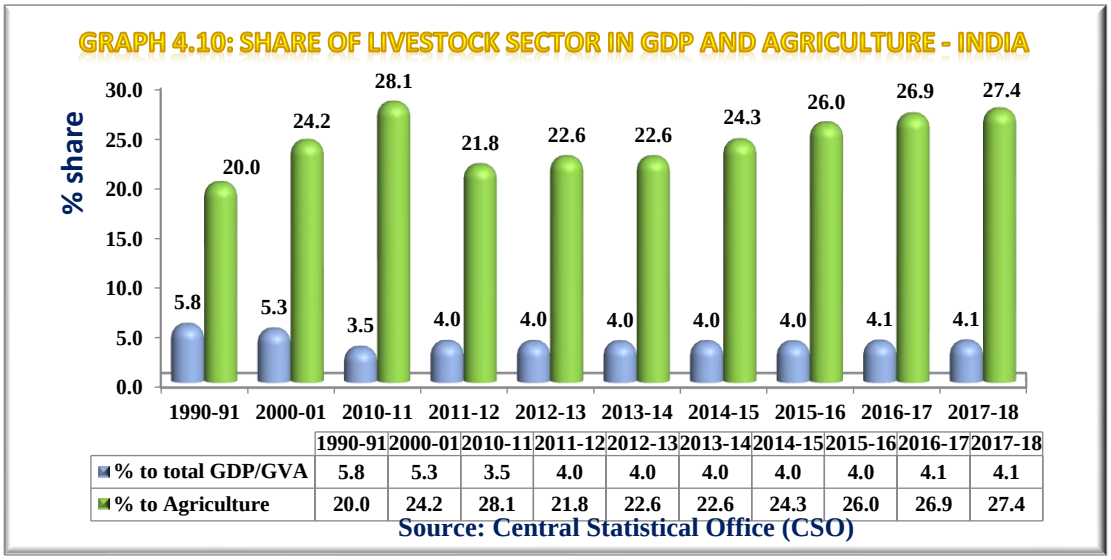
Agriculture and allied sectors and livestock sector's contribution to national income show a declining trend from 28.73 per cent to 14.90 per cent and from 5.75 per cent to 4.08 per cent respectively.

Table 4.11: Share of Livestock Sector in GDP/GVA at constant (2011-12) Prices

Year	Agriculture and Allied Sectors		Livestock Sector	
	% to total GDP/GVA	Growth Rate of GDP/ GVA (%)	% to total GDP/GVA	% to Agriculture
1990-91	28.73	4.09	5.75	20
2000-01	21.84	-0.61	5.29	24. 23
2010-11	14.6	8.8	3.45	28.07
2011-12	18.53	3.9	4.04	21.8
2012-13	17.84	1.49	4.03	22.6
2013-14	17.75	5.57	4.01	22.6
2014-15	16.53	-0.22	4.02	24.3
2015-16	15.40	0.65	4.00	26
2016-17	15.17	6.27	4.07	26.9
2017-18	14.90	4.98	4.08	27.4

Source: National Income Accounts Statistics, Central Statistical Office (CSO)

The slight declining trend in the share of livestock sector to the national income between 1990-91 and 2010-11 is reversed to an increasing trend from 2011-12 onwards (Graph4.10).



Contrary to the declining trend in the share of agriculture and allied sectors in total GDP/GVA, the contribution of livestock sector to total GVA and agricultural GVA is showing an increasing trend between 1990-91 and 2017-18 except during 2010-11 to 2011-12. The declining trend can be considered as a reflection of the development process, structural transformation and the consequent faster growth of

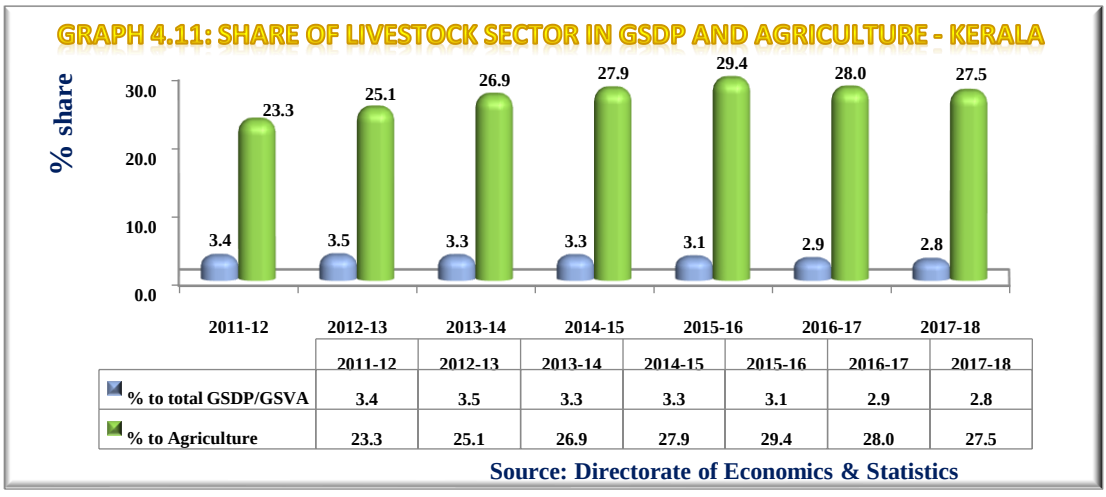
industrial and service sectors taking place in the economy. Kerala also shows a declining trend in the contribution of agriculture and allied sectors in the state income from 23.14 per cent in 1990-91 to 10.04 per cent in 2017-18 (Table 4.12).

Table 4.12: Share of Livestock Sector in GSDP of Kerala (at constant prices)

Years	Agriculture & Allied Sector		Livestock Sector	
	% to total GSDP/GSVA	Growth Rate of GSDP/GSVA (%)	% to total GSDP/GSVA	% to Agriculture
1990-91	23.14	8.32	-	-
2000-01	18.25	2.23	-	-
2010-11	10.1	-4.8	-	-
2011-12	14.39	-1.03	3.35	23.28
2012-13	13.77	-3.1	3.45	25.05
2013-14	12.37	-3.8	3.33	26.92
2014-15	11.92	0.75	3.32	27.85
2015-16	10.74	-7	3.13	29.35
2016-17	10.26	2.5	2.87	27.97
2017-18	10.04	3.64	2.76	27.49

Source: Government of Kerala. Directorate of Economics & Statistics

Growth rate of agriculture and allied sectors in the state income was fluctuating during the same period. Share of livestock sector to GSDP is not available till 2011-12 since its calculation is always clubbed with agriculture and allied activities. Even though the share of livestock sector in the Kerala GSDP/GSVA declined from 3.35 per cent to 2.76 per cent, its contribution towards agriculture GSDP/GSVA increased from 23.28 per cent to 27.49 per cent during 2011-12 to 2017-18 (Graph 4.11).



This shows the relative importance of livestock sector in the agriculture and allied sectors.

Livestock Sector in Employment: Livestock rearing is a unique job since it is done largely by small and marginal farmers who constitute 82 per cent of farmers in India. It is a household job mainly managed by women as a part of the backyard of the house. It is a livelihood option for a large number of rural households of the country where 66 per cent of Indian population lives in rural areas (FAO,2019). The objective of inclusive growth and women empowerment can be brought through a rural focus where livestock sector can contribute significantly.

According to the 55th Round NSSO (1999-2000) survey, 80.27 lakhs of people constituting around 2.4 per cent of the total workforce in India earn their livelihood from livestock sector. As per the 17th Livestock Census (2003), around 94 per cent livestock rearing is taking place in rural areas of Kerala. Out of the total livestock farmers of Kerala, 80 per cent are small and marginal farmers and 60 per cent are women.

66th Round NSSO (2009-10) survey estimates on Employment and Unemployment in India shows that 15.60 million workers on principal and subsidiaries status are engaged in farming of animals, mixed farming and fishing.68th Round NSSO (2011-12) survey in India reveals that 16.44 million people works in activities related to rearing of animals, mixed farming, fishing and aquaculture. As per the 19th Livestock Census (2012), around 97.17 per cent and 95.8 per cent of livestock rearing is taking place in the rural households of India and Kerala respectively (Table 4.13). The rural households of India and Kerala constitute 74.4 per cent 80.7 per cent of the total household respectively.70th Round NSSO (2013) survey in India says that around 1.75 per cent of the total rural households in India are self-employed in livestock sector which constitute around 27 lakh rural households.

NSSO's Periodic Labour Force Survey (PLFS) in 2017-18 shows that about 70.7 per cent of the people in India belong to rural areas. The rate of unemployed rural males and females between the age group 15 to 29 years increased from 5 per cent to 17.4 per cent and 4.8 per cent to 13.6 per cent respectively between 2011-12

and 2017-18. This indicates that rural youth is moving away from agriculture and allied sectors and are in search of urban service sector jobs.

Table 4.13: Number of Households and Households Enterprises Owning Livestock

Species	India (in Thousands)			Kerala (in thousands)		
	Rural	Urban	Total	Rural	Urban	Total
Cattle	11.4	0.2	11.6	572.5	33.5	606
Buffaloes	2.2	0.01	2.21	537.4	3.6	541
Goats	11.1	0.7	11.8	420.6	30.2	450.8
Pigs	7.2	0.02	7.22	9.5	0.2	9.7
Total	31.9	0.93	32.83	1540	67.5	1607.5
% to Total	97.17	2.83	100.00	95.80	4.20	100.00
Total	195606	67306	262912	7133	1706	8839
% to Total	74.4	25.6	100.00	80.7	19.3	100.00

Source: Government of India. 19th Livestock Census, 2012

Trends in Value of Export of Livestock and Livestock Products: The export earnings from livestock sector are very low in the country. During the period between 2000-01 and 2018-19 export earnings from livestock increased from Rs.34, 760 million to 4, 99,571 million (Table 4.14).

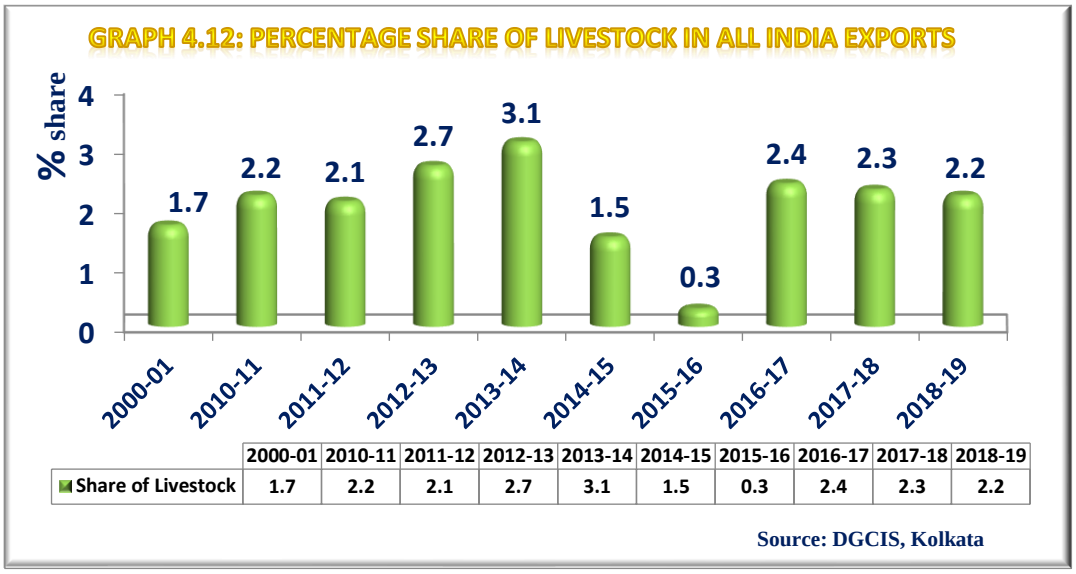
Table 4.14: Export of Livestock and Livestock Products (Rs. In million)

Year	Livestock Sector	India's Total Exports	% Share of Livestock
2000-01	34,760	20,35,710	1.7
2010-11	2,54,089	1,14,26,490	2.2
2011-12	3,08,665	1,46,59,594	2.1
2012-13	4,46,595	1,63,43,188	2.7
2013-14	5,89,109	1,90,50,111	3.1
2014-15	2,77,372	1,89,70, 259	1.5
2015-16	43,470	1,71,46,177	0.3
2016-17	4,40,324	1,84,94,288	2.4
2017-18	4,57,989	1,95, 55,411	2.3
2018-19	4,99,571	2,30,77,262	2.2

Source: Directorate General of Commercial Intelligence and Statistics (DGCIS), Kolkata

In spite of the increase in the value of export earnings from livestock sector, the percentage share of livestock sector earnings in all India export earnings is very low and was fluctuating between 2000-01 and 2018-19 (Graph4.12). It ranges between the highest share of 3.1 per cent in 2013-14 and the lowest share of 0.3 per cent in 2015-16.

The components of exports of India's livestock and livestock products are meat and meat products (82 per cent), live animals (17 per cent) and eggs (1 per cent) and this constitute only 1 per cent to world livestock products exports (Mishra, 2017).



	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Share of Livestock	1.7	2.2	2.1	2.7	3.1	1.5	0.3	2.4	2.3	2.2

Source: DGCIS, Kolkata

To sum up, a well-developed agribusiness in livestock sector can reduce wastage of output, diversify the methods of processing and value addition, increase demand resulting in better price for output, ensure higher income to livestock owners, promote employment especially among rural youth and women, increase export earnings, develop a strong forward and backward linkages between farm and non-farm sectors and between urban and rural areas.

4.3 FEASIBILITY OF AGRIBUSINESS IN BEEF PRODUCTS

The above analysis necessitates the need to identify the investment opportunities, technical and financial feasibilities of agribusiness in the livestock sector of Kerala to utilize the optimal potential of this sector. India ranks 5th in beef and veal

production in the world after United States of America (USA), Brazil, European Union (EU) and China. Beef is the third most widely consumed meat in the world after pork and poultry. USA, Brazil and China are the world's largest consumers of beef. Brazil, India, Australia and USA are the world's largest exporters of beef (United States Department of Agriculture, 2019).

Processing and value addition of meat in India is only 2 per cent and the remaining is sold in fresh or frozen forms and in developed countries it is more than 60 per cent (Mishra, 2017). About 80 per cent of Keralites are non-vegetarians and Kerala ranks first in the consumption of beef products in the country since there is no restriction compared to many other states of India. During this unprecedented emergency of Covid-19 pandemic, it is of utmost importance to mitigate its long-term impact on food and nutritional security and livelihoods of the vulnerable population of Kerala. Livestock sector can contribute to this end by encouraging agribusiness ventures in meat processing and value addition. Therefore, the present study is confined to the feasibility of agribusiness in beef.

Agribusiness in Beef Products: The present study is confined only to value addition in raw beef through processing to get a variety of tasty and healthy beef products with increased market value. A variety of traditional and modern processed meat products are available in the retail and wholesale cold storages, super markets, hyper markets and Malls of Kerala. Irrespective of generations, people demand processed beef products to meet life style requirements, for greater nutritional value by incorporating non-meat ingredients, quality and economy in production. Processed beef products have greater shelf life, easy to preserve, transport, and distribute to large population. Agribusiness in beef products promote professional entrepreneurship, generate employment, offer better price and livelihood to people engaged in livestock rearing (Johnson, 2017). The popular variety of processed and semi-cooked beef products in Kerala are corned beef, meatloaf, pickle, cutlet, keema, sausages, beef fry, beef roll, smoked beef, samosa, bacon, hamburgers, kebabs, nuggets dried beef and beef curries.

Model Beef Unit: A Model Beef Unit is developed based on the data collected from a Base Beef Unit situated in Thrissur district of Kerala state relating to the initial investment, quantity and value of production, sales, cost of raw materials, labour, packaging materials, processing materials, annual fixed costs, selling price etc.

Assumptions: Interactions and discussions with scientists, engineers, researchers and experts working in the study area leads to valid and reasonable assumptions on technical parameters of the Model Beef Unit.

1. Cash flows (costs and returns) and requirement of initial investment of the model unit are based on the data compiled from the Base Beef Unit.
2. The Model Beef Unit requires an initial investment of Rs. 438100 which is equally divided among the three products to calculate product-wise cash flow.
3. Model Beef Unit produces 640Kg Cutlet (semi-cooked), 2900Kg Keema (minced beef) and 310Kg Pickle (processed) annually.
4. The study considered a period of 3 years to assess the feasibility of the Model Beef Unit.
5. Discount rate of 11 per cent is based on interest rate charged by bankers under Kishor scheme of MUDRA loan up to Rs. 10 lakhs to help small entrepreneurs.
6. The study is based on the average values of the initial year variables.
7. The possibility of wastage during production process is zero.
8. Excludes tax / commission in sales price for convenience.
9. Annual average sales are 100 per cent and are done through direct marketing.
10. Annual average working days are 256 (70 per cent of 365 days).
11. Shelf life for the final product is constant throughout the year.
12. Annual average depreciation rate of equipment, building and vessels is constant.
13. The Unit is evaluated based on optimistic, actual and pessimistic assumptions to incorporate the risk element due to instability in the key variables.

Initial Investment: The initial investment of Model Beef Unit is estimated as Rs. 438100 (Table4.15). The major cost components in initial investment or non - recurring cost are the advance for land and building, stainless-steel tables, mixer grinder, meat mincer, cooking range, gas cylinders, deep freezer, heavy

duty continuous band sealer for packets, labelling machine, cutlet mould, planetary mixer, cooking vessels and other unexpected repair, maintenance etc. The highest share of initial investment is for a set of vessels (22.83 per cent) followed by advance for land and building and labelling machine (11.41 per cent), Planetary Mixer and Stainless-Steel Tables (9.13 per cent each) and Deep Freezer (6.85 per cent).

Table: 4.15: Initial Investment of Model Beef Unit (2016-17 prices in rural Kerala)

Sl. No	Particulars	Quantity (No)	Rate (Rs)	Cost (Rs)	%
1	Advance for land and building		50,000	50,000	11.41
2	Stainless Steel Tables	2	20000	40000	9.13
3	Meat Mincer	1	25000	25000	5.71
4	Double Door Hard Top Deep Freezer (500litre)	1	30000	30000	6.85
5	Cooking Vessels (1 Set)		100000	100000	22.83
6	Mixer Grinder	1	12000	12000	2.74
7	Stainless Steel Commercial Two Burner Cooking Range	1	10000	10000	2.28
8	Gas Cylinders	3	1200	3600	0.82
9	Heavy Duty Continuous Band Sealer for Packets	1	25000	25000	5.71
10	Labelling Machine	1	50000	50000	11.41
11	Cutlet Mould	1	2500	2500	0.57
12	Planetary Mixer	1	40000	40000	9.13
13	Others (Unexpected Repair, Maintenance etc.)	1	40000	40000	11.41
Total				438100	100.00

Source: Data compiled from the Base Beef Unit

There is also scope for product expansion with the same initial investment. The initial investment is financed through the Kishor Scheme of MUDRA loan from the State Bank of India for 3 years.

Financing of Initial Investment: The Model Beef Unit's initial investment of Rs.438100/- is financed through the 'KISHORE' loan scheme under the Pradhan Mantri Mudra Yojana (PMMY). The rate of interest is 10.65 per cent for a period of 3 years including the moratorium for 6 months. The total interest paid during the moratorium period is Rs.23329/- with a monthly break up of Rs.3888/-. The total interest payable over the loan term is Rs.86166/- with an annual break up of

Rs.44931 (52 per cent), Rs.30139 (38 per cent) and Rs.11096 each (38 per cent as shown in Table 4.16. The principal loan amount payable over the loan term is Rs.438100/- with an annual break up of Rs.78584/- (18 per cent), Rs.170237/- (39 per cent) and Rs.189279/- (43 per cent) each. The total Equated Monthly Instalments (EMI) payments including the principal and interest made over the loan term is Rs.524266/- with an annual break up of Rs.123515/- (24 per cent), Rs.200376/-(38 per cent) and Rs.200375/- (38 per cent) each.

Table 4.16: Loan (Rs.) Repayment Schedule of Initial Investment

Year	EMI	%	Interest	%	Principal	%
1	123515	24	44931	52	78584	18
2	200376	38	30139	35	170237	39
3	200375	38	11096	13	189279	43
Total	524266	100	86166	100	438100	100

Source: State Bank of India

Results of Cash Flow Analysis: Net Cash Flow (NCF) shows the profitability of the Model Beef Unit based on the cash flows in initial year or Cutlet, Pickle, Keema. The value of the variables for each product in the cash flow statement is based on the data compiled from the Base Unit in the study area (Table 4.17).

Table 4.17: Result Summary of Cash Flows (Rs.) of Model Beef Unit

Variables	Cutlet	Pickle	Keema	Beef Unit
Initial Investment (Rs)	146033	146033	146033	438100
Volume (Kg/year)	640	310	2900	
Unit Selling Price (Rs/Kg)	500	733	360	
Unit Variable Cost (Rs/Kg)	205	267	305	
Annual Fixed Cost (Rs/Kg)	24000	24000	24000	72000
Discount Rate (%)	11	11	11	11
Cash Outflow (Rs/year)	155200	106770	908500	1170470
Cash Inflow (Rs/year)	320000	227230	1044000	1591230
Net Cash Flow (NCF in Rs/year)	**164800**	**120460**	**135500**	**420760**

Source: Primary Data

The initial investment of Rs.146033 for each product is obtained by dividing the initial investment of Rs. 438100 of the Model Unit equally among the three products. The Unit has an average operating profit of Rs. 420760 in 3 years contributed by 39 per cent **from Cutlet, 32 per cent from Keema and 29 per cent from Pickle.** The per unit contribution margin of the products are calculated by taking the difference between unit sales price and unit variable cost. Pickle has the highest margin of Rs.428 followed by Cutlet with Rs.2 and the lowest of Rs.93 for Keema. Thus, an increase in the volume of Cutlet with the highest contribution margin ratio (ratio of contribution margin to sales price) of 59 per cent is a good choice to increase the operating profit of the Model Dairy Unit compared to Pickle (58 per cent) and keema (26 per cent) with lower margin ratio. **The favourable cash flows indicate the ability and flexibility for product expansion through operating profits in the beef processing plants in Kerala.**

The results of the above analysis reveal that agribusiness in beef is a profitable venture in Kerala, provided that the small and marginal entrepreneurs require support from local self-government in terms of tax exemption, subsidy and credit support. Thus, post-Covid phase of Kerala economy finds a great future in agribusiness and agri-entrepreneurship especially in livestock sector.

4.4 FINANCIAL FEASIBILITY ANALYSIS

Considering the small size of investment of Model Beef Unit, only the methods of Net Present Value (NPV), Profitability Index (PI) or Benefit Cost Ratio (BCR) and Payback Period (PB) are calculated to assess the financial feasibility.

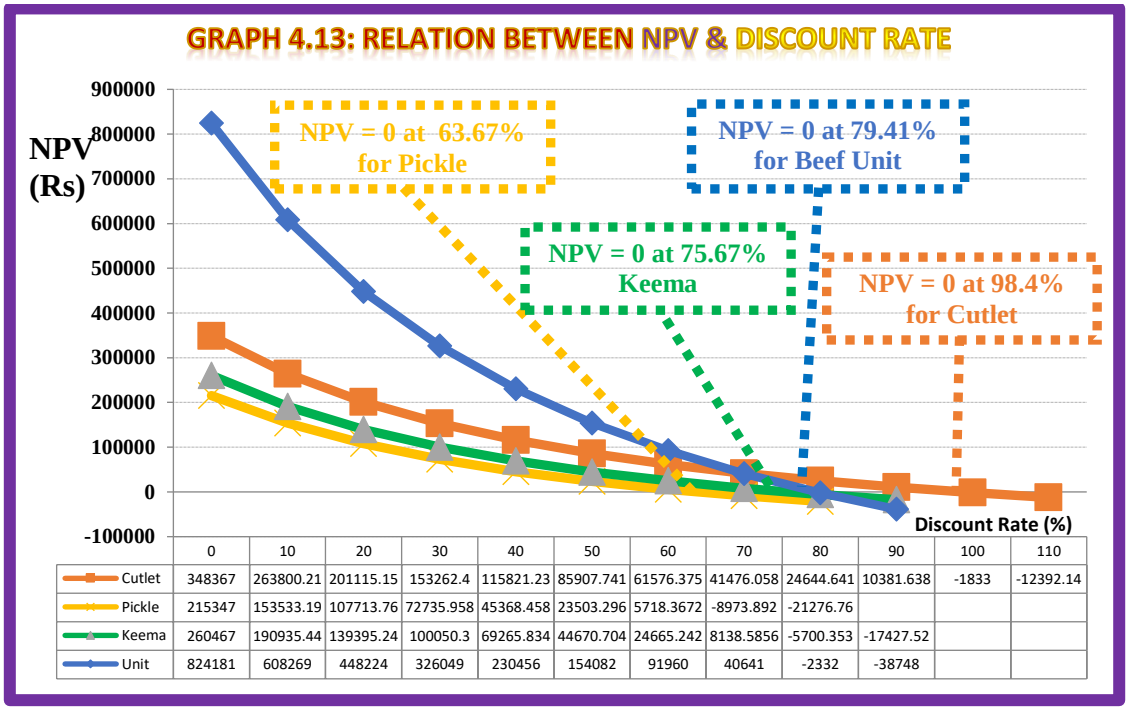
Results and Interpretation of NPV Analysis: The NPV of each product is calculated for a period of three years and results are tabulated (Table 4.18). The NPV of the Model Beef Unit is the sum of NPV's of all the products produced in the unit. The investment in the Model Beef Unit is highly favourable since NPV of individual products as well as the Unit are positive. The three products are ranked based on NPV with highest for Cutlet (Rs. 2,56,691) followed by Keema (Rs.1,85,090) and the lowest for Pickle (Rs.1,48,337).

Table 4.18: Result Summary of NPV (Rs.) Calculation of the Model Beef Unit

Items	$C_1/(1+r)^1$	$C_2/(1+r)^2$	$C_3/(1+r)^3$	C_0	NPV (Rs)
Cutlet	148468	133755	120500	146033	2,56,691
Keema	122072	109975	99076	146033	1,85,090
Pickle	120460	120460	120460	146033	1,48,337
Model Beef Unit	164800	120460	135500	438100	5,90,118

Source: Primary Data

Product-wise NPV profile (Graph4.13) shows that as discount rate increases the NPV of Cutlet, Keema, Pickle and Model Beef Unit declines.



	0	10	20	30	40	50	60	70	80	90	100	110
Cutlet	348367	263800.21	201115.15	153262.4	115821.23	85907.741	61576.375	41476.058	24644.641	10381.638	-1833	-12392.14
Pickle	215347	153533.19	107713.76	72735.958	45368.458	23503.296	5718.3672	-8973.892	-21276.76			
Keema	260467	190935.44	139395.24	100050.3	69265.834	44670.704	24665.242	8138.5856	-5700.353	-17427.52		
Unit	824181	608269	448224	326049	230456	154082	91960	40641	-2332	-38748		

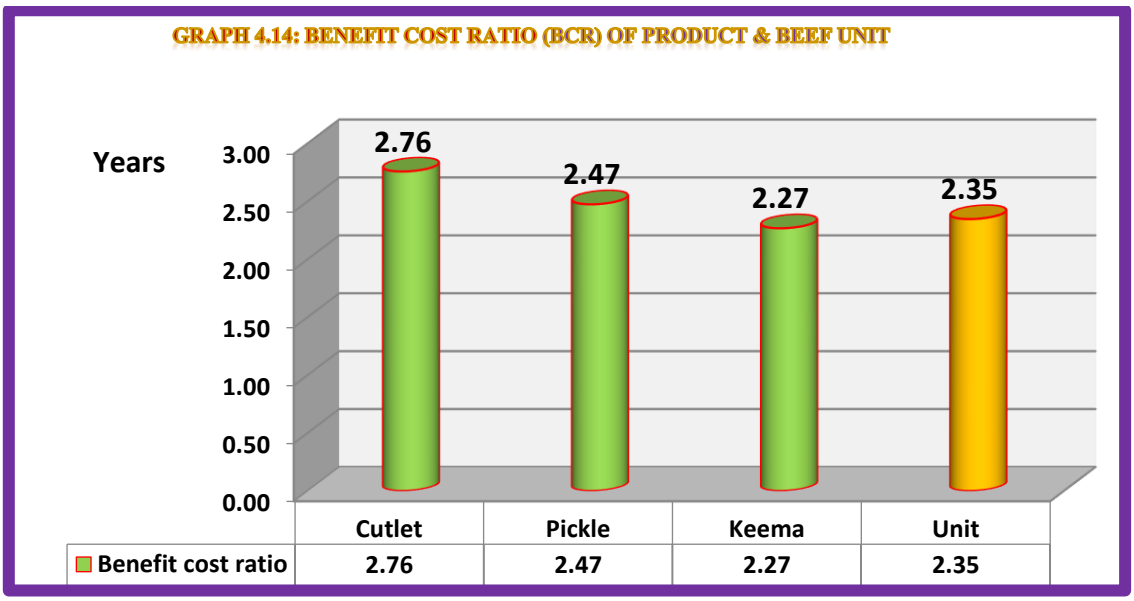
Source: Primary Data

The NPV profile of the Model Beef Unit shows that NPV becomes zero at the discount rates of 98.4 per cent for Cutlet, 75.67 per cent for Keema, 63.67 for Pickle and 79.41 per cent for Model Beef Unit. Further increase in discount rate makes the NPV negative. The investment is financially feasible as the NPV is positive both for products and Unit.

The result summary of NPV study indicates that the Model Beef Unit is profitable and agribusiness in beef products has a promising future in Kerala. Agribusiness in beef products can contribute to the nutritional food security, income,

employment and standard of living of the vulnerable sections of the rural areas of Kerala especially in the post-Covid19 phase of the economy.

Results and Interpretation of Benefit Cost Ratio (BCR) Analysis: The financial feasibility of investment in the Model Beef Unit is further assessed using the Profitability Index or Benefit Cost Ratio. The Model Beef Unit's and the product-wise BCR is computed and illustrated in Graph4.14.

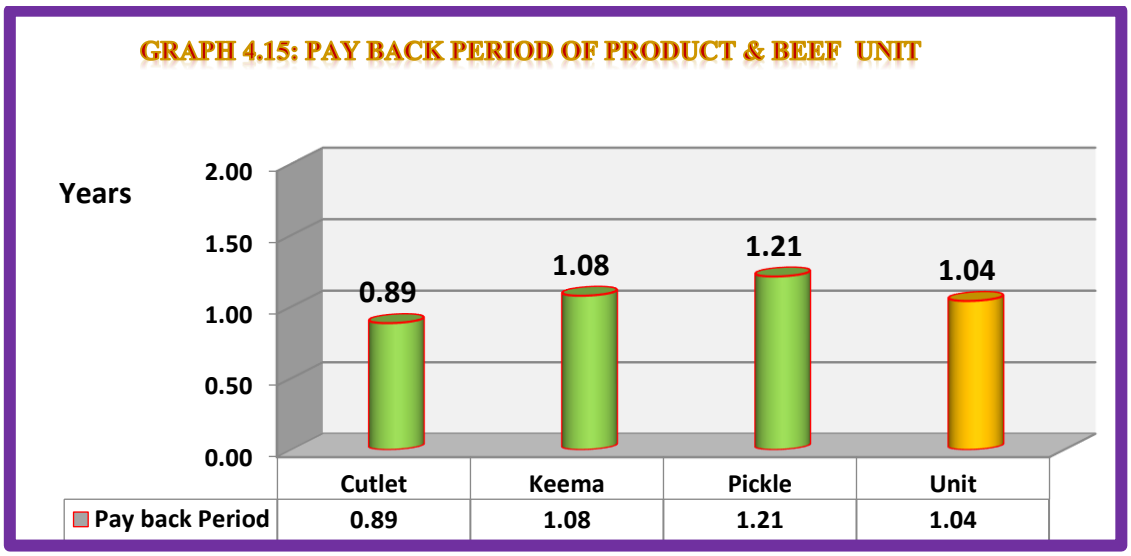


Source: Primary Data

Since the BCR > 1 for each of the product as well as for the Model Beef Unit, the investment is desirable and acceptable. Both cutlet (2.76) and Pickle (2.47) has a BCR greater than the Model Beef Unit (2.35) while Keema (2.27) has the lowest BCR.

BCR result summary shows that agribusiness in beef is financially viable and the earlier discussions proved that there exists untapped potential of beef in Kerala. What is required is the proper planning at local self-government level to develop and promote facilities for emerging entrepreneurs. Post-Covid phase of Kerala economy is looking for opportunities in livestock sector to reallocate the reverse migrants in occupations that enable them to have a living. Entrepreneurship opportunities in diversified beef products with long shelf life can ensure the nutritional food security especially of the vulnerable sections of rural areas of Kerala.

Results and Interpretation of Payback Period Analysis: The Model Beef Unit's financial feasibility is also assessed using payback period method (Graph4.15). Product-wise and Model Beef Unit payback period in years is computed, compared and illustrated.



Source: Primary Data

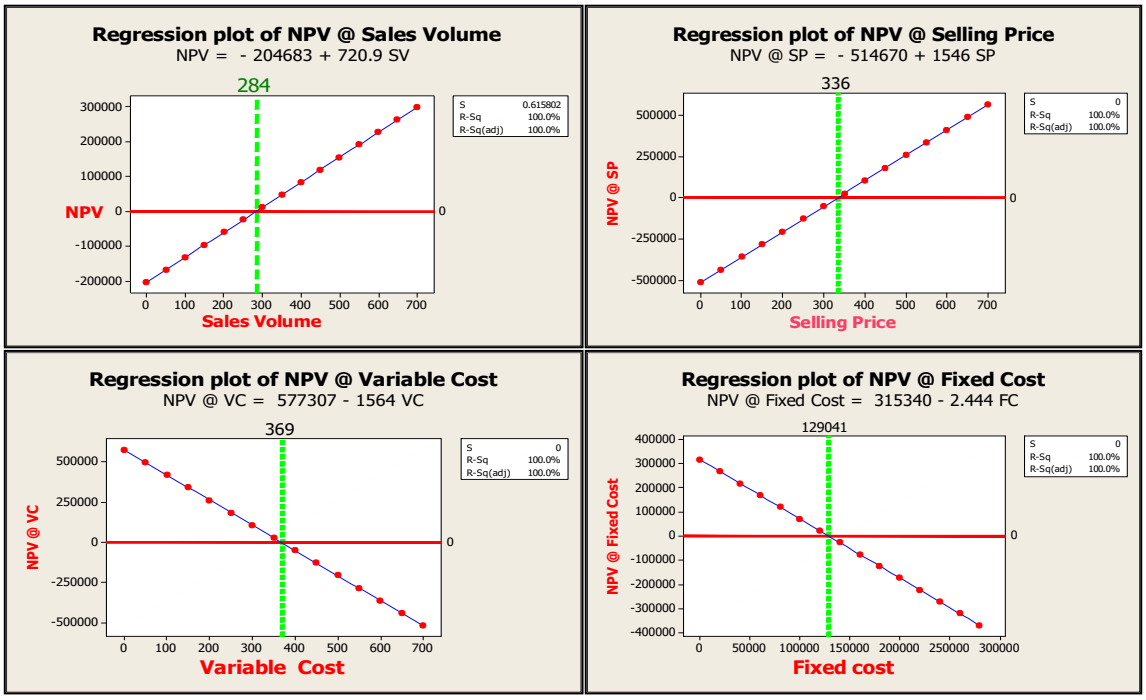
Among the products, Cutlet ranks first with the shortest payback period of 0.89 years followed by Keema (1.08 years) and Pickle (1.21 years). Only Cutlet has a lower payback period than the Model Beef Unit (1.04 year).

The Payback period result summary proves that the environment for starting agribusiness in beef products in Kerala is favourable due to the short payback period. All of these analyses prove that agribusiness in livestock resources is a profitable business in the state. This can give a better livelihood opportunity to the unemployed youth and women especially in the rural areas of Kerala. Thus, agribusiness in beef products is a sun rise industry in post-Covid 19 phase of Kerala economy to mitigate the negative impact on the lives of the vulnerable sections of the society.

Since the investments in agribusiness ventures are not risk-free, there arises the necessity to assess the feasibility of the Model Beef Unit using various risk analysis tools like Break-even, Sensitivity and Scenario methods of analyses.

DCF Break-even Analysis: The risk of investment in the Model unit depends on a number of variables influencing the profitability of each product. A linear Regression Model study using Minitab has been conducted for Beef Cutlet to estimate the Break-even point of NPV with respect to a single variable like Sales Volume (SV), Selling Price (SP), Variable Cost (VC) and Fixed Cost (FC) as shown in Graph 4.16.

Graph 4.16: Fitted Line Plot Regression Model for Break-even (Beef Cutlet)



Source: Primary Data

The rationale behind this study is to estimate the regression line intersection point with X axis, which is the break-even point of the subject variable. Similar study has been conducted for all the products and the break-even point of each product's volume, unit selling price, unit variable cost and annual fixed cost are summarised in Table 4.19.

Results and Interpretation of DCF Break-even Analysis: The results of DCF Break-even analysis shows how many units to be sold at what price and at what cost to break-even of each product of the Model Beef Unit. The Break-even volume for Cutlet is 55.6 per cent (356Kg) less than the Base Case volume. Similar reduction

in Base Case volume possible for Break-even of Keema and Pickle are 47.4 per cent (1377Kg) and 41.9 per cent (130Kg) respectively.

Table 4.19: Result Summary of DCF Break-even (Rs.) of Model Beef Unit

Variables	Beef Cutlet		Beef Keema		Beef Pickle	
	Base Case	Break-even	Base Case	Break-even	Base Case	Break-even
Volume (Kg/year)	640	284	2900	1523	310	180
Unit Selling Price (Rs/Kg)	500	336	360	334	733	537
Unit Variable Cost (Rs/Kg)	205	369	305	331	267	463
Annual Fixed Cost (Rs)	24000	129041	24000	99741	24000	84701

Source: Primary Data

The break-even unit selling price for Cutlet falls at 32.8 per cent (Rs.164) less than the Base Case selling price. Similar reduction in price possible to Break-even the Keema and Pickle are 7.2 per cent (Rs.26) and 26.7 per cent (Rs.196) less respectively.

The production will turn away from profit if its unit variable cost increases by 80 per cent (Rs.164) for Cutlet, 8.5 per cent (Rs.26) for Keema and 73.4 per cent for (Rs.196) for Pickle than the Base Case. The production will turn away from profit if its annual fixed cost increases by 437 per cent (Rs.105041) for Cutlet, 315 per cent (Rs.75741) for Keema and 253 per cent (Rs.60701) for Pickle than the Base Case.

The DCF Break-even analysis result summary reveals that agribusiness ventures in beef products is a financially feasible in Kerala since the break-even volume and selling price of each product is much lower and the break-even variable and fixed cost is much higher in the Model Rice Unit than the Base Case. Thus, agribusiness in beef products can contribute to nutritional food security, income and employment in the rural areas of Kerala to mitigate the long-term impact of Covid-19 pandemic.

Sensitivity Analysis: The study makes use of sensitivity analysis to measure the risk and uncertainty of investment in the Model Beef Unit. The analysis helps to

make desirable changes in investment decisions due to changes in the key variables independently.

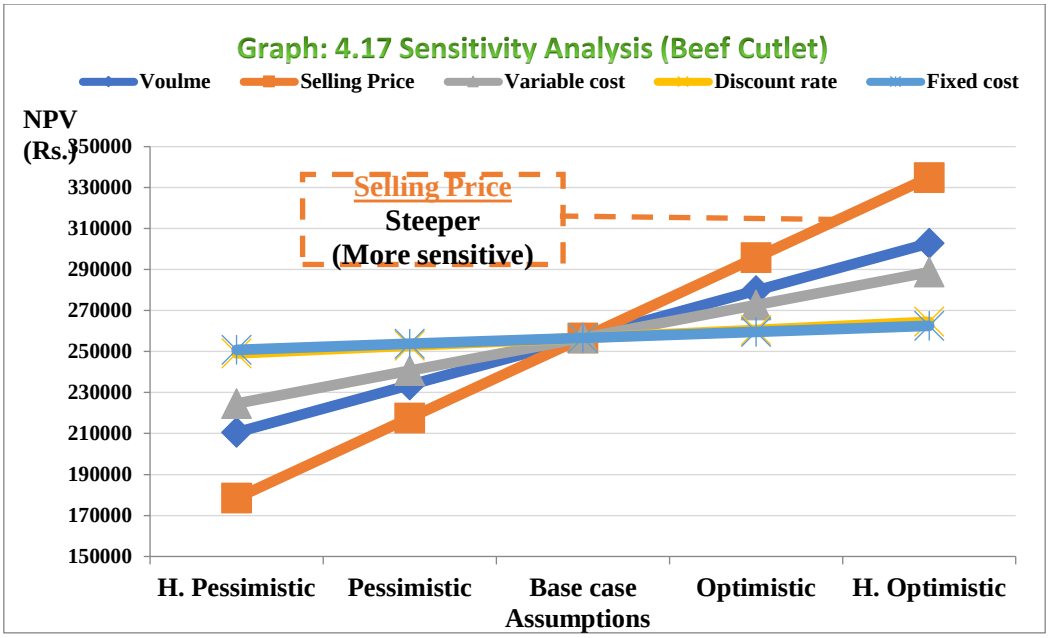
Results and Interpretation of Sensitivity Analysis for Beef Cutlet: The study compiles the percentage change in NPV of Cutlet, Keema and Pickle for each forecast of one variable under highly pessimistic, pessimistic, base case (actual or expected), optimistic and highly optimistic assumptions. Table 4.20 shows the results of sensitivity analysis of beef cutlet.

Table 4.20: Sensitivity Analysis of Beef Cutlet

Variable	Highly Pessimistic Assumptions	Pessimistic Assumptions	Base Case	Optimistic Assumptions	Highly Optimistic Assumptions	% Change
Volume (Kg/year)	576	608	640	672	704	5
NPV (Rs)	210554	233623	256691	279760	302829	9
Selling Price (Rs/Kg)	450	475	500	525	550	5
NPV (Rs)	178492	217592	256691	295791	334890	15
Variable Cost (Rs/Kg)	225.5	215.25	205	194.75	184.5	5
NPV (Rs)	224630	240660	256691	272722	288753	-6
Discount Rate (%)	12.1	11.55	11	10.45	9.9	5
NPV (Rs)	249110	252870	256691	260575	264523	-2
Annual Fixed Cost (Rs)	26400	25200	24000	22800	21600	5
NPV (Rs)	258544	261533	256691	267512	270502	-4

Source: Primary Data

For every 5 per cent change in selling price and volume from the Base Case, NPV response is 15 per cent and 9 per cent respectively. Sensitivity of 5 per cent change in variable cost, annual fixed cost and discount rate results in -6 per cent, -4 per cent and -2 per cent change in respective NPVs. The NPV of Cutlet is positively related to volume and selling price but negatively related to variable cost, discount rate and annual fixed cost. The sensitivity of each of these variables to NPV is plotted graphically (Graph4.17). The NPV of Beef Cutlet is most sensitive (steeper the slope) to selling price followed by volume and variable cost.



Source: Primary Data

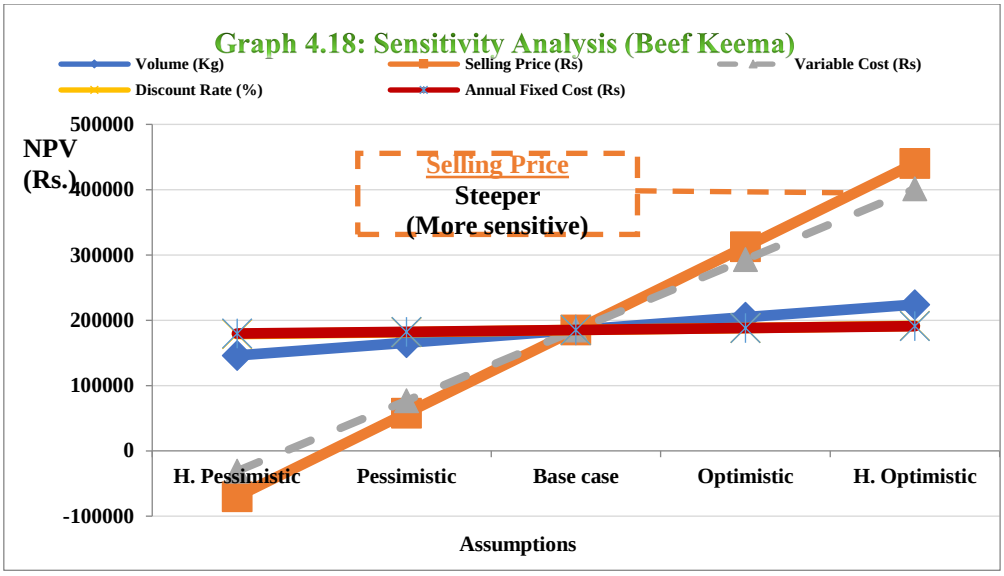
Table 4.20 shows the results of sensitivity analysis of beef cutlet.

Table 4.21: Sensitivity Analysis of Beef Keema

Variable	Highly Pessimistic Assumptions	Pessimistic Assumptions	Base Case	Optimistic Assumptions	Highly Optimistic Assumptions	% Change
Volume (Kg/year)	2610	2755	2900	3045	3190	5
NPV (Rs)	146133	165602	185090	204579	224068	11
Selling Price (Rs/Kg)	324	342	360	378	396	5
NPV (Rs)	-70033	57528	185090	312652	440214	69
Variable Cost (Rs/Kg)	335.5	320.25	305	289.75	274.5	5
NPV (Rs)	-31056	77017	185090	293164	401237	-58
Discount Rate (%)	12.1	11.55	11	10.45	9.9	5
NPV (Rs)	178857	181948	185090	188284	191530	-2
Annual Fixed Cost (Rs)	26400	25200	24000	22800	21600	5
NPV (Rs)	179714	182158	185090	188023	190955	-2

Source: Primary Data

For every 5 per cent change in selling price and volume from the Base Case, NPV response is 69 per cent and 11 per cent respectively. Sensitivity of 5 per cent change in variable cost, annual fixed cost and discount rate results in -58 per cent and -2 per cent each change in respective NPVs. The sensitivity of each of these variables to NPV is plotted graphically (Graph 4.18).



Source: Primary Data

The NPV of Beef Keema is positively related to volume and selling price but negatively related to variable cost, discount rate and annual fixed cost. The NPV of Beef Cutlet is most sensitive (steeper the slope) to selling price followed by volume and variable cost. Table 4.22 shows the results of sensitivity analysis of beef pickle.

Table 4.22: Sensitivity Analysis of Beef Pickle

Variable	Highly Pessimistic Assumptions	Pessimistic Assumptions	Base Case	Optimistic Assumptions	Highly Optimistic Assumptions	% Change
Volume (Kg/year)	279	294.5	310	325.5	341	5
NPV (Rs)	113035	130686	148337	165988	183639	12
Selling Price (Rs/Kg)	659.7	696.35	733	769.65	806.3	5
NPV (Rs)	92808	120573	148337	176101	203865	19
Variable Cost (Rs/Kg)	293.7	280.35	267	253.65	240.3	5
NPV (Rs)	128110	138224	148337	158450	168564	-7
Discount Rate (%)	12.1	11.55	11	10.45	9.9	5
NPV (Rs)	142795	145544	148337	151176	154061	-2
Annual Fixed Cost	26400	25200	24000	22800	21600	5
NPV (Rs)	142472	145404	148337	151269	154202	-2

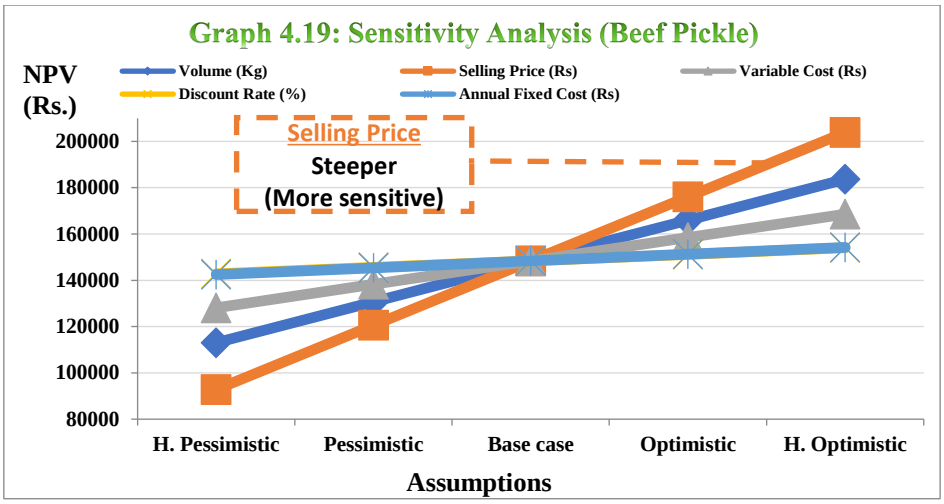
Source: Primary Data

NPV of Beef Pickle is positively related to volume and selling price but negatively related to variable cost, discount rate and annual fixed cost. For every 5 per cent change in selling price and volume from the Base Case, NPV response is 19 per cent and 12 per cent respectively. Sensitivity of 5 per cent change in variable

cost, annual fixed cost and discount rate results in -7 per cent and -2 per cent each change in respective NPVs.

The sensitivity of each of these variables to NPV is plotted graphically (Graph 4.19). The NPV of Beef pickle is most sensitive (steeper the slope) to selling price followed by variable cost and volume.

Table 4.19: Sensitivity Analysis of Beef Pickle



Source: Primary Data

To summarise, the sensitivity analysis shows that Beef Agribusiness Units in Kerala are more sensitive to selling price and variable cost which are mostly decided by the market forces. The sensitivity analysis of the Model Beef Unit proves that in spite of the high sensitivity to price and cost, the unit is making profits and the state has promising opportunities in agribusiness in ready to cook and ready to eat beef products especially in the post Covid-19 phase of Kerala economy.

Scenario Analysis: The study analyses the risk and uncertainty of investment and due to simultaneous changes in volume, price, cost and discount rate on each beef product's NPV under different scenarios. Results of scenario analysis help the investor to make desirable changes in investment decisions in the Model Beef Unit.

Results and Interpretation of Scenario Analysis: Scenario summary of Beef Cutlet (Table 4.23) shows that the Base Case scenario NPV of around Rs.2.56 lakhs range between a profit of Rs.0.9 lakhs under highly pessimistic and Rs.3.54 lakhs under highly optimistic scenarios.

Table 4.23: Scenario Summary of Beef Cutlet

Changing Variables	Highly Pessimistic Scenario	Pessimistic Scenario	Base Scenario	Optimistic Scenario	Highly Optimistic Scenario
Volume (Kg/year)	560	600	640	680	720
Selling Price (Rs/Kg)	450	475	500	525	550
Variable Cost (Rs/Kg)	225	215	205	195	185
Discount Rate (%)	13	12	11	10	9
Annual Fixed Cost (Rs)	26000	25000	24000	23000	22000
Result - NPV (Rs.)	**90082**	**168607**	**256691**	**354819**	**463503**

Source: Primary Data

Thus, Beef Cutlet seems to be profitable even under highly pessimistic scenario. Scenario summary of Beef Keema (Table 4.24) shows that the Base Case scenario NPV of Rs.1.85 lakhs range between profit of Rs.85.7 thousand under pessimistic scenario and Rs.4.24 lakhs under highly optimistic scenario.

Table 4.24: Scenario Summary of Beef Keema

Changing Variables	Highly Pessimistic Scenario	Pessimistic Scenario	Base Scenario	Optimistic Scenario	Highly Optimistic Scenario
Volume (Kg/year)	2500	2700	2900	3100	3300
Selling Price (Rs/Kg)	350	355	360	365	370
Variable Cost (Rs/Kg)	315	310	305	300	295
Discount Rate (%)	13	12	11	10	9
Annual Fixed Cost (Rs)	26000	25000	24000	23000	22000
Result - NPV (Rs)	**-822**	**85744**	**185090**	**297870**	**424774**

Source: Primary Data

But under highly pessimistic scenario, the product will incur a loss of Rs.822. Thus, compared to Cutlet, Keema seems to be a less preferable choice with negative NPV under highly pessimistic scenario.

Table 4.25 shows the scenario summary of Beef Pickle. The Base Case scenario NPV of Beef Pickle around Rs.1.48 lakhs range between a profit of Rs.0.38 lakhs under highly pessimistic scenario and Rs.2.82 lakhs under highly optimistic scenario. Thus, Beef Pickle seems to be profitable even under highly pessimistic scenario.

Table 4.25: Scenario Summary of Beef Pickle

Changing Variables	Highly Pessimistic Scenario	Pessimistic Scenario	Base Scenario	Optimistic Scenario	Highly Optimistic Scenario
Volume (Kg/year)	270	290	310	330	350
Selling Price (Rs/Kg)	667	700	733	766	799
Variable Cost (Rs/Kg)	281	274	267	260	253
Discount Rate (%)	13	12	11	10	9
Annual Fixed Cost (Rs)	26000	25000	24000	23000	22000
Result - NPV (Rs)	**38,656**	**90,643**	**1,48,337**	**2,12,024**	**2,82,009**

Source: Primary Data

The above discussion on the Scenario analysis proves that all the three beef products are financially feasible under different scenarios except Keema under highly pessimistic scenario. Beef is the secular dish among Kerala population irrespective of religion and caste. The popularity of beef dishes among Malayalee is visible even in the midst of a raging Covid19 pandemic as youngsters in Kerala are mobilizing fund by conducting "beef biriyani meal". The study opens up profitable Agri-entrepreneurship opportunities in beef products with the support of local self-government to reallocate the reverse migrants in gainful employment in Kerala. Development of agribusiness in beef products can also mitigate the long-term impact of the pandemic on food nutritional security and contribute to the sustainable development of agriculture.

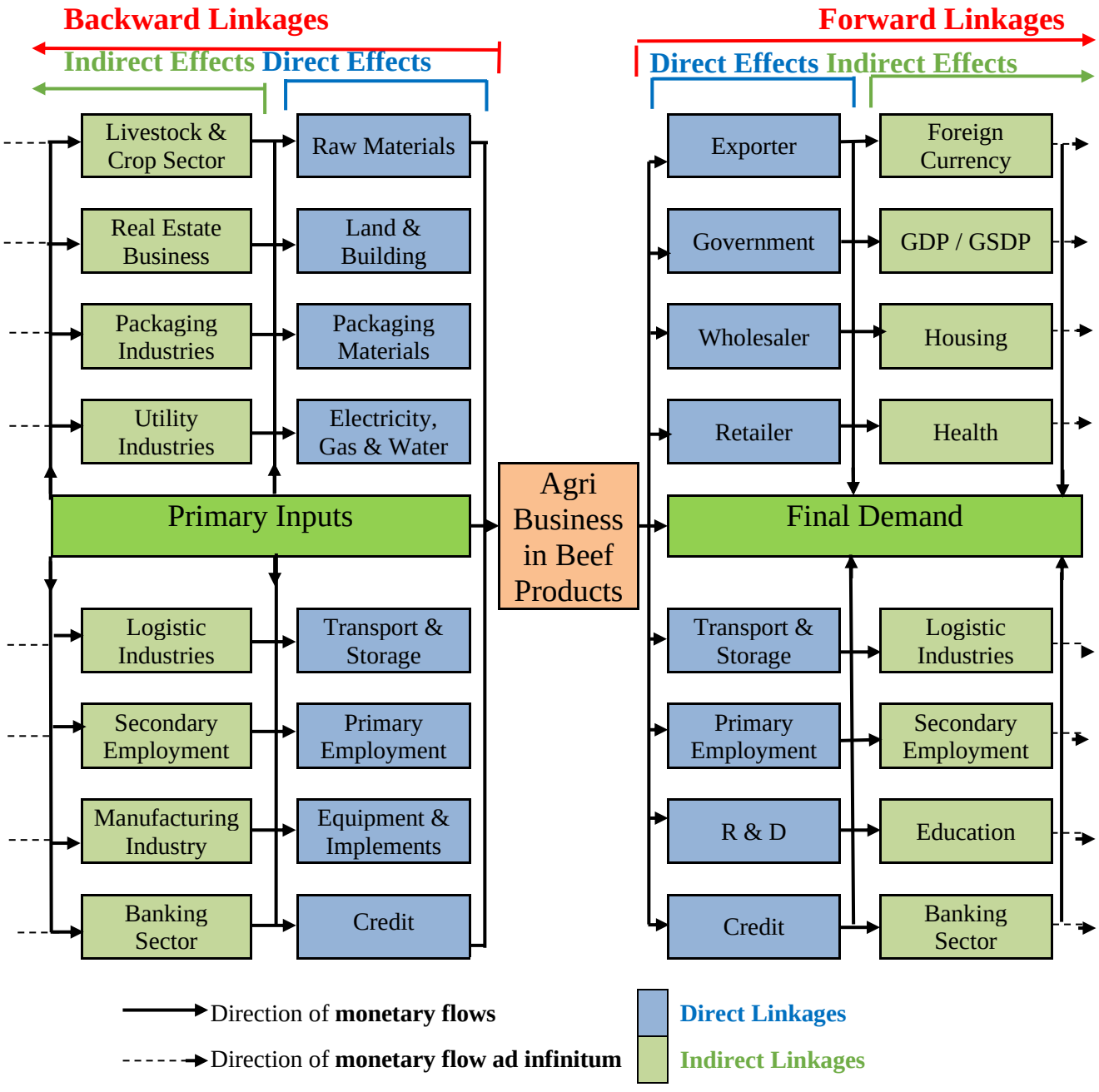
4.5 LINKAGE EFFECTS OF AGRIBUSINESS IN BEEF

The discussion on the linkage effects of livestock sector agribusiness focusses on its direct and indirect forward and backward linkages. Small scale livestock agribusiness entrepreneurs of Kerala play a vital role in development of rural areas through the direct and indirect backward and forward linkages between sectors as well as rural and urban areas. The domestic availability of raw materials, presence of young and energetic unemployed male and female labour, credit support from banks, growing domestic as well as export market and government support in the form of protection, subsidies and tax exemptions supports the progress of these ventures. Therefore, this section analyses the emerging opportunities of livestock sector agribusiness in the post-Covid phase of Kerala economy through the direct-

indirect, inter-sectoral and urban-rural backward-forward linkages as illustrated in Flow Chart 4.1.

Direct & Indirect Backward Linkage Effects of Livestock Sector Agribusiness: Livestock sector agribusiness develops backward linkage effects directly on demand for primary inputs and indirectly on secondary producing sectors as illustrated below.

Flow Chart4.1: Agribusiness Linkages of Model Beef Unit



Stimulus for Livestock and Crop Sector: Greater demand for raw beef and other crop inputs by Model Beef Unit enhances the negotiating ability of livestock farmers and cultivators for a better price. This gives a stimulus to modernize and diversify the livestock and crop production system. The average annual production of the Model Beef Unit is 640Kg cutlet, 2900Kg keema and 310Kg pickle. The direct backward linkage effect is the increased demand for the basic raw materials such as raw beef, vegetables, egg, condiments, spices, vegetable oil etc. The increased demand for these inputs causes a positive backward linkage effect on the primary production in the crop and livestock sectors which raises the price and income of the rural masses working in these sectors.

Stimulus to Cattle feed Industries: Increased demand for raw beef indirectly give a stimulus to cattle feed industries to modernize and diversify the production of cattle feed as per the requirement of farmers. The closure of cattle feed plants in Kerala for few days due to Covid 19 pandemic caused shortage of cattle feed in the market. This supports the argument that there exists indirect backward linkage between agribusiness and cattle feed industry.

Demand for land and building: Starting of an agribusiness beef unit has a direct backward linkage effect on the demand for land and building. The search for land by agri-entrepreneurs directly increases the rent/price of land and indirectly gives a boost to real estate business. Increased demand for buildings directly raises the rent on building which indirectly give a boost to the construction sector.

Growth of Banking Sector: Agri-entrepreneurs require capital to invest and they approach the banking institutions for credit which indirectly enhances the credit creation capacity of banking institutions. Increased credit requirements from Agri-entrepreneurs and livestock farmers necessitate the expansion of banking services.

Better Living Standards: Model Beef Unit creates a positive impact on the standard of living of livestock farmers and cultivators in terms of higher income, employment, nutritious food, better education, health and housing. The urban-rural and inter-sectoral linkage paved the way for inclusive growth of the vulnerable sections of the people in rural areas.

Boost to Manufacturing Sector: Model beef unit requires modern equipment and implements for processing and value addition of beef products. Beef processing units require Meat Mincer, Deep Freezer, Mixer Grinder, Cooking Range, Packaging and Labelling Machine, Planetary Mixer Cutlet Mould, Cooking Vessels and Stainless Tables. This gives a positive stimulus to manufacturing industries producing and supplying implements, machines and equipment to beef agribusiness units. Model Beef Unit requires packaging materials as inputs. This gives a stimulus to the industries supplying packaging materials like, bags, boxes, bottles, lids, covers, stickers, labels etc.

Growth of Logistics and Utility Industries: Model Beef Unit captures backward inter-sectoral and intra-sectoral supply chain that provides goods/services. Increased demand for raw materials requires the development of transport, storage and communication services which in turn promote the logistics industries. This can reduce wastage of livestock resources and strengthen the cold storage and supply chain linkages. Model Beef Unit requires utilities like gas, electricity and water. Greater demand for cooking gas, electricity and water leads to the growth of utility industries.

Employment Generation: Model Beef Unit creates a multiplier effect on primary and secondary employment in primary and intermediate input sectors. This gives stimulus to input suppliers to modernize and diversify production of inputs. Along with Agri-entrepreneurship, inter-sectoral and intra-sectoral employment opportunities are generated in primary secondary and tertiary sectors.

Efficiency in Marketing: Technical support and guidance by agribusiness units increase the productivity and quality of inputs. Long term contracts signed between the agribusiness units and input suppliers avoids middlemen, reduce the price spread, marketing uncertainty and maintains better quality.

Direct and Indirect Forward Linkage Effects of Livestock Sector Agribusiness: With the emergence of modern agribusiness in beef products, direct and indirect forward linkages of processed and value-added livestock products start from the

processors. Direct and indirect forward linkages of the Model Beef Unit as illustrated in the flow diagram can be detailed as follows.

Expansion of Markets: Increased rate of industrialization, urbanization, high literacy, nuclear family set up, higher percentage of middle-income families and changing food habits in Kerala widens the market for processed goods. Value addition and processing increase the value and shelf life of livestock products and processed food requires less storage space. The marketing of the products of the Model Beef Unit in the rural areas of Kerala is taking place through the retail shops and outlets. The growth of Malls, Hyper markets and supermarkets with a wide range of products offers market for agribusiness products in cities. Thus, marketing avenues are increased and a rural-urban link is developed through the marketing of the Model Beef unit's products.

Export Promotion: Commercial agribusiness production increases the volume of marketable surplus. Diversified production of processed and value-added beef products directly widens the export market in volume and direction. Export earnings give a stimulus to import advanced technological know-how for greater diversification, productivity and economic development.

Growth of Professional Agri-entrepreneurship: Agribusiness in beef products enhances healthy competition among Agri-entrepreneurs which provides adequate profit to producers and ensures better quality products to consumers at reasonable prices. Agri-entrepreneurs require professional training and qualification to excel in their job and this led to the growth of Agricultural Universities and research and training institutions.

Employment Generation: Multiplier effect on secondary and tertiary employment generation in ready to cook and ready to eat production sectors especially in rural areas. This can attract large number of unemployed youth and women in rural areas towards agribusiness. Agribusiness opportunities can absorb workers from agriculture who face disguised unemployment. Emerging agribusiness in livestock sector can contribute to the reallocation of reverse migrants due to Covid 19 pandemic.

Nutritional Food Security: Better employment, income and standard of living lead to changes in the taste and preferences of the people. Inclusion of a variety of nutritious processed food items in the diet ensures market for agribusiness products and helps to attain food security. Thus, emerging agribusiness beef units can contribute to mitigate the long-term impact of Covid19 pandemic on nutritional food security.

Growth of Logistics Industries: Model Beef Unit requires a well- developed storage and marketing supply chain management for the timely supply of quality products to the consumers both at the domestic and international markets. This indirectly led to the growth of modern logistics industries with efficient and professional management in transportation and communication.

Sustainable and Inclusive Development: Emerging agribusiness can achieve the goals of sustainable economic development through women empowerment and inclusive growth. Positive economic linkage through government support in the form of subsidies and tax concession will reach the vulnerable people in rural areas especially the youth and women.

Stimulus to Research and Development: Agribusiness in beef products requires latest and modern technology which enhances the scope for research and development. Agri-entrepreneurs utilize the innovations through the expansion of educational, scientific and technical research facilities to produce diversified beef products as per the tastes and preferences of the consumers.

Growth of Banking and Insurance Sector: Agribusiness enhances domestic as well as foreign trade which requires the help of banking institutions for settling bills and accounts. This led to the expansion of existing public, private and foreign commercial banks as well as the emergence of new generation banks.

The above discussion reveals that there is a great need for developing efficient backward and forward agribusiness linkages in the state to enhance production, productivity, offer better price to farmers, create better marketing and storage facilities, expand employment opportunities, increase rural income and

thereby reduce rural poverty. Ultimately, agribusiness linkages strengthen the inter sectoral and urban rural linkages leading to agricultural and economic development of the state with a rural focus.

4.6 CHALLENGES FACED BY AGRI-ENTREPRENEURS OF BEEF

The earlier discussions strongly argue that livestock sector agribusiness play a significant role in the agricultural and economic development of Kerala. It is undoubtable that local self-government institutions at the district, block and panchayat levels are supporting and encouraging Agri-entrepreneurs through their development policies and programmes. Kerala government is considering livestock sector agribusiness as one of the thrust areas to ensure long-term nutritional food security and a means to reallocate the reverse migrants in gainful employment in the post Covid 19 pandemic development phase. In spite of the government measures to ensure the quality of livestock resources through quality feed and fodder supply, provision of adequate infrastructure in the value chain and marketing operations, fixing quality standards compatible with international standards etc., livestock entrepreneurs face many challenges. In this context, it is relevant to discuss the challenges and problems faced by the livestock entrepreneurs of Kerala.

In Kerala, livestock rearing is characterized by production by masses compared to mass production in advanced countries. Due to the absence of sophisticated and modern slaughtering mechanisms, the chances of contamination are high which lowers the quality of domestically available raw meat. Livestock products have low shelf life and there is the difficulty in cold chain maintenance due to high electricity cost and frequent power failure in the state. In spite of the advancement in education and research in Kerala, the poor disease diagnosis facilities and health and hygiene maintenance adversely affects the domestic production potential of livestock sector. The state lacks the application of genomic tools to develop and improve livestock breeds, production and productivity.

Inadequate domestic availability of quality nutrients through feed and fodder reduces the quality of meat. The seasonality in the supply of raw livestock resources and the seasonal fluctuations in demand for livestock products create instability in price and uncertainty in profits. Kerala lacks sufficient cold chain facilities and well-organized marketing system. Lack of reliable and accurate instruments and equipment for processing and infrastructure for storage leads to wastage of livestock resources. Heavy requirement of capital and lack of trained and skilled workers is another challenge faced by the livestock entrepreneurs in Kerala. Insufficient quality and safety standards and stringent phytosanitary measures of importing countries resulted in fluctuating export trade.

Preference of domestic consumer in Kerala is for raw meat rather than frozen meat or value-added meat products. This pauses a challenge to the entrepreneurs. The socio-religious taboos against the consumption of beef and pork by Hindus and Muslims in Kerala is less compared to north Indian states. But still, it reduces the demand for meat and meat products. The linkage effect of agribusiness in Kerala is reaching only very small proportion of livestock entrepreneurs. Majority of agribusiness activities in Kerala are done by small entrepreneurs without much professional skill in management. But they face stiff competition from a few large scale agri-entrepreneurs with sophisticated technology and product brand names. With limited capital, these small entrepreneurs cannot invest for long-term benefits.

Thus, agricultural policy reforms should be directed towards supporting the large number of small agri-entrepreneurs. At the same time agri-entrepreneurs should be competent enough to produce the products as per the aspirations of consumers regarding attributes like nutritive value, taste, colour, flavour, convenient packing, and easy availability. Agribusiness regulations all over the world are focusing on consumer welfare encircled by environmental protection, food health, safety standards and child labour issues. The need of the hour is sustainable agribusiness by safeguarding the welfare of both producers and consumers. Thus, the prevailing functional and institutional inefficiencies need to be addressed and online marketing facilities need to be coordinated.

4.7 CONCLUSION

The study proves that livestock sector plays a significant role in Kerala economy in terms of nutritious food, income, employment and export earnings. It is a livelihood option for 2.4 per cent of the rural households in Kerala. Its share in the Gross State Value Added (GSVA) of Kerala is 2.76 per cent. The declining profit and low social profile of the people engaged in livestock rearing keep the young generation of Kerala away from this sector. Instability in price, insufficient infrastructure, inadequate processing, value addition and marketing facilities lead to wastage and underutilization of livestock resources. Emergence of agribusiness and agri-entrepreneurship can augment this problem through its backward and forward linkage effects. It can create additional demand for livestock products which in turn increase the price of output, can transform the lives of people employed in livestock rearing or working in the livestock agribusiness enterprises. Agribusiness in livestock sector can ensure sustainable economic development of rural areas. The study results prove that even under uncertain pessimistic situations agribusiness in livestock resource is profitable. The forward and backward linkages of agribusiness will directly or indirectly give a stimulus to the economic development of the state.

CHAPTER V

DAIRY SECTOR ENTERPRISES

5.1 INTRODUCTION

Dairy sector has a vital role to play in the socio-economic development of an economy. It supplies cost effective and nutritive food, provides supplementary family income, generate gainful employment to landless labourers, small / marginal farmers, youth and women especially in the rural areas. As per the estimates of Food and Agriculture Organisation, (FAO, 2019) India is the largest milk producing country in the world contributing around 22 per cent of the world milk production. As per the Basic Animal Husbandry Statistics (BAHS, 2019), the total milk production in the country is187.7 million tonnes with a growth rate of 6.5 per cent over the previous year. In spite of the top-ranking position in milk production, the potential of dairy resources in the country is not optimally utilised. This is evident from the fact that the share of Indian dairy sector in the world export is very negligible compared to the contributions of around 68 per cent by New Zealand, European Union and United States of America (USA) together.

The significance of dairy sector in Kerala is evident from the fact that it is an important primary/secondary source of livelihood for millions of rural families in Kerala. Milk and milk products are an unavoidable item in the diet of the people in Kerala but the daily per capita availability of milk in the state is only 189 grams per day as against the national availability of 394 grams. Kerala depends on the neighbouring states to bridge the demand supply gap in milk production.

The total milk production in Kerala is 2.55 million tonnes in 2018-19 contributing only 1.36 per cent to national milk output with a negative growth rate of -1.1 per cent over the previous year (BAHS, 2019). The negative growth rate in Kerala is attributed to the climate related disasters like floods during 2018 and 2019.The daily average yield per exotic/crossbred animal in Kerala is 10.17 Kg which is much higher than the national level yield of 7.95 Kg. But, the daily average yield per indigenous/non-descript animal of 2.97 Kg in Kerala is lower than the

national yield of 3.01 Kg. Lower shelf life, production by masses and greater chances of contamination, variations in raw milk standardisation, seasonality in supply, difficulty in cold chain maintenance due to high electricity cost and frequent power failure, inadequate processing and value addition etc. lead to wastage and underutilization of dairy resource potential in the state. Emergence of agribusiness and agri-entrepreneurship can augment this problem through its backward and forward linkage effects.

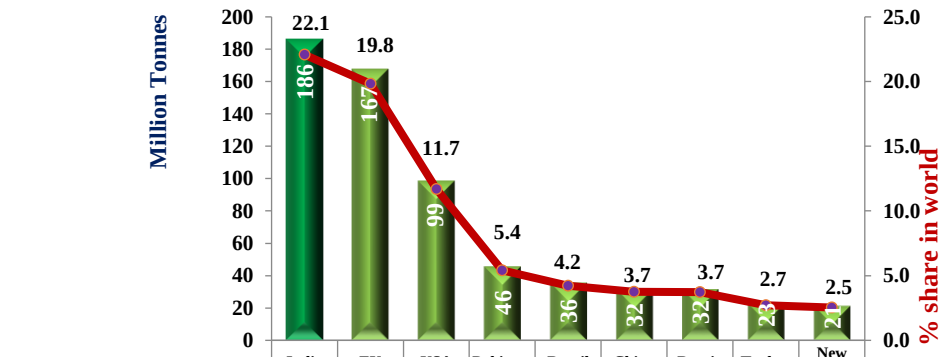
Therefore, it is relevant to discuss the feasibility of agribusiness in the dairy sector of Kerala. Introductory section of this chapter is followed by a discussion to assess the potential of dairy sector in India and Kerala. This necessitates the feasibility study of agribusiness in the dairy products in Kerala. Last section develops and identifies the linkages of agribusiness as well as the challenges faced by the emerging dairy Agri-entrepreneurs of Kerala.

5.2 PERFORANCE OF DAIRY SECTOR IN KERALA

Let us start the discussion on the potential of agribusiness in India in general and Kerala in particular. To understand the status of India in the international milk production scenario, let us analyse the contribution of India in the world milk output.

India's Position in World Milk Production Scenario: India is the largest milk producer in the world with a production of 186 million tonnes contributing 22.1 per cent in the world milk output (Graph 5.1) followed by European Union (EU) with

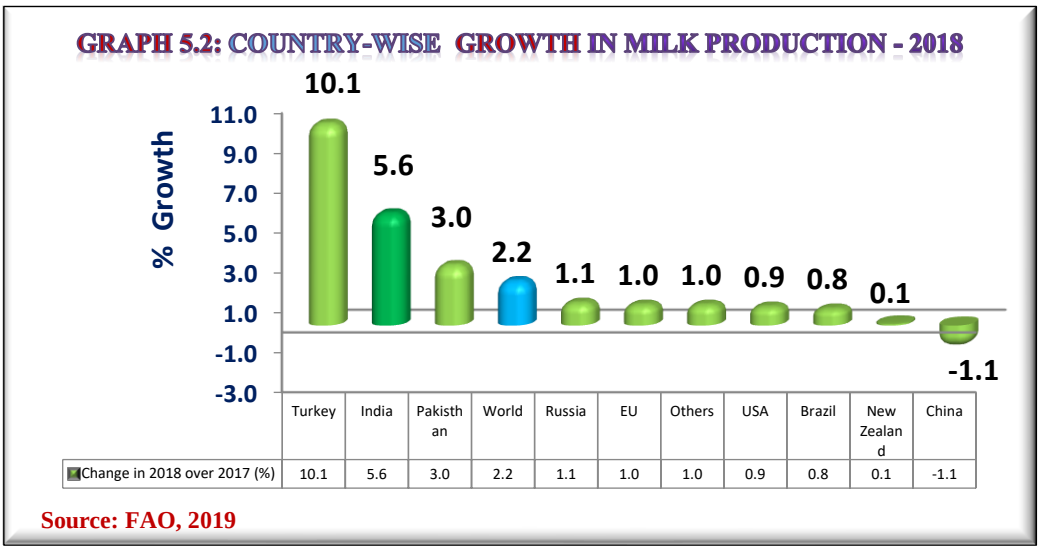
GRAPH 5.1: COUNTRY-WISE MILK PRODUCTION & SHARE IN WORLD - 2018



	India	EU	USA	Pakistan	Brazil	China	Russia	Turkey	New Zealand
Production (Million Tonnes)	186	167	99	46	36	32	32	23	21
% Share in 2018	22.1	19.8	11.7	5.4	4.2	3.7	3.7	2.7	2.5

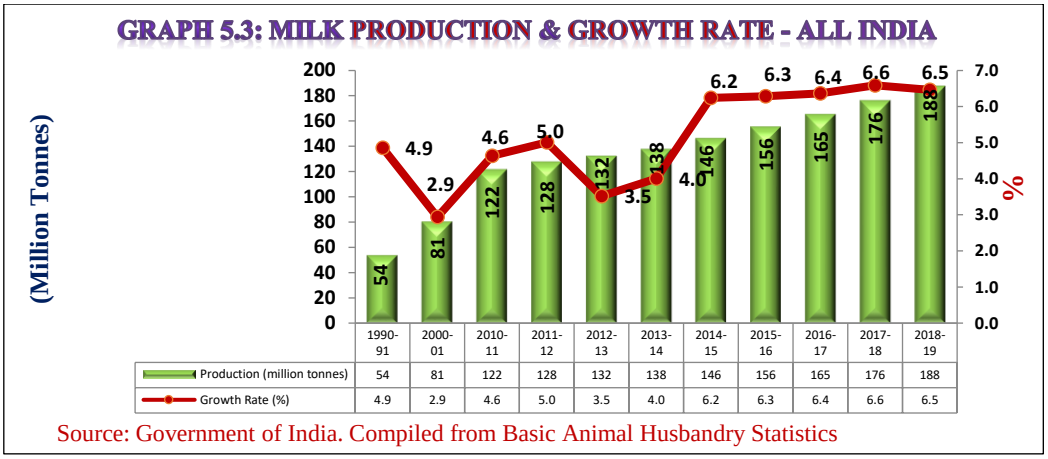
Source: FAO, 2019

167 million tonnes (19.8 per cent), United States of America (USA) with 99 million tonnes (11.7 per cent) and Pakistan with 46 million tonnes (5.4 per cent). India, EU and USA together constitute about 53 per cent of world milk production. The global milk output in 2018 is 843 million tonnes with an increase of 2.2 per cent over the previous year (Graph 5.2).



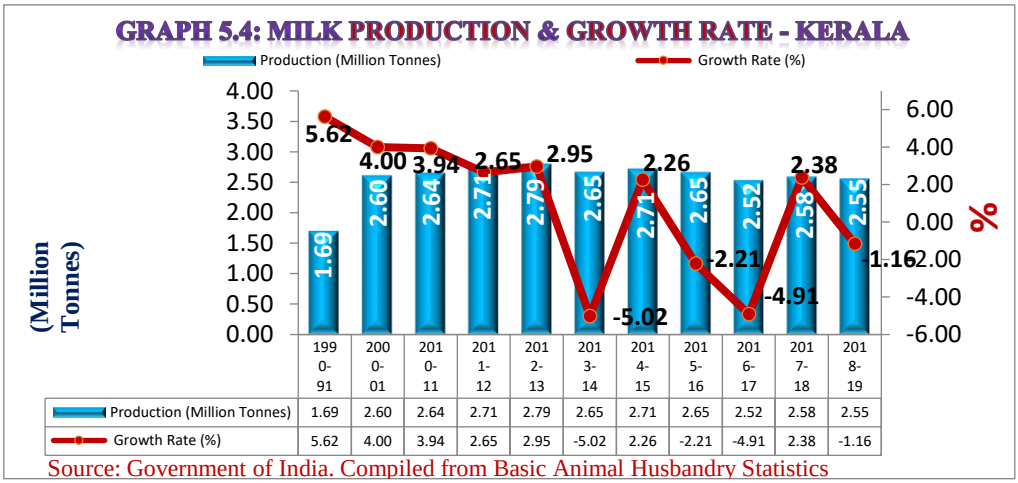
India ranks second in annual growth rate of milk production (5.6 per cent) in 2018 after Turkey (10.1 per cent). India's growth rate is much better than countries like European Union (1 per cent), USA (0.9 per cent), New Zealand (0.1 per cent) and China (-1.1) who are the major players in the international dairy product market. The higher growth rate is realised in India due to the increase in the number of in-milk animals along with improvements in milk collection processes. India's milk production is characterised by production by masses compared to mass production by advanced countries.

Trends in Milk Production and Annual Growth Rate in India and Kerala: Production of milk in India shows an increasing trend from 54 to 188 million tonnes between 1990-91 and 2018-19 (Graph 5.3). This is due to the increase in the number of in-milk animals and greater productivity. Even though the annual growth rate of milk production was fluctuating between 1990-91 and 2012-13, it steadily increased from 3.52 per cent to 6.6 per cent between 2012-13 and 2017-18.



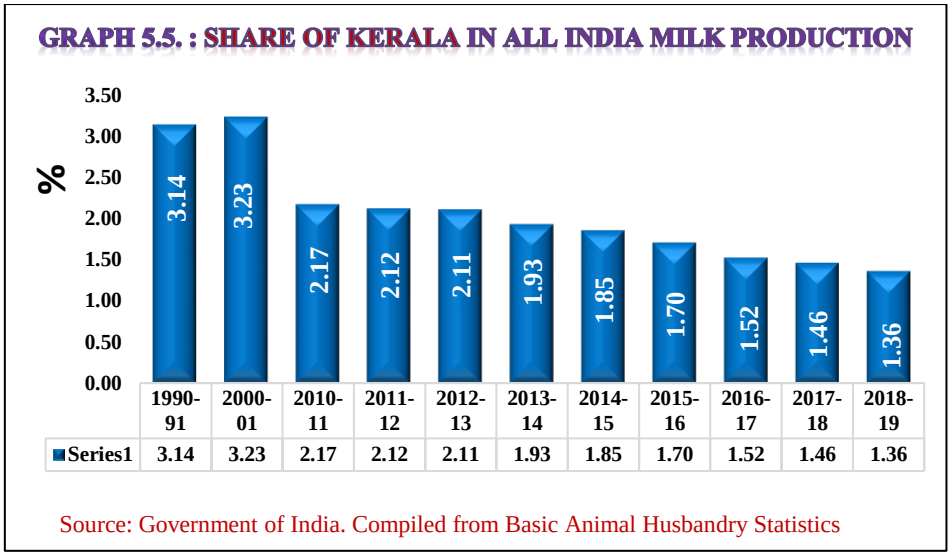
Source: Government of India. Compiled from Basic Animal Husbandry Statistics

However, the milk output growth rate slightly lowered to 6.47 per cent in 2018-19 due to the vagaries of climate. Milk production in Kerala shows an increasing trend (Graph 5.4) from 1.69 to 2.79 million tonnes between 1990-91 and 2012-13, but it started fluctuating between 2012-13 and 2018-19 with negative growth rates except in 2014-15 and 2017-18.

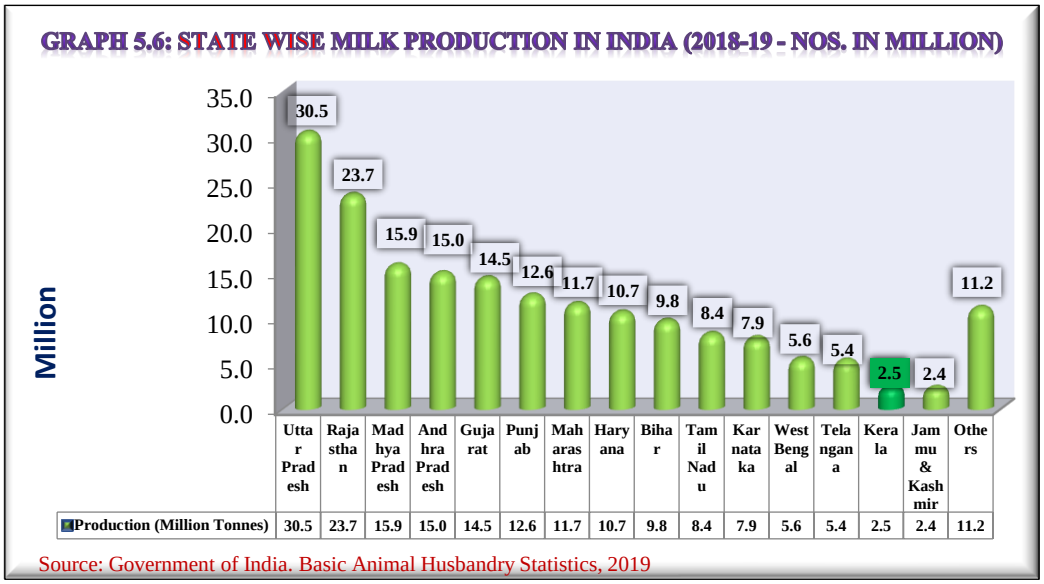


Source: Government of India. Compiled from Basic Animal Husbandry Statistics

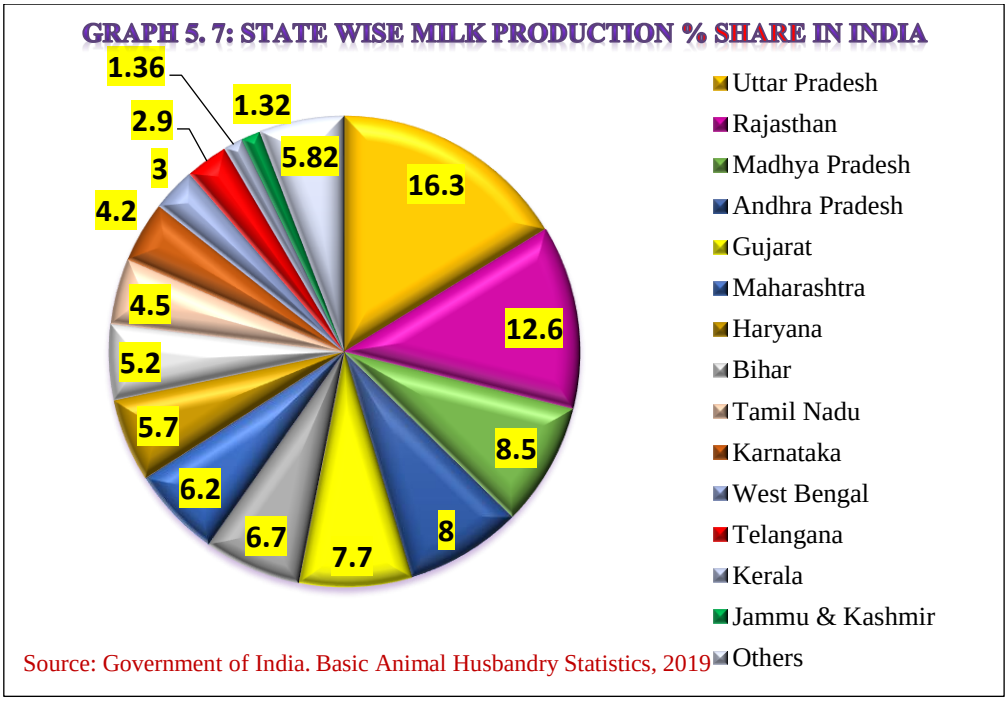
The contribution of Kerala in all India milk production shows a declining trend from 3.14 per cent in 1990-91 to 1.36 per cent in 2018-19 (Graph 5.5). The poor performance of the state is mainly due to the erratic supply of cattle feed and limited fodder availability. The state is not self-sufficient in the production of cattle feed and depends on neighbouring states to meet the requirements. Shrinking pasture land and gracing grounds due to the high density of population and unfavourable monsoon resulted in inadequate supply of fodder cultivation.



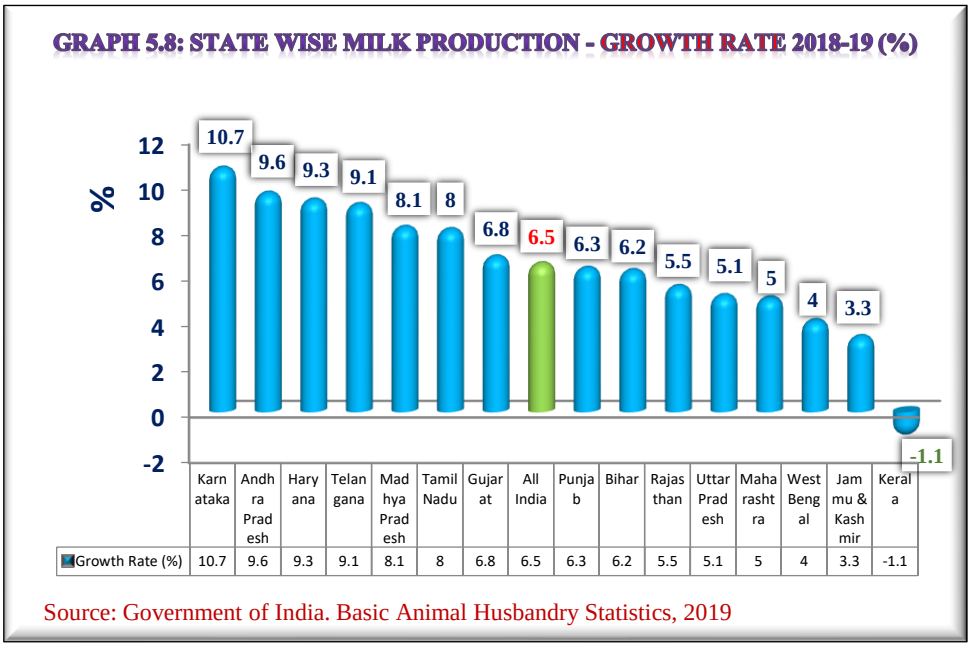
State-wise Milk Production, Percentage Share & Growth Rate: The distribution of milk production in the country is greatly influenced by the social set up, food habits of the people, cropping pattern and agro climatic conditions. The highest milk producing state in the country is Uttar Pradesh (Graph 5.6) with a production of 30.5 million tonnes followed by Rajasthan (23.7 million), Madhya Pradesh (15.9 million), Andhra Pradesh (15 million) and Kerala ranks 14th with 2.5 million tonnes.



The share of Uttar Pradesh in all India milk production is 16.3 per cent (Graph 5.7) followed by Rajasthan (12.6 per cent), Madhya Pradesh (8.5 per cent), Andhra Pradesh (8 per cent) and Kerala contributes only 1.36 per cent.



The annual all India milk production growth rate in 2018-19 (Graph 5.8) is 6.5 per cent which is mainly contributed by Karnataka (10.7 per cent), Andhra Pradesh (9.6 per cent), Haryana (9.3 per cent), Telangana (9.1 per cent) Madhya Pradesh (8.1 per cent), Tamil Nadu (8 per cent) and Gujarat (6.8 per cent).



Kerala's annual growth rate of milk production in 2018-19 is -1.1 per cent and the poor performance are attributed to the climate related disasters like floods during 2018 and 2019.

Species-wise Milk Contribution in India & Kerala: The animal-wise milk production in the country (Table 5.1) shows that 48.9 per cent is contributed by Buffaloes followed by Cows (47.8 per cent) and Goats (3.3 per cent). The Species-wise milk contribution in India shows that 35.2 per cent is contributed by indigenous buffaloes followed by crossbred cows (26 per cent), non-descript buffaloes (13.7 per cent) and non-descript cows (10.8 per cent). The animal-wise milk production in Kerala shows that 94.7 per cent is contributed by cows followed by Goats (4.77 per cent) and Buffaloes (0.48 per cent). The Species-wise share in Kerala shows that 93.82 per cent is contributed by crossbred cows and 4.47 per cent by goats. The base for setting up of a sound dairy industry in the state is lacking due to inadequate genetic up gradation of in- milk animals for greater yield.

Table 5.1: Species-wise Milk Contribution in India & Kerala (2018-19)

(in million tonnes)

Animals	Species	India		Kerala	
		Production	% in India	Production	% in Kerala
Cow	Exotic	1.83	0.98	-	-
	Crossbred	49.42	26	2.39	93.82
	Indigenous	18.37	9.8	0.002	0.08
	Non-Descript	20.20	10.8	0.02	0.86
Total		89.83	47.8	2.41	94.75
Buffaloes	Indigenous	66.16	35.2	0.009	0.37
	Non-Descript	25.65	13.7	0.003	0.11
Total		91.81	48.9	0.012	0.48
Goats		6.09	3.3	0.12	4.77
Total		187.7	100.0	2.55	100.0

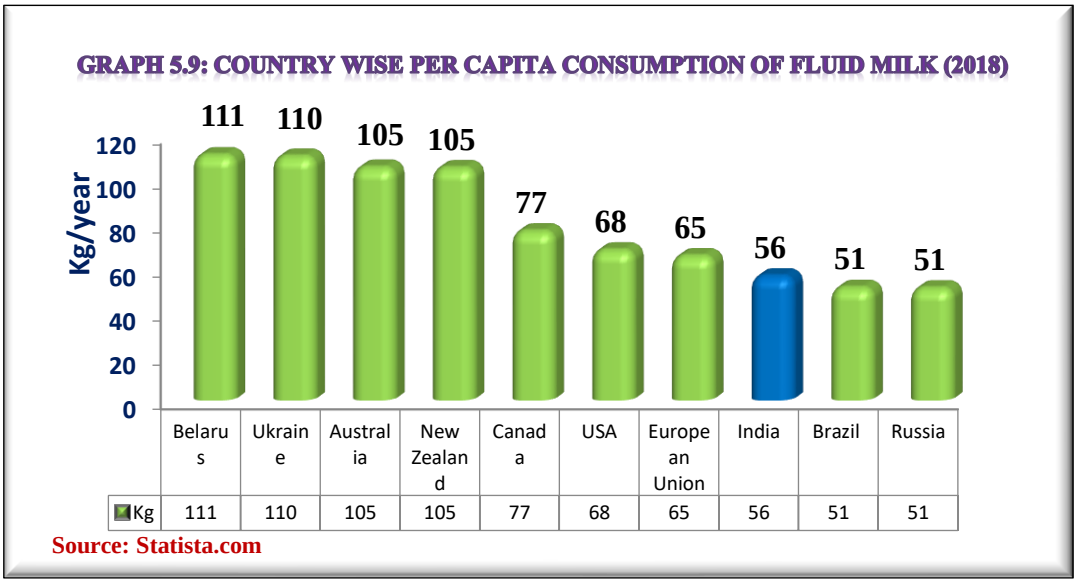
Source: Government of India. Basic Animal Husbandry Statistics, 2019

The above discussion on the production and growth of dairy sector reveals that, in spite of the increasing trend in the production of milk in Kerala, its contribution to national milk production is decreasing. The important causes for Kerala's negative growth rate in milk production in 2018-19 are climatic vagaries like flood, inadequacy of quality cattle feed and fodder. This can be attributed to shrinking gracing grounds and pasture land due to unfavourable monsoon and high population density.

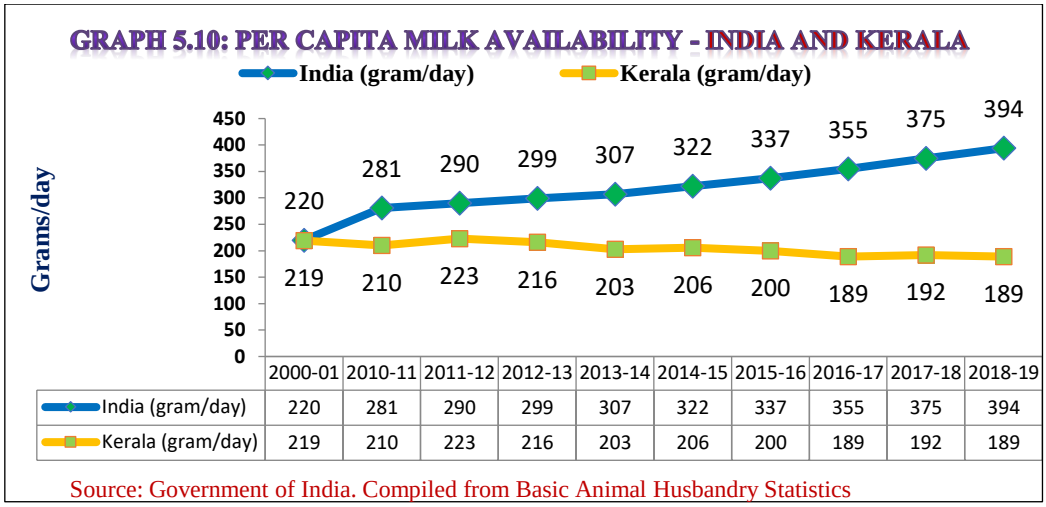
In Kerala, dairy farming is a small holder family-based business where each house in rural areas will have one or two cows and it is the primary or secondary

source of income for the family. The species-wise milk production in Kerala shows that about 94 per cent of milk produced in the state is contributed by crossbred cows. The "Operation Flood Programme" initiated at the national level is being taken up by Kerala Cooperative Milk Marketing Federation (MILMA) to strengthen the infrastructure, technical and financial base of dairy sector agribusiness. Local Self Governments (LSGs) in Kerala can frame policies and programmes to utilise the agribusiness potential in dairy sector to reduce the long-term impact of Covid 19 pandemic on nutritional food security and to utilise the Agri-entrepreneurship opportunities to reallocate the reverse migrants in gainful employment.

Country-wise Per Capita Consumption of Fluid Milk (2018): It is visible from Graph 5.9 that the country with the highest per capita consumption of fluid milk in 2018 is Belarus (111.09Kg) followed by Ukraine (110.48Kg), Australia (105.48Kg), New Zealand (105.26Kg) and India ranks 8th with 56.26Kg.



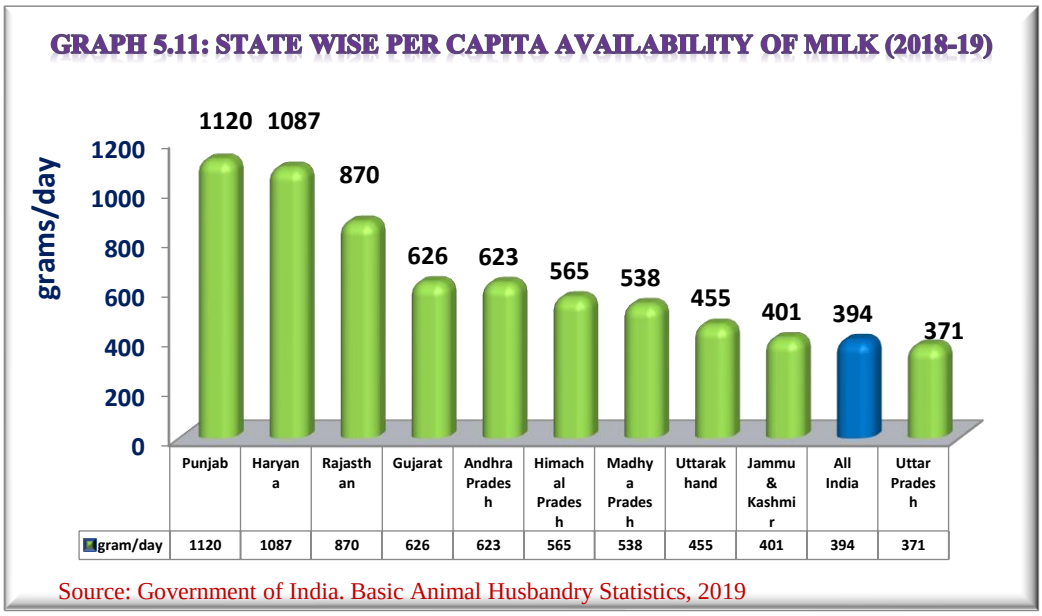
Trends in the Per capita Availability of Milk in India & Kerala: The dairy product with greatest demand is liquid milk, which has the lowest shelf life. The per capita availability of milk in India shows an increasing trend between 2000-01 and 2018-19 from 220 to 394 gram per day (Graph5.10). Contrary to this, Kerala's per capita availability of milk fluctuates and ranges between 223 and 189 gram per day which is always lower than the corresponding years at the national level.



	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
India (gram/day)	220	281	290	299	307	322	337	355	375	394
Kerala (gram/day)	219	210	223	216	203	206	200	189	192	189

Source: Government of India. Compiled from Basic Animal Husbandry Statistics

The state-wise analysis of per capita availability of milk in 2018-19 shows that Punjab ranks 1st with 1120 gram per day followed by Haryana (1087g/day) and Rajasthan (870g/day) (Graph 5.11)



	Punjab	Haryana	Rajasthan	Gujarat	Andhra Pradesh	Himachal Pradesh	Madhya Pradesh	Uttarakhand	Jammu & Kashmir	All India	Uttar Pradesh
gram/day	1120	1087	870	626	623	565	538	455	401	394	371

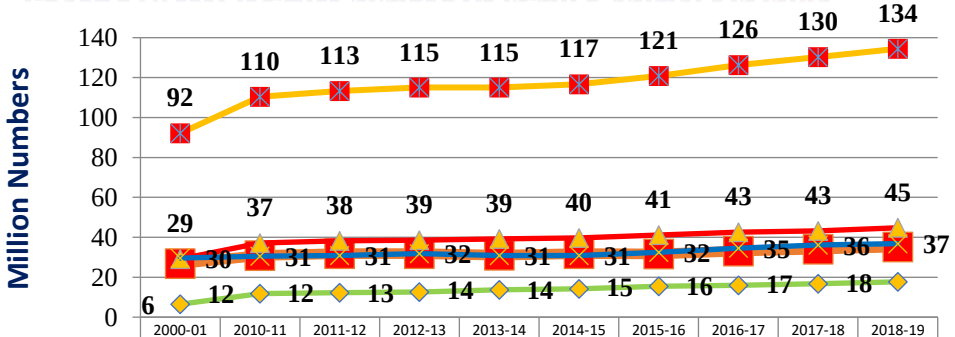
Source: Government of India. Basic Animal Husbandry Statistics, 2019

Only nine states in India have achieved per capita availability of milk above the national average. During 2018-19, the per capita availability of milk in Kerala is only just above half of the national average. Factors contributing to the increasing demand for milk in Kerala are growing population, urbanisation, high literacy and the consequent consumer preference for nutritive diet. On the supply side the production of milk in the state is showing a decreasing trend due to low productivity, high cost of production, climatic vagaries, inadequacy of quality feed and fodder and lack of incentive for dairy farmers due to uncertainty in profit. To reduce the

dependency on other states for milk, policies and programmes need to be included in the local level planning to promote the upcoming agribusiness opportunities in dairy sector.

The Number of in-Milk Animals in India & Kerala: Milk production in the country is mainly derived from cows, buffaloes and goats. The number of in-milk animals in India increased from 92 to 134 million between 2000-01 and 2018-19 with a positive annual growth rate except in 2000-01 and 2013-14 (Graph5.12).

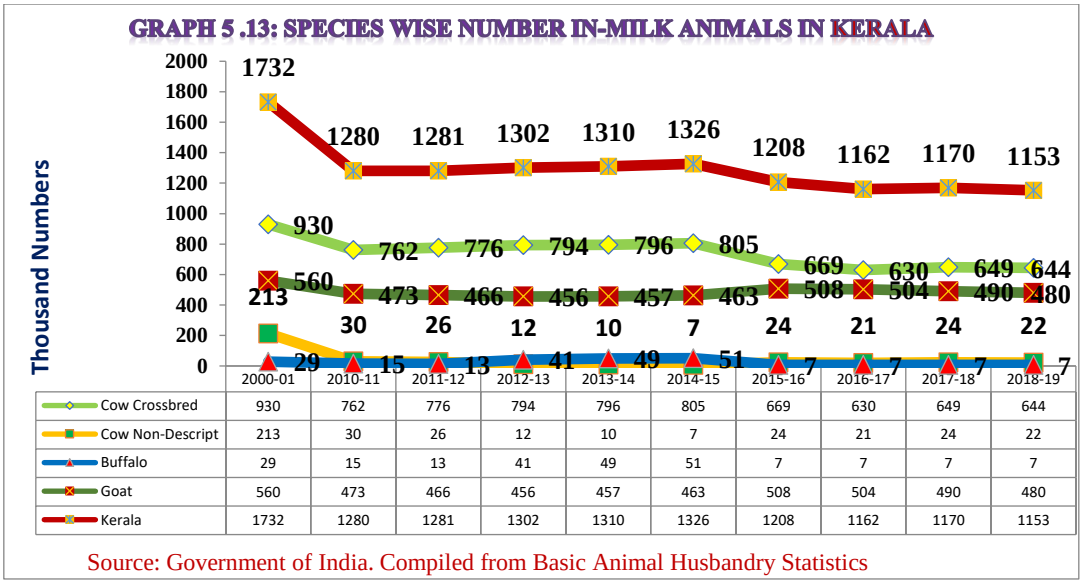
GRAPH 5.12: SPECIES-WISE NUMBER OF IN-MILK ANIMALS IN INDIA



	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Cow Crossbred	6	12	12	13	14	14	15	16	17	18
Cow Non-Descript	27	31	32	32	31	32	32	33	34	35
Buffalo	29	37	38	39	39	40	41	43	43	45
Goat	30	31	31	32	31	31	32	35	36	37
India	92	110	113	115	115	117	121	126	130	134

Source: Government of India. Compiled from Basic Animal Husbandry Statistics

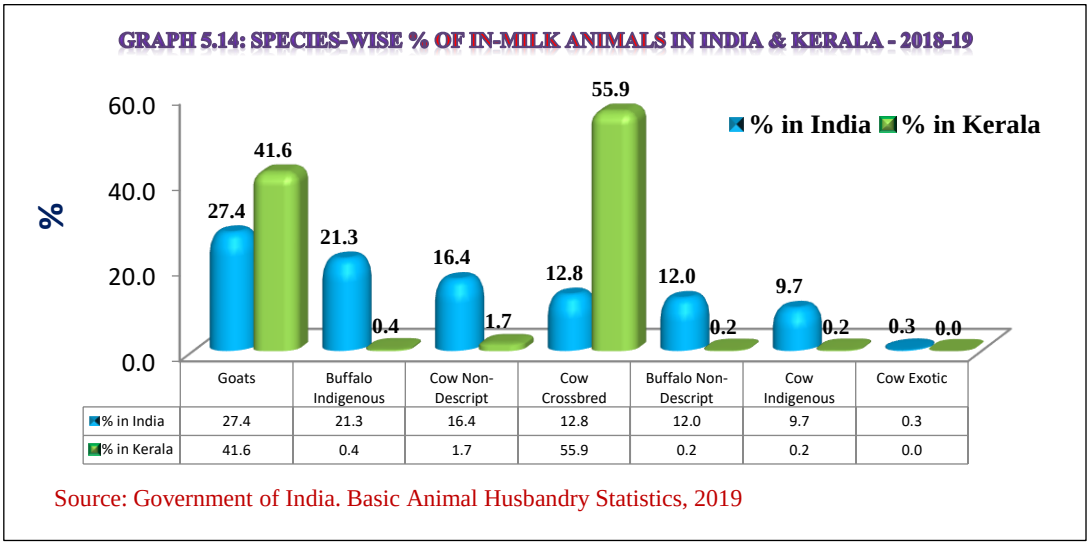
The increasing trend in the total number of in milk animals is visible for all the species of animals such as crossbred cows from 6.48 to 17.68 million, non-descript cows from 27 to 35 million, buffaloes from 29 to 45 million and goats from 30 to 37 million. Contrary to this, a decreasing trend is visible in Kerala not only in the total number of in milk animals from 1732 to 1153 thousand, but also in the number of each species such as crossbred cows from 930 to 644 thousand, non-descript cows from 213 to 22 thousand, buffaloes from 29 to 7 thousand and goats from 560 to 480 thousand (Graph 5.13). Kerala has 1153 thousand in-milk animals in 2018-19 consisting of 666 thousand cattle (57.8 per cent), 480 thousand goats (41.6 per cent) and 7 thousand buffaloes (0.6 per cent).



	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Cow Crossbred	930	762	776	794	796	805	669	630	649	644
Cow Non-Descript	213	30	26	12	10	7	24	21	24	22
Buffalo	29	15	13	41	49	51	7	7	7	7
Goat	560	473	466	456	457	463	508	504	490	480
Kerala	1732	1280	1281	1302	1310	1326	1208	1162	1170	1153

Source: Government of India. Compiled from Basic Animal Husbandry Statistics

The total number of in-milk animals in India during 2018-19 is contributed by 52.84 million cows including exotic, crossbred, non-descript and indigenous (39.3 per cent), 44.77 million buffaloes including indigenous and non-descript (33.3 per cent) and 36.83 million goats (27.4 per cent) (Graph 5.14). The percentage of buffaloes in Kerala is very negligible but goats have a greater share than at the national level. The negative annual growth rate in many years indicate the lack of interest by people to do dairy farming because of low profit, high risk due to perishable nature of product, animal disease, price spread, inadequate cattle feed, high cost of production and fodder and climatic vagaries. The support of Local Self Government to promote dairy sector agribusiness can be a solution to make dairy farming a profitable business.

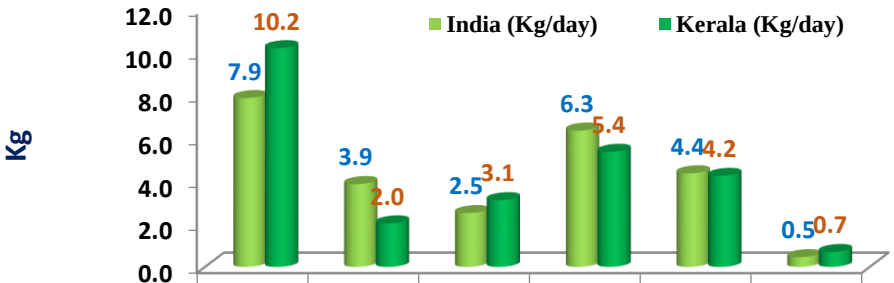


	Goats	Buffalo Indigenous	Cow Non-Descript	Cow Crossbred	Buffalo Non-Descript	Cow Indigenous	Cow Exotic
% in India	27.4	21.3	16.4	12.8	12.0	9.7	0.3
% in Kerala	41.6	0.4	1.7	55.9	0.2	0.2	0.0

Source: Government of India. Basic Animal Husbandry Statistics, 2019

Species-wise Average Yield Per In-Milk Animals in India& Kerala: An analysis of the productivity of in-milk animals in the country in 2018-19 shows that the daily average yield is highest for exotic (11.67Kg) and crossbred (7.85Kg) cow followed by indigenous (6.34Kg) and non-descript (4.35Kg) buffaloes, non-descript cows (2.5Kg) and lowest for goats (0.69Kg) (Graph 5.15).

GRAPH 5.15: AVERAGE YIELD PER IN-MILK ANIMAL INDIA & KERALA (2018-19)



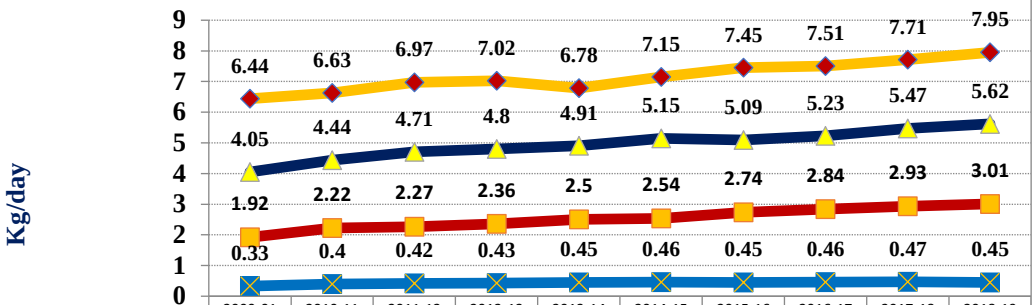
	Cow Crossbred	Cow Indigenous	Cow Non-Descript	Buffalo Indigenous	Buffalo Non-Descript	Goats
India (Kg/day)	7.9	3.9	2.5	6.3	4.4	0.5
Kerala (Kg/day)	10.2	2.0	3.1	5.4	4.2	0.7

Source: Government of India. Basic Animal Husbandry Statistics, 2019

In Kerala, the daily average yield is highest for crossbred cow (10.17Kg) followed by indigenous (5.35Kg) and non-descript (4.23Kg) buffaloes. The productivity of goats is the lowest both at the state (0.69Kg) as well as at the national level (0.45Kg). A comparison of Productivity of in-milk animals in India and Kerala shows that the average yield per day of crossbred (10.7Kg) and non-descript (3.10Kg) cow is higher in Kerala than the national average of 7.85Kg and 2.50Kg respectively.

The increasing trend in daily average yield per animal in India is seen in all the species between 2000-2001 and 2018-19 (Graph5.16). But, the increase in daily average yield per animal is only nominal over these 19 years from 6.44Kg to 7.95Kg for crossbred cows, 1.92Kg to 3.01 Kg for non-descript cows, 4.05Kg to 5.62Kg for buffaloes and 0.33Kg to 0.45Kg for goats.

GRAPH 5.16: AVERAGE YIELD PER IN-MILK ANIMALS IN INDIA

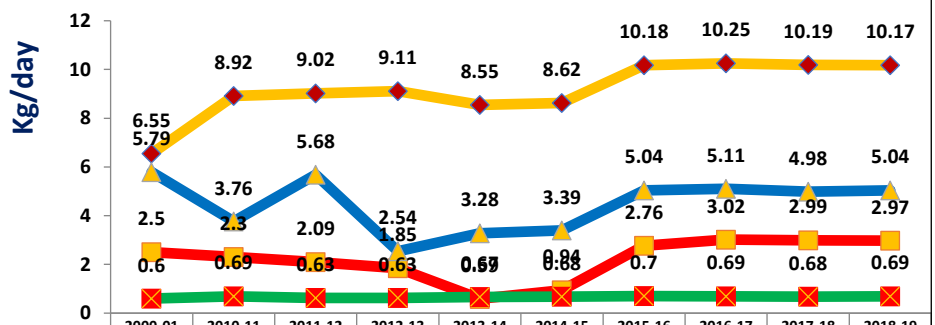


	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Cow Crossbred	6.44	6.63	6.97	7.02	6.78	7.15	7.45	7.51	7.71	7.95
Cow Non-Descript	1.92	2.22	2.27	2.36	2.5	2.54	2.74	2.84	2.93	3.01
Buffalo	4.05	4.44	4.71	4.8	4.91	5.15	5.09	5.23	5.47	5.62
Goat	0.33	0.4	0.42	0.43	0.45	0.46	0.45	0.46	0.47	0.45

Source: Government of India. Compiled from Basic Animal Husbandry Statistics

The daily average yield per crossbred cows in Kerala is higher than the national average and it increased steadily from 6.55Kg to 10.17Kg between 2000-01 and 2018-19 (Graph5.17). For non-descript cows, the yield was highly fluctuating and reached lowest (0.59Kg) in 2013-14 and during 2018-19 it is 2.97Kg which is lower than the national yield of 3.01Kg. The same trend is seen for buffaloes and it is lower than the national average between 2012-13 and 2018-19. Contrary to this, the yield of goats is always better than the national average in spite of the lower yield compared to cows and buffaloes. Increasing the productivity of in-milk animals is vital because it is an important source of income and employment for the poorest sections of the population in rural areas of Kerala.

GRAPH 5.17: AVERAGE YIELD PER IN-MILK ANIMALS IN KERALA

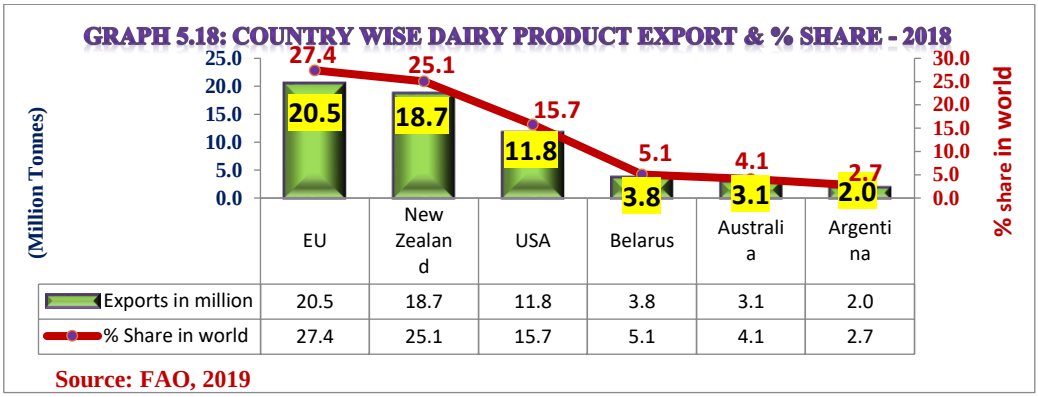


	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Cow Crossbred	6.55	8.92	9.02	9.11	8.55	8.62	10.18	10.25	10.19	10.17
Cow Non-Descript	2.5	2.3	2.09	1.85	0.59	0.94	2.76	3.02	2.99	2.97
Buffalo	5.79	3.76	5.68	2.54	3.28	3.39	5.04	5.11	4.98	5.04
Goat	0.6	0.69	0.63	0.63	0.67	0.68	0.7	0.69	0.68	0.69

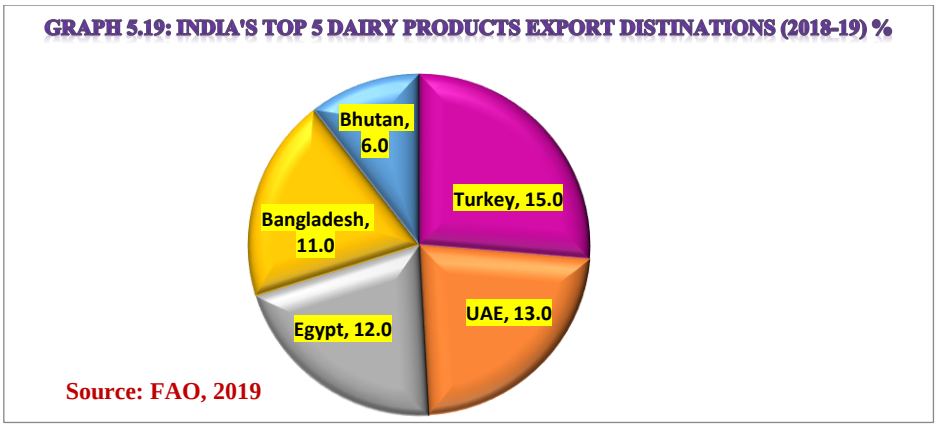
Source: Government of India. Compiled from Basic Animal Husbandry Statistics

The share of dairy sector direct employment in total employment is expected to decline as the economy develops. But agribusiness in dairy products can create direct and indirect employment opportunities through the backward and forward linkage effects.

World Export-Import Scenario of Dairy Products: The world milk export in 2018 is 74.78 million tonnes with an annual growth rate of 2.9 per cent. European Union is the largest dairy exporter contributing 27.4 per cent followed by New Zealand (25.1 per cent) and USA (15.7 per cent) (Graph 5.18).



India's major items of dairy exports include butter, skimmed milk powder (SMP), whole milk powder (WMP), ghee, cream, cheese, curd etc. Turkey (15 per cent), United Arab Emirates (13 per cent), Egypt (12 per cent), Bangladesh (11 per cent) and Bhutan (6 per cent) are the main destinations of India's dairy exports (Graph 5.19).



Between 1990-91 and 2014-15 India's dairy export was fluctuating both in terms of quantity and value (Table 5.2).

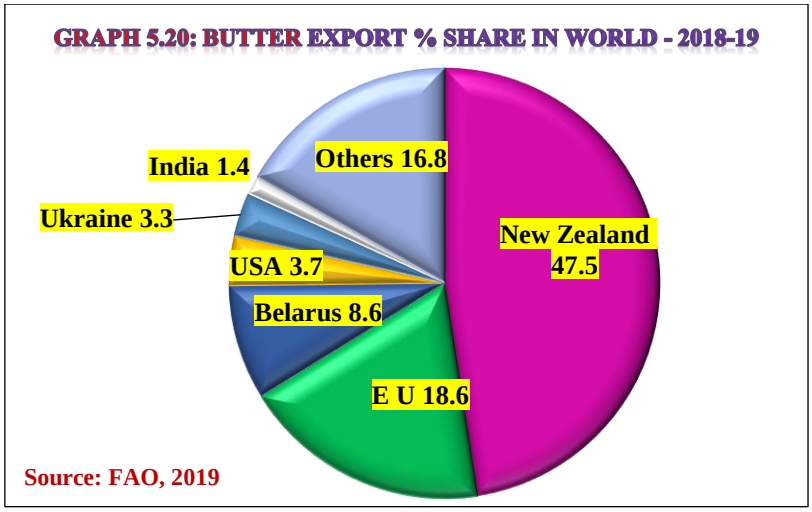
Table 5.2: Trend in India's Dairy Products Export

Year	Quantity (MT)	Value (Rs. in lakhs)
1990-91	622	249
2000-01	9528	7570
2010-11	37436	54797
2011-12	25633	28930
2012-13	87824	141210
2013-14	159229	331857
2014-15	66424	120540
2015-16	33442	75551
2016-17	39166	90572
2017-18	40039	119618
2018-19	113725	242301

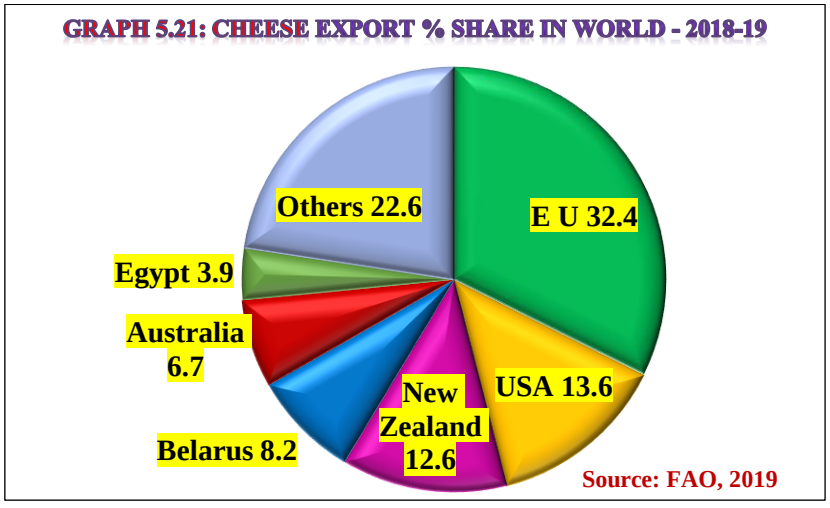
Source: Directorate General of Commercial Intelligence and Statistics, Kolkata

But during the last four years between 2014-15 and 2018-19 it shows an increasing trend. During 2018-19, India's dairy products export amounts to 1,13,725 metric tonnes which contributes to 1.85 per cent share in Agricultural and Processed Food Products Export Development Authority's (APEDA) total exports and accounts for less than 1 per cent of world dairy exports. It is a very negligible share compared to the high growth rate and prime position in the world milk production. Low level of processing and value addition, high domestic price for processed dairy products compared to the international market price, difficulty to meet the international quality standards, insufficient infrastructure and technological knowhow etc can be attributed to the poor performance in the export front.

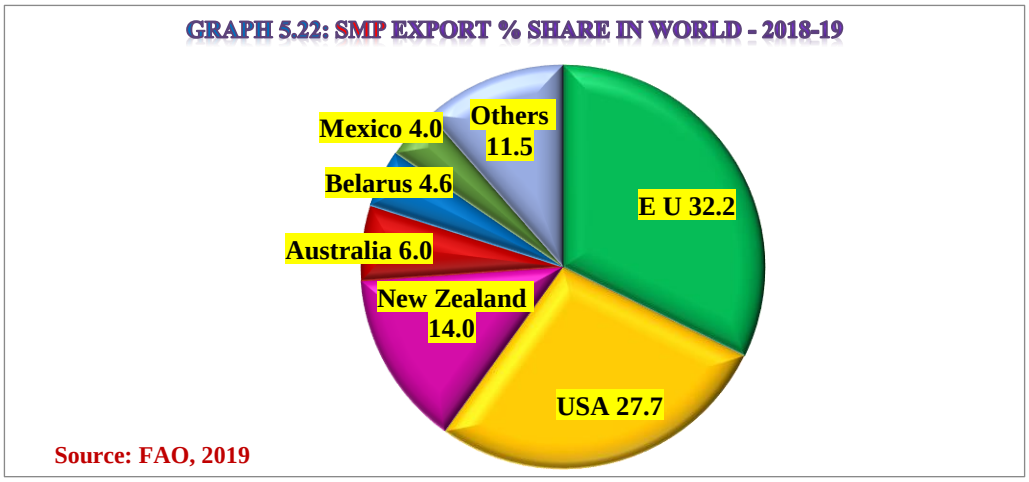
The major dairy products demanded in the international market are Skim Milk Powder (SMP), Cheese, Whole Milk Powder (WMP) and Butter. The global Butter export is 9.17 lakh tonnes in 2018 with an annual increase of 7.5 per cent (Graph 5.20). New Zealand ranks first in butter export with 4.36 lakh tonnes (47.5 per cent) followed by European Union with 1.71 lakh tonnes (18.6 per cent). India ranks 6th position with 0.13 lakh tonnes (1.4 per cent). The world Cheese export is 25.7 lakh tonnes in 2018 with an annual growth rate of 0.8 per cent.



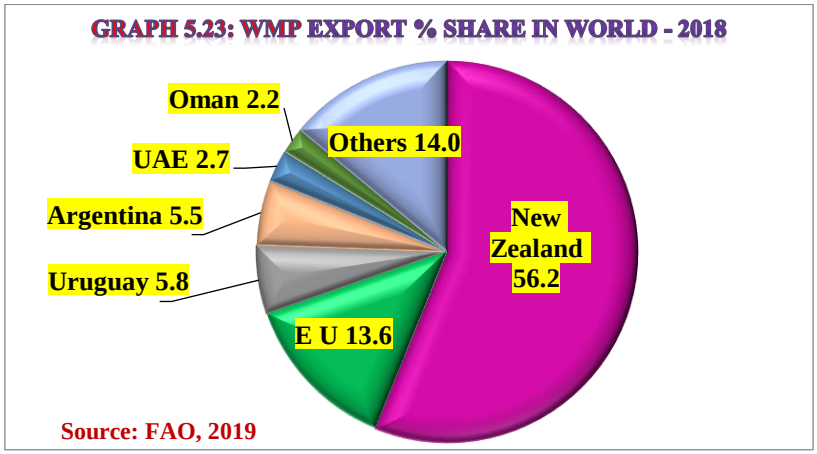
European Union ranks first in Cheese export with 8.32 lakh tonnes (32.4 per cent) followed by USA with 3.50 lakh tonnes (13.6 per cent) and New Zealand with 3.24 lakh tonnes (12.6 per cent) (Graph 5.21). Despite signing contracts with Russia, world's largest importer of cheese, to export cheese and getting clearance from Russian Phyto-sanitary authority during the last two years, India is yet to begin sending shipments to Russia due to some 'procedural issues' (Das, 2017). Another argument for India's low share in cheese export is that the domestic cheese price is more than the international price charged by the major exporters EU and USA.



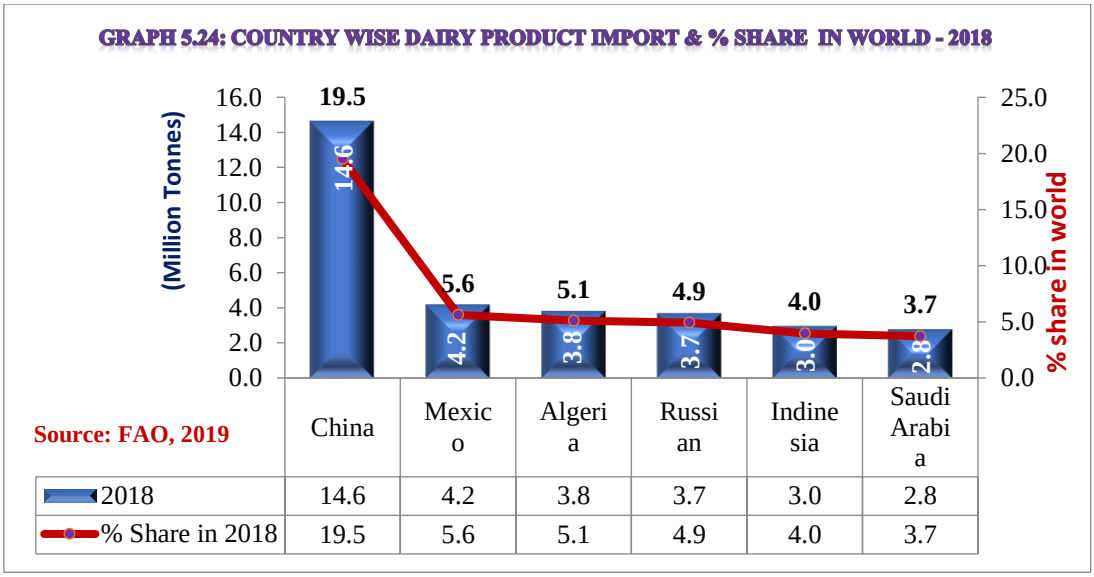
The global export of Skim Milk Powder (SMP) in 2018 is 25.87 lakh tonnes with an annual increase of 8.6 per cent (Graph 5.23). European Union ranks first in SMP export with 8.32 lakh tonnes followed by USA (3.50 lakh tonnes).



The world export of Whole Milk powder (WMP) is 24.57lakh tonnes in 2018 registering an annual growth rate of 1.7 per cent (Graph 5.23). New Zealand ranks first in WMP export with 13.80 lakh tonnes followed by E U (3.33 lakh tonnes).



The world milk product import in 2018 is 14.6 million tonnes with China taking the highest share of 19.5 per cent (Graph 5.24) followed by Mexico (5.6 per cent), Algeria (5.1 per cent) and Russia (4.9 per cent). China is the largest Butter importer (9.04 lakh tonnes) followed by Russia (0.88 lakh tonnes). Japan is the largest Cheese importer (2.85 lakh tonnes) followed by Russia (2.63 lakh tonnes). Mexico is the largest SMP importer (3.60 lakh tonnes) followed by China (3.09 lakh tonnes). China is the largest WMP importer (6.48 lakh tonnes) followed by Algeria (3.11 lakh tonnes).



The above discussion on the export-import scenario of dairy products proves that even though India is the biggest milk producer in the world, its contribution to world export is negligible. Kerala is not self-sufficient in the production of milk and not contributing much in the export market. In order to reduce the dependency on other states for milk and to utilise the untapped dairy potential of the state, agribusiness ventures in dairy sector is to be promoted through local level planning. Thus, the following section is devoted to discuss the need and scope of agribusiness in the dairy sector of Kerala.

The above discussion underlines the need and scope of agribusiness in dairy products in Kerala. This is directed towards the goals of sustainable dairy development, nutritional security, meet the demand for diversified dairy products, attract the youth towards agribusiness and prevent from migration to cities, empowerment of women, earn foreign exchange, reduce the poverty by increasing income and standard of living of rural people. Dairy sector agribusiness opportunities can be tapped to mitigate the long-term impact of Covid 19 pandemic on nutritional food security and unemployment in the state.

5.3 FEASIBILITY OF AGRIBUSINESS IN MILK PRODUCTS

Dairy sector of Kerala produces 2.55 million tonnes of milk in 2018-19 contributing 1.36 per cent of all India milk output. The milk output in the state with a negative growth rate of -3.4 per cent declined from 2.64 to 2.55 million tonnes

between 2010-11 and 2018-19. The crossbred cows contribute 94 per cent of the milk output in the state with the highest yield of 10.2Kg/crossbred cow higher than the national average. But the per capita availability of milk decreased from 219 to 189 gram per day with a negative growth rate of -13.7 per cent.

People in rural areas of Kerala prefer fresh milk delivered by milkman due to its taste and freshness. But in urban areas consumption of packed and processed milk is increasing due to the perception of quality. The demand for processed dairy products with enhanced shelf life increases as a result of higher income, increased health consciousness due to the high literacy and changing food habits of the people in Kerala. The production of diversified varieties of high quality nutritive dairy products through agribusiness can provide adequate supply.

High cost of production coupled with international quality standards for processed dairy products are the main challenges faced by dairy exporters. Enhanced agribusiness in dairy products adhering to the international quality standards and export incentives by government can utilise the untapped export potential of dairy sector of the state. Emerging agribusiness can provide direct and indirect gainful employment for women and empower them to have a lead role in their rural households.

The typical structural transformation of the state is visible here where the highly literate young generation are shifting from traditional and primitive dairy sector to more remunerative white-collar services sector jobs. Successful agribusiness in dairy products can attract and hold the unemployed and under employed youth in rural areas to prevent them from moving to urban cities, offer better price for farm milk, reduce wastage and empower the women in rural households.

The above discussion reveals that it is high time to reduce the dependency of Kerala on other states for milk and milk products. Profitable agribusiness ventures in the dairy sector can give a further boost to milk production and productivity in the state. In this context, let us analyse the investment opportunities, technical and financial feasibilities of agribusiness in the dairy sector of Kerala.

Agribusiness in Milk Products: There are a number of traditional and modern tasty and healthy value-added and processed dairy products available in the market to meet the life style requirements of different generations of people in Kerala. They include packed milk, butter milk, curd, cheese, yogurt, cream, whey, milk powder, ice cream, lassi, milk-peda, paneer, sip up, Gulab jamun etc. These products have greater shelf life, higher nutritional value, transportable to longer distances, healthy and tasty and highly demanded by people in developed countries. Thus, present study develops a micro model dairy unit that produces three selected processed dairy products based on the data collected from a Base Dairy Unit situated in Thrissur district of Kerala state.

Model Dairy Unit: The Model Dairy Unit produces Paneer, Milk Peda and Ghee. The initial investment, quantity and cost of raw materials, labour, packaging and processing materials, annual fixed cost, volume of production and sales, selling price etc. are computed based on the data collected from the Base Dairy Unit located in Thrissur District.

Assumptions: Valid and reasonable assumptions on the technical parameters of the Model dairy unit is made after face-to-face discussions with scientists, engineers, technicians, teachers, researchers, input suppliers, entrepreneurs, office staff in retail outlets and other experts related to the Base Dairy Unit.

1. The Model Dairy Unit requires an initial investment of Rs. 4, 88,900 which is equally divided among the three products to calculate product-wise cash flow.
2. Feasibility of the Unit is assessed by considering the cash flow for 3 years.
3. The annual production of the Unit consists 760Kg Milk Peda, 893Kg Paneer and 975Kg Ghee.
4. The discount rate of 11 per cent is based on the interest rate charged by bankers.
5. The annual fixed cost of Rs.60, 000 is the rent for land and building which is equally divided among the three products to calculate product-wise cash flow.
6. Study analysis is based on average values of the variables in the initial year.
7. Wastage during production process is assumed to be zero.
8. Excluded the commission/tax in sales price.

9. Annual average sale is assumed to be 100 per cent and marketing is done through direct sales outlets.
10. Annual average working days are taken as 256 days i.e., 70 per cent of 365 days.
11. Shelf life of each final product is assumed to be constant throughout the year.
12. Annual average depreciation rate of equipment, building and vessels is kept as constant.
13. The risk of the Unit is evaluated by incorporating the possible changes in the values of key variables under different pessimistic and optimistic scenarios.

Initial Investment: The Model Dairy Unit requires an initial investment of Rs. 4, 88,900 which is equally divided among the three products to calculate the product-wise initial investment for cash flow analysis (Table 5.3).

Table 5.3: Initial Investment of Model Dairy Unit (2016-17 prices)

Sl. No	Particulars	Qty (No)	Rate (Rs)	Cost (Rs)	%
1	Advance for land and building		40,000	40,000	8
2	Stainless Steel Tables	2	20,000	40,000	8
3	Cream Separator (500 Lit/hour)	1	75,000	75,000	15
4	Double Door Hard Top Deep Freezer (500litre)	1	30,000	30,000	6
5	Stainless Steel Utensils (1 set)	1	50,000	50,000	10
6	Mixer Grinder	1	12,000	12,000	2.5
7	Multi-purpose Vat (100 lit. capacity)	1	1,20,000	1,20,000	25
8	Gas Cylinders	2	1,200	2,400	0.5
9	Sealing Machine	1	3,000	3000	0.6
10	Labelling Machine	1	50,000	50,000	10
11	Paneer Press	1	15,000	15,000	3
12	Milk Peda Mould	3	500	1,500	0.3
13	Others	1	50,000	50,000	10
Total				4,88,900	100

Source: Data compiled from the Base Dairy Unit

The dairy unit equipment like cream separator, freezer, mixer grinder, multi-purpose vat, sealing and labelling machine, paneer press, milk peda mould and gas cylinders together constitute 63.2 per cent share in the initial investment. The share of stainless-steel tables, utensils etc. and rent on land and building, repair work for

building, equipment and vessels etc. is 18. 4 per cent each. The initial investment is financed through loans from banking institutions.

Financing of Initial Investment: Loan repayment schedule of initial investment is shown in Table 5.4. Initial investment is financed through a bank loan with a principal amount of Rs.4, 88,900 for tenure of 3 years. The rate of interest is 10.65 per cent including the moratorium for 6 months.

Table 5.4: Loan (Rs.) Repayment Schedule of Initial Investment (Rs.)

Year	EMI	%	Interest	%	Principal	%
1	1,37,837	24	50,141	52	87,696	18
2	2,23,610	38	33,634	35	1,89,977	39
3	2,23,610	38	12,383	13	2,11,227	43
Total	585057	100	96,157	100	4,88,900	100

Source: State Bank of India

The total interest paid during the moratorium period is Rs.26033/- with a monthly break up of Rs.4339/-. The total interest payable over the loan term is Rs.96, 157/- with an annual break up of 52 per cent, 35 per cent and 13 per cent respectively in three years. The principal is paid with an annual break up of 18 per cent, 39 per cent and 43 per cent respectively in three years. The total Equated Monthly Instalments (EMI) payments including the principal and interest made over the loan term is Rs.5, 85,057/- with an annual break up of 24 per cent, 38 per cent and 38 per cent respectively in three years.

Results of Cash Flow Analysis: The Net Cash Flow (NCF) shows the profitability of the Model Dairy Unit based on the cash flows in initial year for Paneer, Milk Peda and Ghee (Table 5.5). The value of the variables for each product in the cash flow statement is based on the data compiled from the Base Unit in the study area. The initial investment of Rs. 162967 for each product is obtained by dividing the initial investment of Rs. 488900 of the Model Unit equally among the three products. The Unit has an average operating profit of Rs.3, 75,563 in 3 years contributed by 46 per cent from Paneer, 35 per cent from Milk Peda and 19 per cent from Ghee. The per unit contribution margin of the products are calculated by taking the difference

between unit sales price and unit variable cost. Paneer has the highest margin of Rs.216 followed by Milk Peda with Rs.200 and the lowest of Rs.93 for Ghee.

Table 5.5: Result Summary of Cash Flows (Rs.) of Model Dairy Unit

Variables	Paneer	Milk Peda	Ghee	Dairy Unit
Initial Investment (Rs)	162967	162967	162967	488900
Volume (Kg/year)	893	760	975	
Unit Selling Price (Rs/Kg)	440	480	520	
Unit Variable Cost (Rs/Kg)	224	280	427	
Annual Fixed Cost (Rs)	20000	20000	20000	60000
Discount Rate (%)	11	11	11	11
Cash Outflow (Rs)	220032	232800	436325	889157
Cash Inflow (Rs)	392920	364800	507000	1264720
Net Cash Flow (NCF) (Rs)	**172888**	**132000**	**70675**	**375563**

Source: Primary Data

Thus, an increase in the volume of paneer with the highest contribution margin ratio (ratio of contribution margin to sales price) of 49 per cent is a good choice to increase the operating profit of the Model Dairy Unit compared to Milk Peda (42 per cent) and Ghee (18 per cent) with lower margin ratio. The favourable cash flows indicate the ability and flexibility for product expansion through operating profits in the dairy processing plants in Kerala.

The study results reveal that agribusiness in dairy is a profitable venture in Kerala, provided that the small and marginal entrepreneurs require support from local self-government in terms of tax exemptions, subsidies and credit support. Thus, post-Covid phase of Kerala economy finds a great future in agribusiness and agri-entrepreneurship especially in dairy sector.

5.4 FINANCIAL FEASIBILITY ANALYSIS

The financial viability is evaluated by considering the expected return from the Model Dairy Unit for a period of 3 years using the Net Present Value (NPV), Benefit Cost Ratio (BCR) and Payback Period.

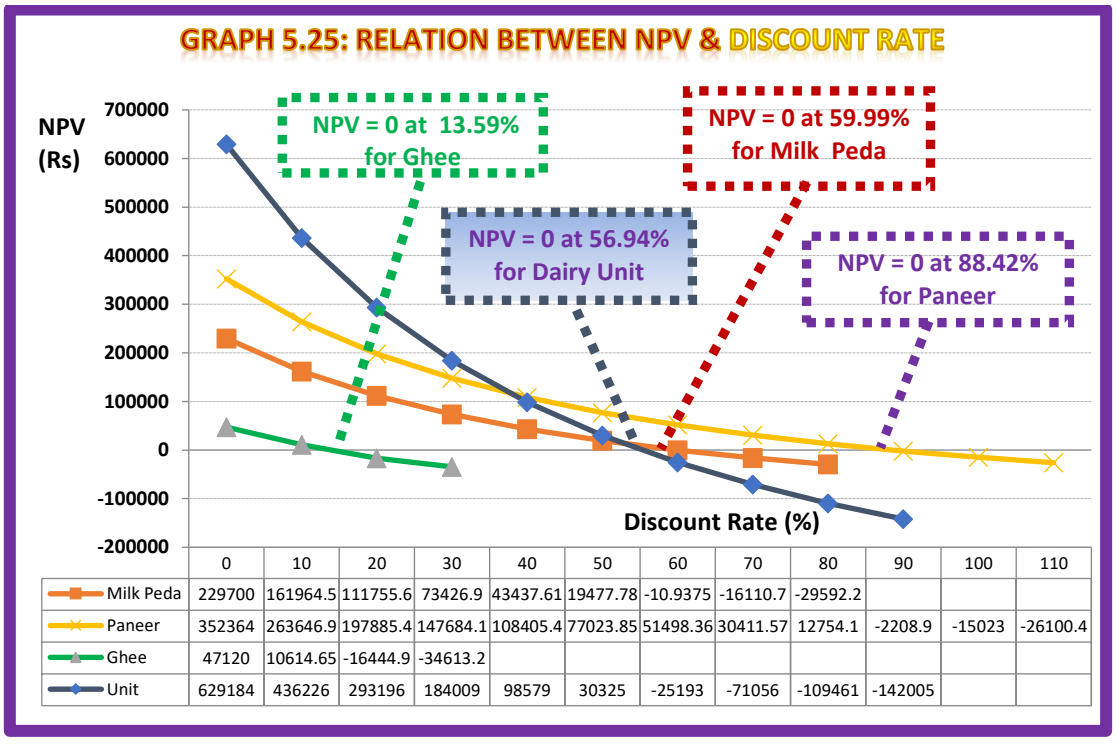
Results and Interpretation of NPV Analysis: The NPV analysis proves that the Model Dairy Unit has an NPV of Rs. 4, 28,868 in 3 years contributed by 61 per cent **from Paneer, 37 per cent from Milk Peda and 2 per cent from Ghee** (Table 5.6).

Table 5.6: Result Summary of NPV (Rs.) Calculation of Model Dairy Unit

Items	$C_1/(1+r)^1$	$C_2/(1+r)^2$	$C_3/(1+r)^3$	C_0	NPV (Rs)
Paneer	155755	140320	126414	162967	2,59,522
Milk Peda	118919	107134	96517	162967	1,59,603
Ghee	63671	57361	51677	162967	9,743
Model Unit	338345	304815	274608	488900	4,28,868

Source: Primary Data

Paneer with highest NPV is the most profitable product of the Unit followed by Milk Peda and Ghee is least profitable. The favourable expected return of the Model Dairy Unit shows the financial viability of agribusiness investment in Dairy products. The inverse relationship between NPV and discount rate is illustrated in Graph 5.25.

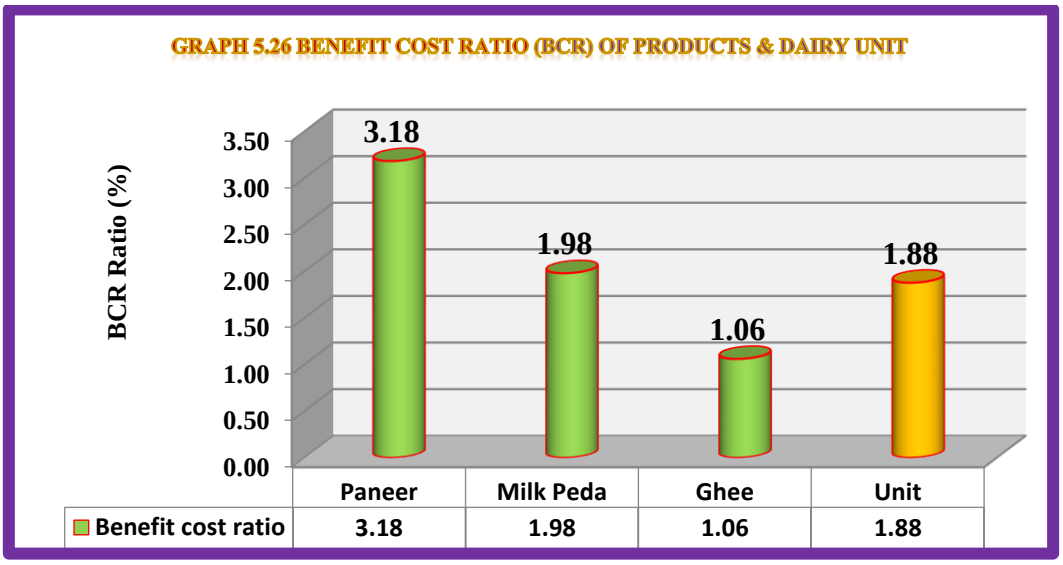


	0	10	20	30	40	50	60	70	80	90	100	110
Milk Peda	229700	161964.5	111755.6	73426.9	43437.61	19477.78	-10.9375	-16110.7	-29592.2			
Paneer	352364	263646.9	197885.4	147684.1	108405.4	77023.85	51498.36	30411.57	12754.1	-2208.9	-15023	-26100.4
Ghee	47120	10614.65	-16444.9	-34613.2								
Unit	629184	436226	293196	184009	98579	30325	-25193	-71056	-109461	-142005		

Source: Primary Data

The NPV result of the Model Dairy Unit shows that NPV becomes zero at the discount rates of 88.42 per cent for Paneer, 59.99 per cent for Milk Peda, 13.59 per cent for Ghee and 56.94 per cent for Model Dairy Unit. Further increase in discount rate makes the NPV negative. The investment is financially feasible as the NPV is positive both for products and Unit. The summary of NPV study result proves that agribusiness in dairy products is a financially viable and promising investment venture in Kerala especially in the post Covid 19 pandemic phase of the economy.

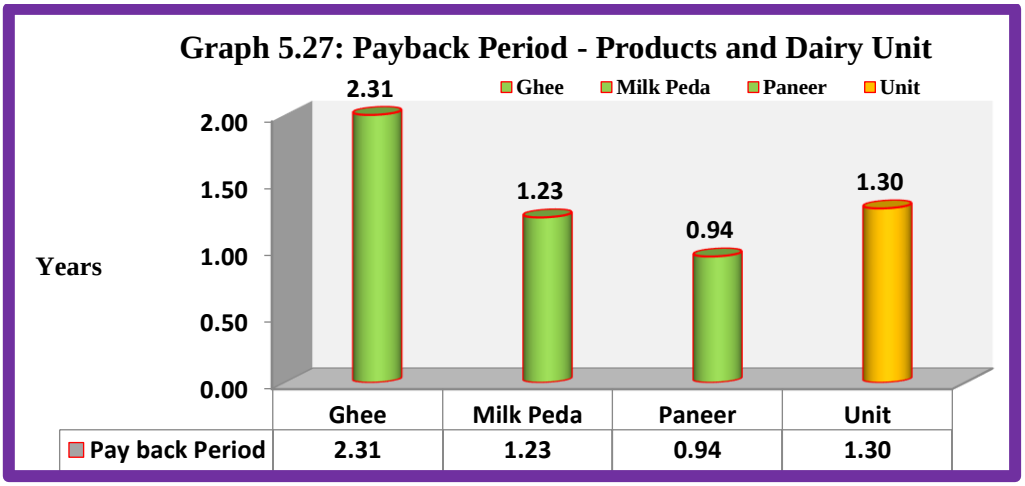
Results and Interpretation of Benefit Cost Ratio (BCR) Analysis: The BCR analysis illustrated in Graph 5.26 shows the profitability index of each product as well as the Model dairy Unit as a whole.



Source: Primary Data

The BCR of Model Dairy Unit is 1.88 per cent contributed by Paneer with the highest ratio of 3.18 per cent followed by Milk Peda (1.98 per cent) and even the least profitable Ghee has a BCR of 1.06 per cent. BCR result summary indicates that investment in dairy processing is financially viable with a high entrepreneurial potential especially in the rural areas of Kerala. Post-Covid phase of Kerala economy is looking for job opportunities in dairy sector and nutritional food security especially to the vulnerable sections of the rural areas.

Results and Interpretation of Payback Period Analysis: The Payback period analysis illustrated in Graph 5.27 shows the time taken to recover the initial investment by each product and the Model Dairy Unit.



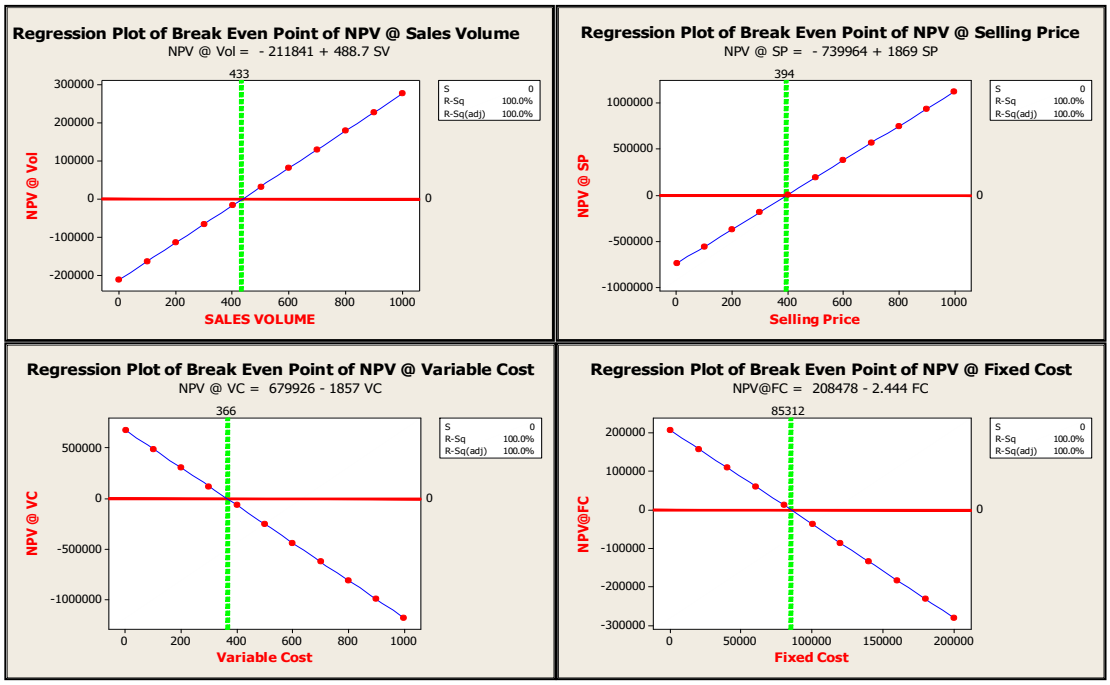
Source: Primary Data

The Model Dairy Unit is able to recover its initial investment of Rs.4, 88,900 within 1.3 years. Among the products Paneer performs best with a recovery period of less than a year (0.94 year) followed by Milk Peda (1.23 years) and Ghee (2.31 years). The Payback period result summary also proves that the environment for starting agribusiness in the dairy sector of Kerala is favourable. Thus Agri-entrepreneurship in dairy products is a promising opportunity for gainful employment to those who become jobless due to the Covid 19 pandemic.

The financial feasibility analysis presented in the previous section is based on the values of variables with certainty. But, in reality, we know that Model Dairy Unit's cash flows are uncertain due to fluctuations in input/output prices, fixed /variable costs and volume of production/sales etc. Therefore, the variability in the Model Dairy Unit's financial feasibility is assessed using the Break-even, Sensitivity and Scenario methods of Risk analysis.

DCF Break-even Analysis: A linear Regression Model study using Minitab has been conducted for Milk Peda to estimate the DCF Break-even point of NPV with respect to a single variable like Sales Volume (SV), Selling Price (SP), Variable Cost (VC) and Fixed Cost (FC) as illustrated in Graph 5.28.

Graph 5.28: Fitted Line Plot Regression Model for Break-even (Milk Peda)



Source: Primary Data

The rationale behind this study is to estimate the regression line intersection point with X axis, which is the break-even point of the subject variable. Similar study has been conducted for all the products and the break-even point of each product's volume, unit selling price, unit variable cost and annual fixed cost are summarised in Table 5.7

Table 5.7: Result Summary of DCF Break-even (Rs.) of Model Dairy Unit

Variables	Milk Peda		Paneer		(Ghee)	
	Base Case	Break-even	Base Case	Break-even	Base Case	Break-even
Volume (Kg)	760	433	893	401	975	932
Unit Selling Price (Rs/Kg)	480	394	440	321	520	516
Unit Variable Cost (Rs/Kg)	280	366	224	343	427	431
Annual Fixed Cost (Rs)	20,000	85,312	20,000	1,26,200	20,000	23,987

Source: Primary Data

Results and Interpretation of DCF Break-even Analysis: The results of DCF Break-even analysis shows how many units to be sold at what price and at what cost to break-even of each product of the Model Dairy Unit. The Break-even volume for Milk Peda is 43.1 per cent (327Kg) less than the Base Case volume. Similar

reduction in Base Case volume possible for Break-even of Paneer and Ghee are 55.1 per cent (492Kg) and 4.5 per cent (43Kg) respectively.

The break-even unit selling price for Milk Peda falls at 18 per cent (Rs.86) less than the Base Case selling price. Similar reduction in price possible to Break-even the Paneer and Ghee are 27 per cent (Rs.119) and 0.8 per cent (Rs.4) less respectively. The production will turn away from profit if its unit variable cost increases by 30.7 per cent (Rs.86) for Milk Peda, 53 per cent (Rs.119) for Paneer and 0.9 per cent for (Rs.4) for Ghee than the Base Case. The production will turn away from profit if its annual fixed cost increases by 327 per cent (Rs.65, 312) for Milk Peda, 531 per cent (Rs.1, 06,200) for Paneer and 20 per cent (Rs.3987) for Ghee than the Base Case.

DCF Break-even analysis result summary reveals that agribusiness in dairy products is a financially feasible venture in Kerala since the break-even volume and selling price of each product is much lower and the break-even variable and fixed cost is much higher in the Model Dairy Unit than the Base Case. Thus, agribusiness in dairy products can mitigate the long-term impact of Covid-19 pandemic on nutritional food security and by contributing to income and employment in the rural areas of Kerala.

Sensitivity Analysis: The study makes use of sensitivity analysis to measure the risk and uncertainty of investment in the Model Dairy Unit. The analysis helps to make desirable changes in investment decisions due to changes in the key variables independently.

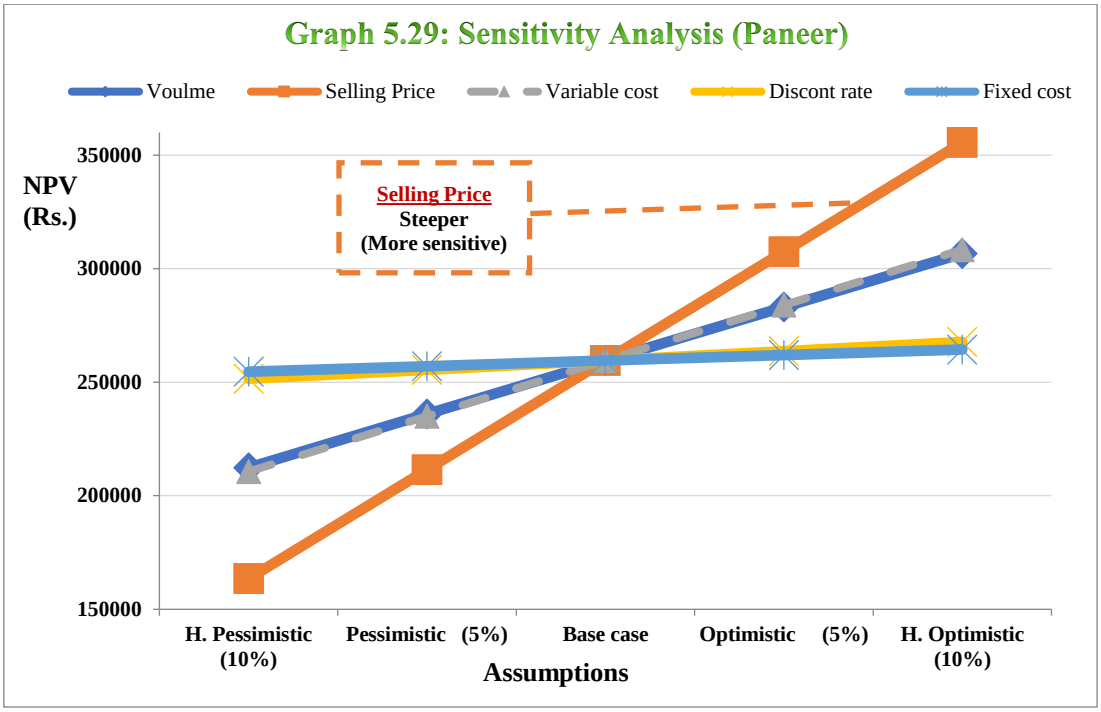
Results and Interpretation of Sensitivity Analysis for Paneer: The sensitivity analysis for Paneer shows that for every 5 per cent change in volume and selling price from the Base Case, NPV response is 9 per cent and 18 per cent respectively (Table 5.8). Sensitivity of 5 per cent change in Variable cost, discount rate and annual fixed cost results in -9 per cent, -2 per cent and -1 per cent change in respective NPV.

Table 5.8: Sensitivity Analysis for Paneer

Changing Variables	H. Pessimistic Assumptions	Pessimistic Assumptions	Base Case Assumptions	Optimistic Assumptions	H. Optimistic Assumptions	% Change
Volume (Kg)	804	848	893	938	982	5
NPV (Rs)	212386	235954	259522	283090	306658	9
Selling Price (Rs)	396	418	440	462	484	5
NPV (Rs)	163504	211513	259522	307531	355540	18
Variable Cost (Rs)	246.4	235.2	224	212.8	201.6	5
NPV (Rs)	210640	235081	259522	283963	308404	-9
Discount Rate (%)	12.10	11.55	11	10.45	9.90	5
NPV (Rs)	251568	255513	259522	263596	267738	-2
Annual Fixed Cost (Rs)	22000	21000	20000	19000	18000	5
NPV (Rs)	254635	257078	259522	261966	264409	-1

Source: Primary Data

Sensitivity of Paneer is illustrated in Graph 5.29 with respect to the slope of the curve. Steeper the slope more sensitive is the variable to NPV and flatter the slope less sensitive is the variable to NPV. Selling price is the most sensitive variable for Paneer followed by variable cost and volume.



Source: Primary Data

Results and Interpretation of Sensitivity Analysis for Milk Peda: Sensitivity analysis for Milk Peda shows that for every 5 per cent change in volume and selling price from the Base Case, NPV change is 12 per cent and 28 per cent respectively

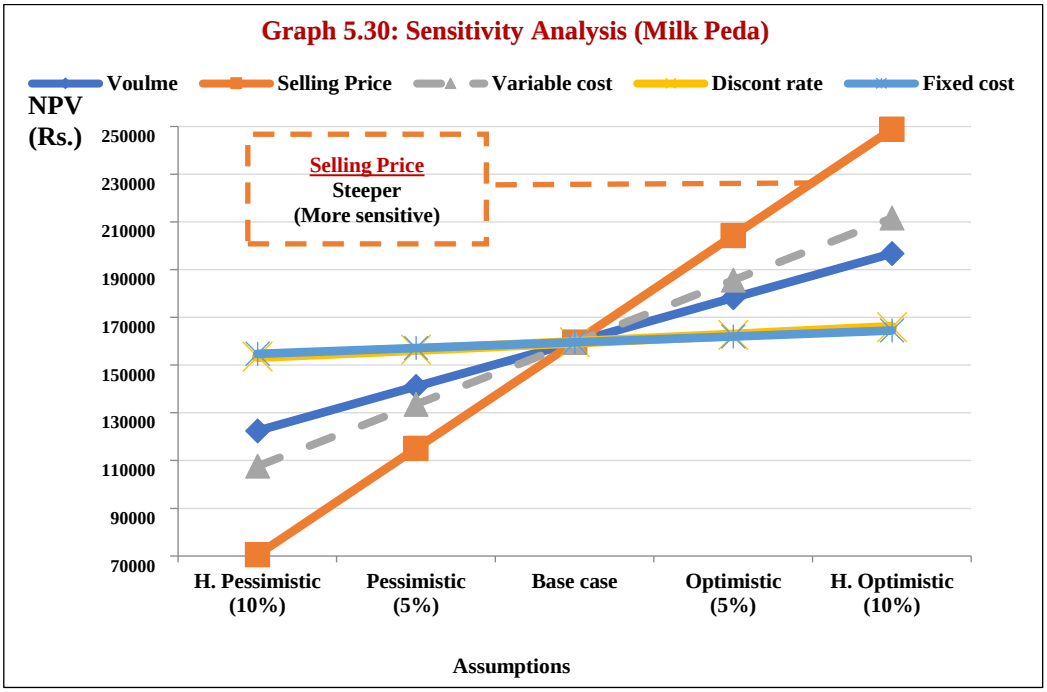
(Table 5.9). The Sensitivity of 5 per cent change in variable cost, discount rate and annual fixed cost from the Base Case results in a change of -16 per cent, -2 per cent and -2 per cent respectively in NPV.

Table 5.9: Sensitivity Analysis for Milk Peda

Changing Variables	H. Pessimistic Assumptions	Pessimistic Assumptions	Base Case Assumptions	Optimistic Assumptions	H. Optimistic Assumptions	% Change
Volume (Kg)	684	722	760	798	836	5
NPV (Rs)	122459	141031	159603	178176	196748	12
Selling Price (Rs)	432	456	480	504	528	5
NPV (Rs)	70457	115030	159603	204177	248750	28
Variable Cost (Rs)	308	294	280	266	252	5
NPV (Rs)	107601	133602	159603	185604	211606	-16
Discount Rate (%)	12.10	11.55	11.00	10.45	9.90	5
NPV (Rs)	153531	156543	159603	162714	165876	-2
Annual Fixed Cost (Rs)	22000	21000	20000	19000	18000	5
NPV (Rs)	154716	157160	159603	162047	164491	-2

Source: Primary Data

The Sensitivity Graph 5.30 for Milk Peda shows that Selling price is the most sensitive variable for Milk Peda followed by variable cost and volume.



Source: Primary Data

Results and Interpretation of Sensitivity Analysis for Ghee: Sensitivity analysis for Ghee is shown in Table 5.10.

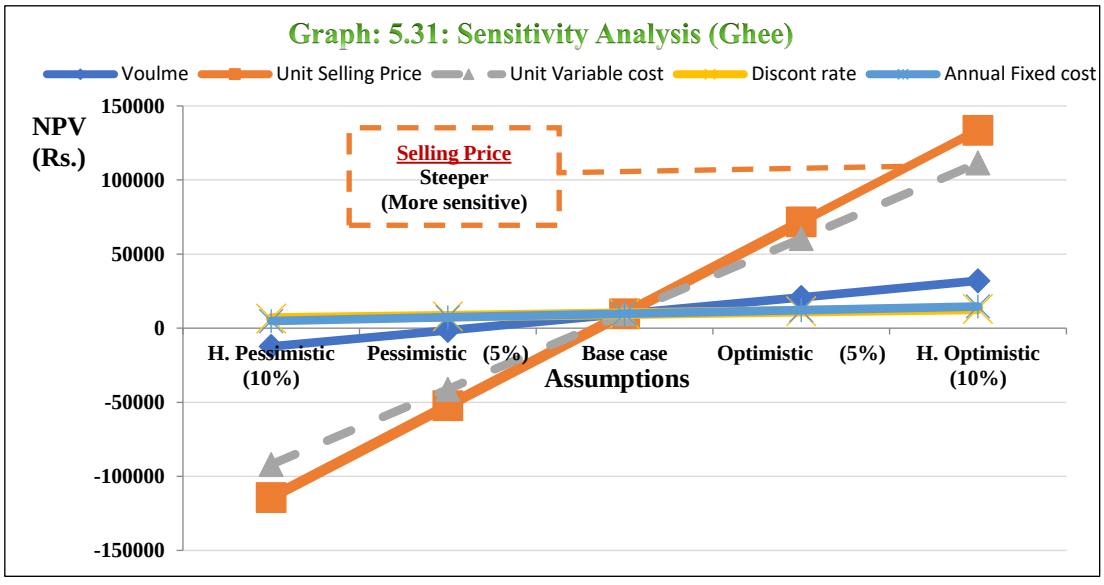
For every 5 per cent change in volume and selling price from the Base Case, NPV change is 114 per cent and 636 per cent respectively. The Sensitivity of 5 per cent change in variable cost, discount rate and annual fixed cost from the Base Case results in a change of -522 per cent, -25 per cent and -25 per cent respectively in NPV.

Table 5.10: Sensitivity Analysis for Ghee

Changing Variables	H. Pessimistic Assumptions	Pessimistic Assumptions	Base Case Assumptions	Optimistic Assumptions	H. Optimistic Assumptions	% Change
Volume (Kg)	878	926	975	1024	1073	5
NPV (Rs)	-12302	-1393	9743	20879	32015	114
Selling Price (Rs)	468	494	520	546	572	5
NPV (Rs)	-114154	-52206	9743	71691	133639	636
Variable Cost (Rs)	469.7	448.35	427	405.65	384.3	5
NPV (Rs)	-91995	-41126	9743	60612	111480	-522
Discount Rate (%)	12.10	11.55	11	10.45	9.90	5
NPV (Rs)	4855	7299	9743	12186	14630	-25
Annual Fixed Cost (Rs)	22000	21000	20000	19000	18000	5
NPV (Rs)	4855	7299	9743	12186	14630	-25

Source: Primary Data

The Sensitivity Graph 5.31 for Ghee shows that Selling price is the most sensitive variable for Milk Peda followed by variable cost and volume. The least sensitive variables are annual fixed cost and discount rate.



Source: Primary Data

It is very clear from the above sensitivity analysis of different variables for each product that dairy processing units in Kerala are more sensitive to selling price and variable cost which are mostly decided by the market forces. In spite of the high sensitivity to price and cost, the unit is making profits and the state has promising opportunities in agribusiness in processed dairy products especially in the post Covid-19 phase of Kerala economy.

Scenario Analysis: The risk and uncertainty of investment in Model Dairy Unit may arise due to the simultaneous changes in volume, price, cost and discount rate on each dairy product's NPV under different scenarios. Results of scenario analysis help the investor to make desirable changes in investment decisions in the Model Dairy Unit.

Results and Interpretation of Scenario Analysis: Scenario summary of Paneer is illustrated under five different scenarios in Table 5.11.

Table 5.11: Scenario Summary of Paneer

Changing Variables	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario
Volume (Kg)	804	848	893	938	982
Selling Price (Rs)	396	418	440	462	484
Variable Cost (Rs)	246.4	235.2	224	212.8	201.6
Discount Rate (%)	12.10	11.55	11	10.45	9.90
Annual Fixed Cost (Rs)	22,000	21,000	20,000	19,000	18,000
Result - NPV (Rs)	**72,568**	**1,61,573**	**2,59,522**	**3,66,666**	**4,83,264**

Source: Primary Data

The Base Case scenario NPV of around Rs.2.59 lakhs range between a profit of Rs.72.5 thousands under highly pessimistic and Rs.4.83 lakhs under highly optimistic scenarios.

Scenario summary of Milk Peda (Table 5.12) shows that the Base Case scenario NPV of around Rs.1.59 lakhs decline to a loss of Rs.12.3 thousand under highly pessimistic scenario but Milk Peda is profitable under all the other scenarios.

Table 5.12: Scenario Summary of Milk Peda

Changing Variables	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario
Volume (Kg)	684	722	760	798	836
Selling Price (Rs)	432	456	480	504	528
Variable Cost (Rs)	308	294	280	266	252
Discount Rate (%)	12.10	11.55	11	10.45	9.90
Annual Fixed Cost (Rs)	22000	21000	20000	19000	18000
Result - NPV (Rs)	**-12,352**	**69,316**	**1,59,603**	**2,58,751**	**3,67,009**

Source: Primary Data

Scenario summary of Ghee (Table 5.13) shows that the Base Case scenario NPV of around Rs.9743 moves to a loss of Rs.1.11 and 2.19 lakhs under pessimistic and highly pessimistic scenarios respectively.

Table 5.13: Scenario Summary of Ghee

Changing Variables	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario
Volume (Kg)	878	926	975	1024	1073
Selling Price (Rs)	468	494	520	546	572
Variable Cost (Rs)	470	448	427	406	384
Discount Rate (%)	12.10	11.55	11	10.45	9.90
Annual Fixed Cost (Rs)	22000	21000	20000	19000	18000
Result - NPV (Rs)	**-2,19,295**	**-1,11,478**	**9743**	**1,44,748**	**2,93,931**

Source: Primary Data

Scenario analysis assesses the risk of simultaneous changes in variables influencing the profitability under different scenarios and the study result found that production of Paneer is profitable even under highly pessimistic scenario. The production of Milk Peda is profitable except under highly pessimistic scenario but Ghee has only a small profit margin even under Base case scenario. People dwelling in different parts of the world have a preference for highly nutritive processed dairy products regardless of their age, caste, religion, gender and status. Thus, there exists tremendous opportunity for profitable agribusiness in dairy products.

5.5 LINKAGE EFFECTS OF AGRIBUSINESS IN MILK

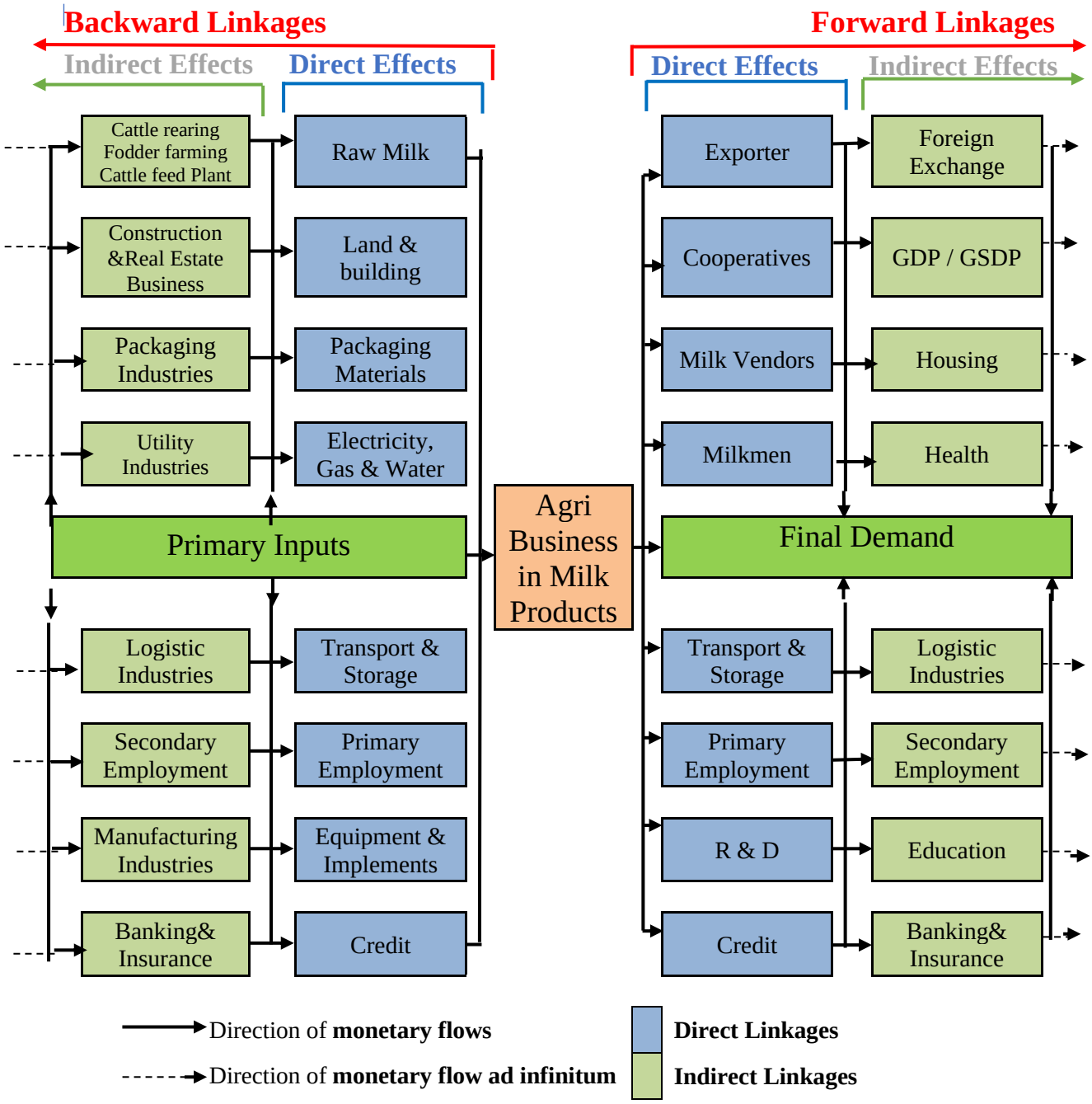
Small holder dairy sector agribusiness plays a significant role in the inclusive development of Kerala, since dairy farming is the main source of livelihood for a large number of rural households. The developmental opportunities of agribusiness in dairy sector starts from the inter sectoral, intra-sectoral, urban-rural and direct-indirect backward and forward linkages as illustrated in the Flow Chart 5.1.

Direct & Indirect Backward Linkage Effects: The backward linkage effects of agribusiness in dairy sector can be direct and indirect through multiplier effects of secondary and primary production.

Stimulus for Dairy, Livestock and Crop Sector: Model Dairy Unit requires standardised milk of good quality and other crop sector ingredients to prepare the processed dairy products. This gives a stimulus to dairy farmers to modernize the production system cater to the needs of agri-entrepreneurs. At the same time greater demand for raw milk enhances the negotiating ability of dairy farmers for a higher price. Similar stimulus is also expected in the crop sector for the cultivation of fodder and processed dairy product ingredients like, dry/fresh fruits, nuts, vegetables, spices etc. Agribusiness in dairy sector has a direct positive impact on the standard of living of dairy farmers in terms of higher income, nutritious food, better education, employment, health and housing. Indirectly, the standard of living of all those who have an indirect positive link in the processing from production, distribution and marketing of agribusiness dairy products.

Stimulus to Cattle Feed Industries: Increased demand for milk by the dairy processing units lead to the expansion of dairy farming which in turn increase the demand for cattle feed. This gives a stimulus to the cattle feed plants to modernise and expand the production system. The demand for land to start an agribusiness dairy unit directly increases the demand for land and indirectly gives a boost to real estate business. Uncultivated and barren land will be increasingly used for fodder cultivation. Increased demand for building indirectly raise the rent, demand for building materials and encourages the growth of construction sector.

Flow Chart 5.1: Agribusiness Linkages of Model Dairy Unit



Growth of Banking Sector: Increased credit requirements by dairy farmers and agri-entrepreneurs necessitate the growth of banking services. Credit support is provided to Marginal, Small and Medium Enterprises (MSME) in dairy sector by public sector banking institutions at a reduced lending rate. Credit need arises not only from agri-entrepreneurs but also from input suppliers like farmers, industries supplying fertilisers, pesticides, insecticides, packaging materials, logistics etc.

Boost to Manufacturing Sector: The Dairy Unit requires equipment and implements like cream separator, freezer, mixer grinder, multi-purpose vat, sealing and labelling machines, paneer press, peda mould, gas cylinders, stainless-steel tables and utensils, milk testing equipment etc. This gives indirect stimulus to the manufacturing industries supplying machines, equipment and implements to agribusiness units. Expansion of dairy processing increases the demand for packaging materials and this give a positive stimulus to the industries supplying packaging materials like, boxes, bottles, lids, covers, stickers etc. Increased demand for raw materials requires the development of transport, storage and communication services and which in turn promote the logistics industries. Agribusiness strengthens the cold storage, supply chain linkages and reduce wastage. Growing agribusiness increases the demand for cooking gas, electricity and water which leads to the growth of utility industries.

Employment Generation: Agribusiness in dairy products creates a multiplier effect on primary and secondary employment in crop, livestock, dairy, manufacturing, logistics and other service sectors. Inter sectoral and intra- sectoral employment opportunities will emerge through agribusiness in dairy sector.

Efficiency in Marketing and Stimulus to Scientific Research and Technical Institutions: Long term contracts signed between the dairy plants and raw milk suppliers avoids middlemen, reduce wastage, marketing uncertainty and maintains better quality. Technical support and guidance by veterinary doctors, scientists, engineers and researchers increase the productivity and quality of inputs through better varieties of in-milk animals. Therefore, dairy sector agribusiness gives stimulus to agricultural research and technical institutions.

Direct & Indirect Forward Linkage Effects: Traditional dairy farmer sells raw milk directly to nearby houses and tea shops at a low price. The forward linkages start from the dairy farmer and continue with milk vendor cooperatives and ends with final consumers. With the emergence of modern agribusiness, direct and indirect forward linkages of processed and value-added livestock products start from the processors.

Expansion of Markets: Production of diversified processed and value-added dairy products directly widens the domestic as well as export market through milkmen, milk vendor, cooperatives and exporters. The growth of supermarkets with a wide range of products offers market for agribusiness dairy products in urban cities. Enhances the negotiating ability of dairy-entrepreneur for a higher output price, and stability in input supply and price. Industrialization, urbanization, high literacy, nuclear family set up, higher percentage of middle-income families and changing food habits widens the market for processed goods in Kerala. Commercial dairy farming increases the volume of marketable surplus and the capacity to export. Export earnings are used for importing advanced technological know-how for greater productivity, diversification and economic development.

Growth of Professional Agri-entrepreneurship and Employment Generation: Enhances healthy competition among Agri-entrepreneurs in dairy processing which provides adequate profit to producers and ensures better quality products to consumers at reasonable prices. Agricultural Universities produce agribusiness and agri-entrepreneur professionals who excel in their profession and this give a professional touch to agribusiness. Multiplier effect on secondary and tertiary employment generation in processed dairy plants especially in rural areas can attract large number of unemployed youth and women in rural areas towards dairy processing also can absorb workers from agriculture who face disguised unemployment.

Nutritional Food Security, Sustainable and Inclusive Development: Better employment, income and standard of living lead to changes in the taste and preferences of the people. Inclusion of a variety of nutritious processed dairy products in the diet ensures market for agribusiness products and helps to attain nutritional food security. Agribusiness helps to achieve the goals of sustainable economic development through rural-urban linkages, women empowerment and inclusive growth of rural economically deprived households.

Stimulus to Research and Development: The innovations through the expansion of research and development reach the dairy entrepreneurs. This helps them to

produce diversified dairy products with different flavour acceptable to consumers of all ages

Growth of Banking and Insurance: Increased credit requirements necessitate the growth of banking services. Positive economic linkage through government support in the form of subsidies and tax concession requires banking and insurance services.

Stimulus to Manufacturing Industries: Better standard of living increases the demand for household equipment and facilities like refrigerator, washing machine, microwave oven, air conditioner etc. Increased standard of living reflects in the increased demand for transportation and communication facilities like vehicles, mobiles, television etc. Value addition and processing of dairy products increase the value, shelf life and requires less storage space. Successful agribusiness requires infrastructure for storage, distribution and marketing which increases productivity and prevents wastage. Thus, dairy sector agribusiness gives stimulus to logistics industries.

The above discussion reveals that there is a great need for developing efficient dairy sector agribusiness linkages in the state to create better marketing facilities, expand employment opportunities, increase rural income and thereby reduce rural poverty.

5.6 CHALLENGES FACED BY AGRI-ENTREPRENEURS OF MILK

The earlier discussions strongly argue that dairy sector agribusiness play a significant role in the agricultural and economic development of Kerala. It is undoubtable that local self-government institutions at the district, block and panchayat levels are supporting and encouraging Agri-entrepreneurs through their development policies and programmes. Kerala government is considering dairy sector agribusiness as one of the thrust areas to ensure long-term nutritional food security and a means to reallocate the reverse migrants in gainful employment in the post Covid 19 pandemic development phase. In spite of the government measures, Kerala is not self-sufficient in the production of milk and milk products and it is

high time to reduce the dependency on other states. In this context, it is relevant to discuss the challenges and problems faced by the dairy entrepreneurs of Kerala.

Dairy processors in Kerala face difficulties in collecting milk from large masses of small household farmers scattered over different parts of the state and the quality of milk is a big concern. Due to the absence of sophisticated and modern milking mechanisms, the chances of contamination are high which lowers the quality of domestically available raw milk. Farmers make use of traditional feeding practices without scientific knowledge. Inadequacy of feed and fodder with essential optimum nutrients based on the in-milk animal's genetic profile reduces quality and productivity.

Dairy products have low shelf life and there is the difficulty in cold chain maintenance due to high electricity cost and frequent power failure in the state. In spite of the advancement in education and research in Kerala, the poor disease diagnosis facilities and health and hygiene maintenance adversely affects the domestic production potential of dairy sector. The state lacks the application of genomic tools to develop and improve livestock breeds, production and productivity.

The seasonality in the supply of raw milk and the seasonal fluctuations in demand for dairy products create instability in price and uncertainty in profits. Kerala lacks sufficient cold chain facilities and well-organized marketing system. Lack of reliable and accurate instruments and equipment for processing and infrastructure for storage leads to wastage of dairy resources. Heavy requirement of capital and lack of trained and skilled workers is another challenge faced by the dairy entrepreneurs in Kerala. Insufficient quality and safety standards and stringent phytosanitary measures of importing countries resulted in fluctuating export trade.

Preference of domestic consumer in Kerala is for raw milk rather than value-added milk products pauses a challenge to the dairy entrepreneurs. The linkage effect of agribusiness in Kerala is reaching only very small proportion of dairy entrepreneurs. Majority of agribusiness activities in Kerala are done by small entrepreneurs without much professional skill in management. But they face stiff

competition from a few large scale agri-entrepreneurs with sophisticated technology and product brand names. With limited capital, these small entrepreneurs cannot invest for long-term benefits.

Inadequate credit is another challenge faced by agri-entrepreneurs in the state. Majority of the dairy processors in Kerala are poor and low investment reduces the chances of modernisation in processing. Uninterrupted supply of milk is not possible due to seasonal variation in production. Milk procurement in the state shows a declining trend from January to May and from August to September. The deficit in supply is met by buying milk and milk powder from neighbouring states which is expensive. The price of processed and value-added dairy products in Kerala is high due to high cost of production. This reduces the scope of exports. The price offered to dairy farmers in Kerala is less since raw milk is available at a lower price from other states.

Thus, agricultural policy reforms should be directed towards supporting the large number of small agri-entrepreneurs. At the same time agri-entrepreneurs should be competent enough to produce the products as per the aspirations of consumers regarding attributes like nutritive value, taste, colour, flavour, convenient packing, and easy availability. Agribusiness regulations all over the world are focusing on consumer welfare encircled by environmental protection, food health, safety standards and child labour issues. The need of the hour is sustainable agribusiness by safeguarding the welfare of both producers and consumers. Thus, the prevailing functional and institutional inefficiencies need to be addressed and online marketing facilities need to be coordinated.

5.7 CONCLUSION

The study proves that dairy sector plays a significant role in Kerala economy in terms of cost effective and nutritive food provides supplementary family income; generate gainful employment to landless labourers, small / marginal farmers and youth especially in the rural areas. The declining profit and low social profile of the people engaged in dairy farming keep the young generation of Kerala away from

this sector. Instability in price, insufficient infrastructure, inadequate processing, value addition and marketing facilities lead to wastage and underutilization of dairy resources.

Emergence of agribusiness and agri-entrepreneurship can augment this problem through its backward and forward linkage effects. It can create additional demand for dairy products which in turn increase the price of output, can transform the lives of people employed in dairy farming or working in the dairy agribusiness enterprises. Agribusiness in dairy sector can ensure sustainable economic development of rural areas. The study results prove that even under uncertain pessimistic situations agribusiness in dairy resource is profitable. The forward and backward linkages of agribusiness will directly or indirectly give a stimulus to the economic development of the state.

CHAPTER VI

FISHERIES SECTOR ENTERPRISES

6.1 INTRODUCTION

Fisheries sector plays a vital role in the socio-economic development of the country by providing nutritive food, employment, and income and export earnings. As per the estimates of Food and Agriculture Organisation, (FAO) world fish production reached 178.5 million tonnes in 2018. India ranks 2nd after China (16 per cent) by contributing 14 per cent of world inland capture production and shares 5th position with United States of America [China (15 per cent), Peru and Indonesia (8 per cent) and Russia (6 per cent)] by contributing 4 per cent of world marine capture production (FAO, 2020).

The share of fisheries sector in the total Gross Domestic Product (GDP at current prices) is 1.03 per cent and to agricultural GDP is 6.58 per cent2017-18 (Ministry of Statistics and Programme Implementation, 2020). The sector is one of the major foreign exchange contributors where marine exports stand at about 5 per cent of total exports of India and constitute 19.23 per cent of Agri-exports during 2017-18 (National Fisheries Policy, 2020). The sector provides direct employment to 16.09 million people and around twice along the value chain (Economic Survey 2019-20).

Kerala with a coastline of 590 Km length constituting 7.26 per cent of India's total coastline is rich in fisheries resources and make vital contributions to the state economy. Fisheries sector of Kerala contributes about 4 per cent of all India fish production in 2018-19. The sector contributes 13.12 per cent to all India marine exports and about 10.39 lakh people constituting 5 per cent of national fisher folk population earn their livelihood from fisheries. The contribution of fisheries sector to Gross State Value Added (GSVA) of the state is 1.82 per cent and to agriculture GSVA is 13.79 per cent which is much higher than the corresponding shares at the national level (Economic Review, 2018).

Despite the substantial contribution of fisheries sector, the fisher folk community continues to remain as one of the most economically backward sections of the society. Lower shelf life, production by masses and greater chances of contamination, variations in raw fish standardization, seasonality in supply due to vagaries of nature, difficulty in cold chain maintenance due to high electricity cost and frequent power failure, inadequate processing and value addition etc. lead to wastage and underutilization of fish resource potential in the state. Emergence of agribusiness and agri-entrepreneurship in fish products can augment this problem through its backward and forward linkage effects.

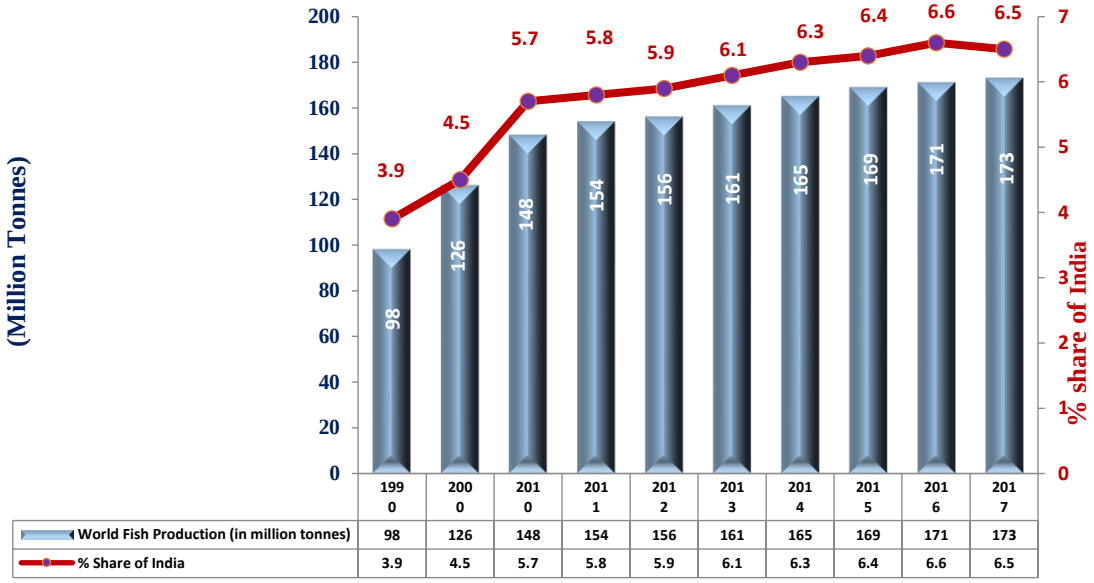
In this context it is inevitable to discuss the feasibility of agribusiness in the fishery sector of Kerala. Introductory section of this chapter is followed by a discussion to assess the potential of fishery sector in India and Kerala. This necessitates a discussion on the need and scope of processing and value addition in fish products followed by an analysis on the feasibility of agribusiness in the fish products in Kerala. Last section develops and identifies the linkages of agribusiness as well as the challenges faced by the emerging fishery Agri-entrepreneurs of Kerala.

6.2 PERFORMANCE OF FISHERIES SECTOR IN KERALA

The discussion on the fishery sector potential in India can proceed through the trends, structure, and state-wise analysis of fish production and growth, contribution to national and state income, employment and exports.

India's Position in World Fish Production Scenario: India with a coastline of 7516km and Exclusive Economic Zone (EEZ) of 2.02km^2 provides livelihood to more than 1 billion people living in the coastal areas. Fishery and aquaculture are fast-growing sub-sector of Indian agriculture. India ranks 5th and 2nd in the value of marine capture and inland aquaculture production respectively (Food and Agriculture Organization (FAO), 2020). The World fish production increased steadily from 98 to 173 million tonnes with an average annual growth of 2.1 per cent during the last 8 years (Graph 6.1).

GRAPH 6.1 : WORLD FISH PRODUCTION & % SHARE OF INDIA

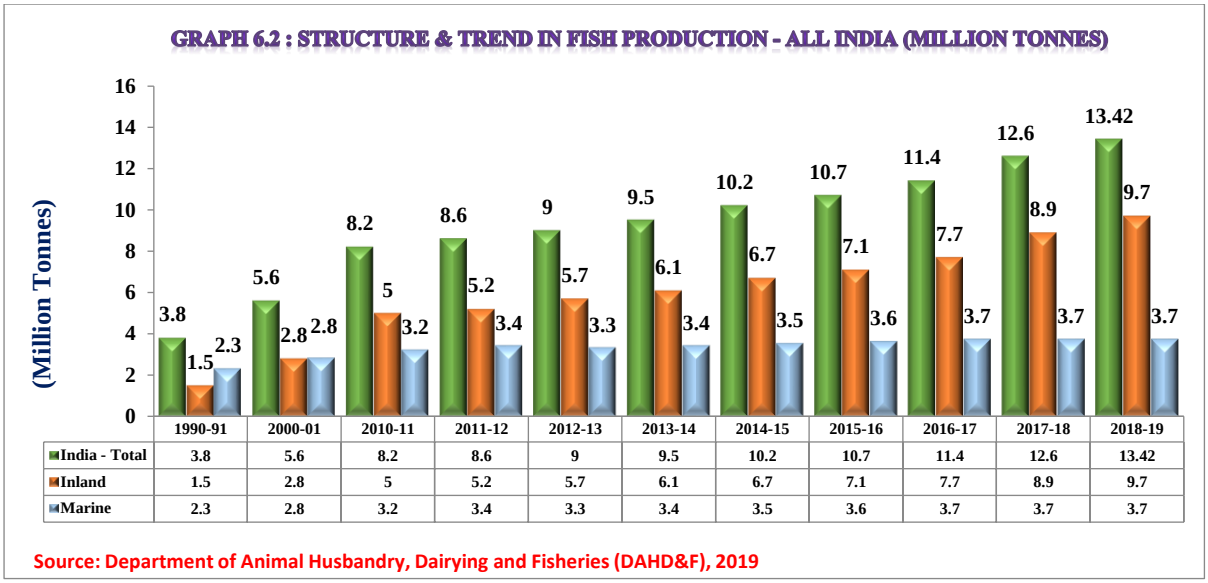


	1990	2000	2010	2011	2012	2013	2014	2015	2016	2017
World Fish Production (in million tonnes)	98	126	148	154	156	161	165	169	171	173
% Share of India	3.9	4.5	5.7	5.8	5.9	6.1	6.3	6.4	6.6	6.5

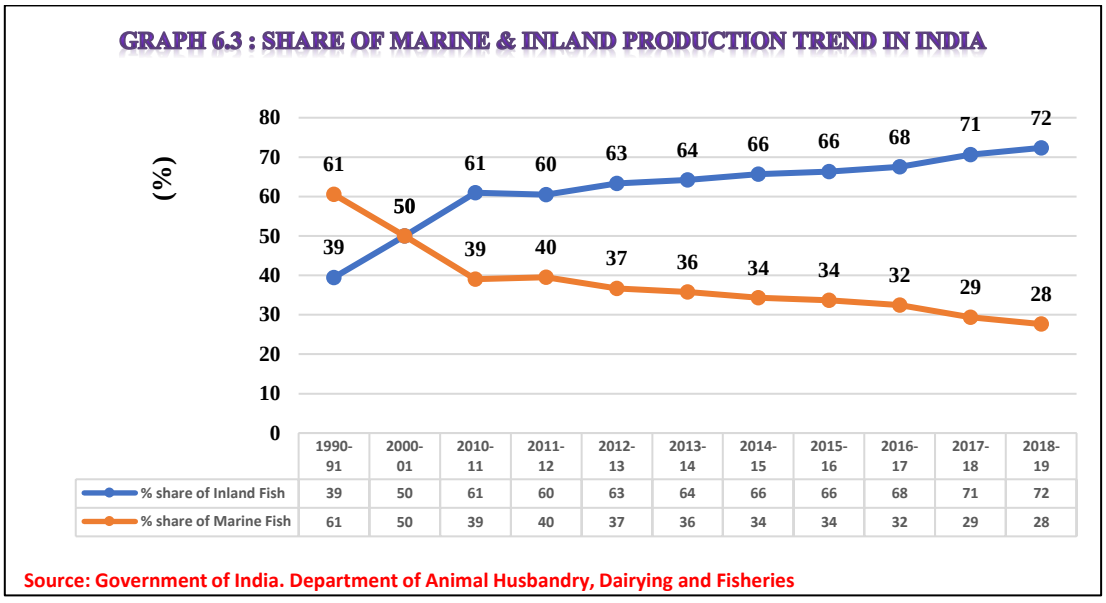
Source: Food and Agriculture Organisation, 2019

India's contribution towards world fish production increased from 3.9 per cent to 6.5 per cent between 1990 and 2017 with an average annual growth of 6 per cent during the last 8 years. The growth in production is contributed about 71 per cent by aquaculture and 29 per cent by capture fisheries. As per the latest estimates of FAO, 2020 it further increased to 178.5 million tonnes in 2018.

Structure and Trend of Fish Production in India: The importance of Fishery sector is evident from the increasing trend in all India fish production from 3.8 to 13.42 million tonnes between 1990-91 and 2018-19 (Graph 6.2). Among the agriculture and allied sectors of India only fisheries sector has registered a steady growth with an average annual increase of 7 per cent during the last 9 years. Both inland and marine fish production show an increasing trend from 1.5 to 9.7 million tonnes and 2.3 to 3.7 million tonnes respectively during the same period.



Contrary to this, share of marine fish in all India fish production shows a declining trend from 61 to 28 per cent while inland fish increased from 39 to 72 per cent between 1990-91 and 2018-19 (Graph 6.3).



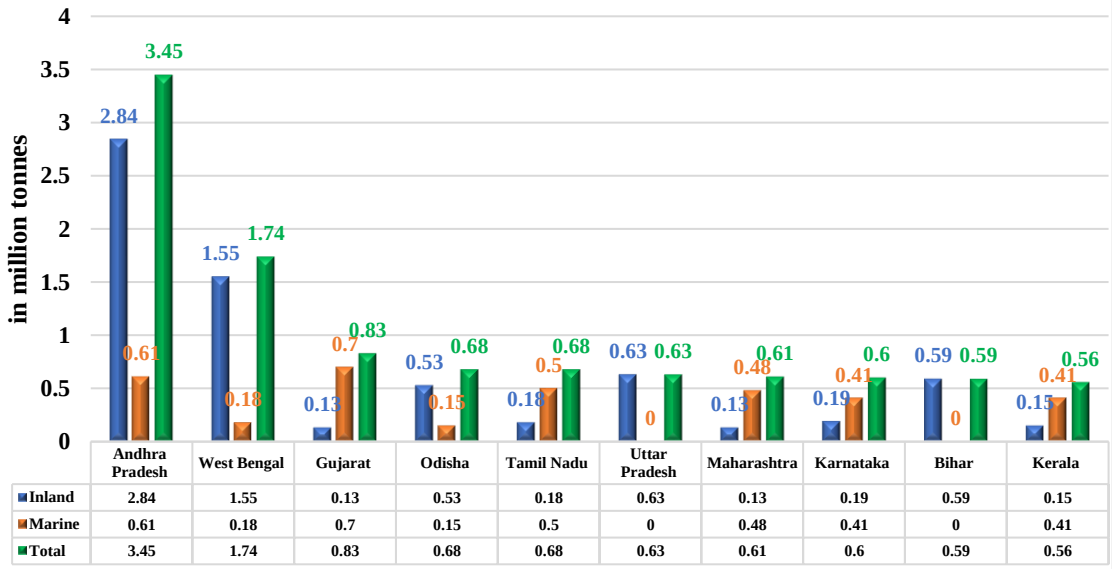
It is observed that only 58 per cent of inland and 71 per cent of marine fisheries potential have been harnessed during 2018-19 (Economic Survey). The reduction in the number of fishing days due to climatic vagaries like cyclonic storms and floods in many coastal states, overcapacities in territorial waters, weak regulation, inefficient management, traditional fishing practices, inadequate infrastructure like fishing harbours, landing centres, cold chain and distribution systems, lack of skilled manpower, poor processing and value addition, wastage etc.

can be attributed to the reduction in marine fish catch (National Fisheries Policy, 2020).

The share of inland fish increased tremendously from 39 to 72 per cent between 1990-91 and 2018-19 and almost 50 per cent of India's inland fish production is from culture fisheries. The untapped fisheries resources from rivers, canals, lakes, ponds, tanks, reservoirs and brackish water resources offer great opportunities for livelihood development and enhancing economic prosperity. In order to exploit the unused fisheries potential for the sustainable, responsible, inclusive and equitable development; the gaps in investment, infrastructure, value addition, quality inputs, technological know-how and skilled manpower has to be bridged through appropriate Central and Sate Government policy changes and financial support by banking institutions.

State-wise Analysis of Fish Production in India: Andhra Pradesh ranks first with 3.45 million tonnes of fish output contributing 27 per cent of all India fish production in 2018-19 followed by West Bengal with 1.74 million (14 per cent) and Gujarat with 0.83 million (7 per cent). Kerala with 0.56 million tonnes ranks 10th position contributing 4 per cent of all India fish production (Graph 6.4).

GRAPH 6.4 : STATE-WISE FISH PRODUCTION (2018-19) - TOP 10



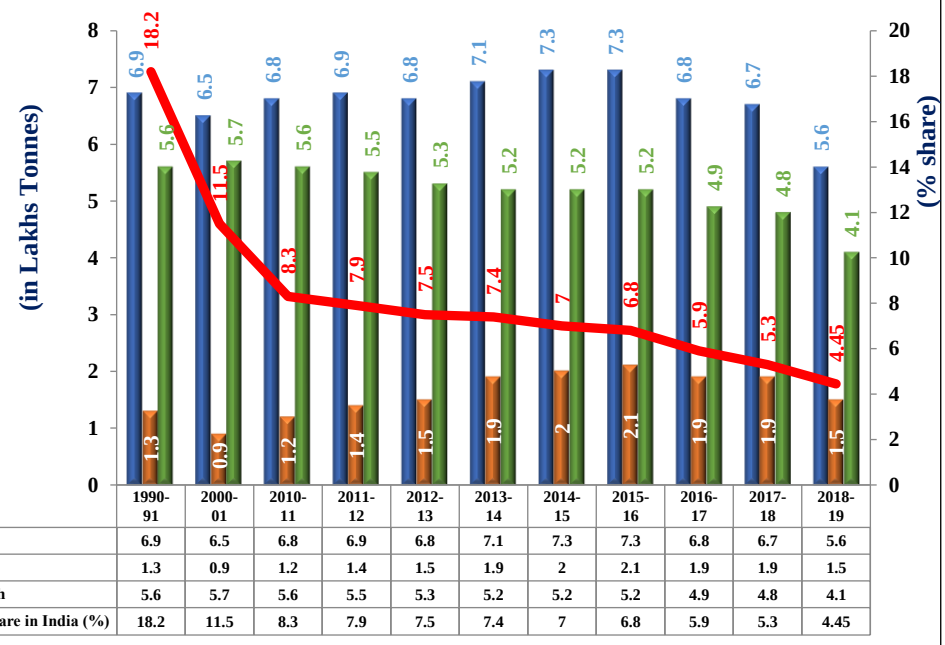
	Andhra Pradesh	West Bengal	Gujarat	Odisha	Tamil Nadu	Uttar Pradesh	Maharashtra	Karnataka	Bihar	Kerala
Inland	2.84	1.55	0.13	0.53	0.18	0.63	0.13	0.19	0.59	0.15
Marine	0.61	0.18	0.7	0.15	0.5	0	0.48	0.41	0	0.41
Total	3.45	1.74	0.83	0.68	0.68	0.63	0.61	0.6	0.59	0.56

Source: Government of India. Department of Animal Husbandry, Dairying and Fisheries, 2019

Among the nine maritime states Gujarat with 0.7 million tonnes ranks 1st in marine fish production followed by Andhra Pradesh (0.61MT), Tamil Nadu (0.5MT), Maharashtra (0.48MT) and Kerala shares 5th position with Karnataka (0.41MT). State-wise analysis of inland fish catch in India reveals that Andhra Pradesh (2.84MT) ranks 1st followed by West Bengal (1.55MT), Uttar Pradesh (0.63) and Kerala (0.15MT) is in the 11th position.

Fish Production in Kerala: Structure and Trend: The total fish production in Kerala between 1990-91and 2018-19 shows an increasing trend except for the years 2012-13 and 2016-17 and 2018-19 (Graph 6.5).

GRAPH 6.5: FISH PRODUCTION IN KERALA (IN LAKHS TONNES) & % SHARE IN INDIA



	1990-91	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Kerala	6.9	6.5	6.8	6.9	6.8	7.1	7.3	7.3	6.8	6.7	5.6
Inland Fish	1.3	0.9	1.2	1.4	1.5	1.9	2	2.1	1.9	1.9	1.5
Marine Fish	5.6	5.7	5.6	5.5	5.3	5.2	5.2	5.2	4.9	4.8	4.1
Kerala's share in India (%)	18.2	11.5	8.3	7.9	7.5	7.4	7	6.8	5.9	5.3	4.45

Source: Government of Kerala. Department of Fisheries

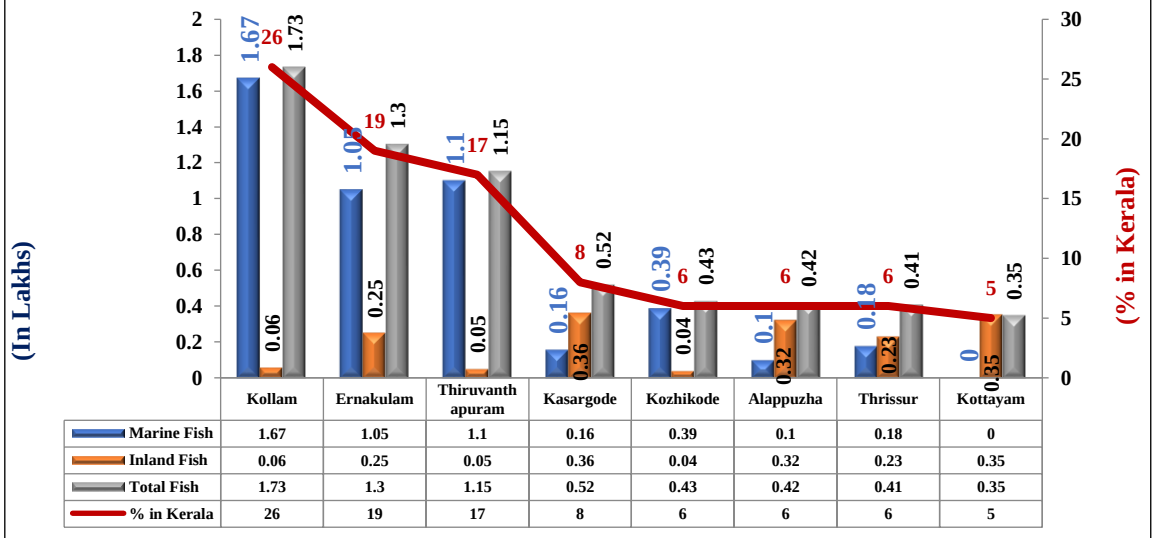
The reduction of fish catch in particular years can be attributed to the reduced fishing days as a result of climatic vagaries.

In Kerala, 73 per cent of the total fish production is contributed by the marine sector as against the national share of 28 per cent. Similarly, the contribution of inland sector is only 27 per cent in Kerala as against the national share of 72 per cent. Inland fisheries in the state suffers from issues like seasonal nature of fishing, depletion of fish in natural waters, problems of tenure and lease rights, obsolete

fishing technology, poor post-harvest and processing facilities, inadequate infrastructure for production, distribution and storage, pollution and poor quality of water, disease, low productivity, high input costs, lack of skilled manpower, shortage and high cost of credit etc. (National Fisheries Policy, 2020). Thus, through proper state government intervention there is scope for tapping the unutilized potential in the inland fishing of Kerala. Moreover, Kerala's contribution in all India fish production is continuously decreasing from 18.2 to 4.45 per cent between 1990-91 and 2018-19. This can be attributed to the structural change taking place in Kerala economy at a rapid rate than any other state. Being the most literate state, people of Kerala are shifting from low income earning and socially less attractive fishing jobs to more income earning white collar service sector jobs.

The district-wise analysis of fish production in Kerala during 2017-18shows that Kollam ranks 1st with 1.73 lakhs contributing 26 per cent of state's fish production followed by Ernakulum (19 per cent) and Thiruvananthapuram (17 per cent) (Graph 6.6).

GRAPH 6.6: DISTRICT-WISE FISH PRODUCTION IN 2017-18 (IN LAKH TONNES)



	Kollam	Ernakulam	Thiruvanth apuram	Kasargode	Kozhikode	Alappuzha	Thrissur	Kottayam
Marine Fish	1.67	1.05	1.1	0.16	0.39	0.1	0.18	0
Inland Fish	0.06	0.25	0.05	0.36	0.04	0.32	0.23	0.35
Total Fish	1.73	1.3	1.15	0.52	0.43	0.42	0.41	0.35
% in Kerala	26	19	17	8	6	6	6	5

Source: Government of Kerala. Department of Fisheries

Kollam (1.67 lakhs) ranks first in marine fish production followed by Thiruvananthapuram (1.1 lakhs) and Ernakulum (1.05 lakhs). Inland fish production is highest in Kasaragod (0.36 lakhs) followed by Kottayam (0.35 lakhs)

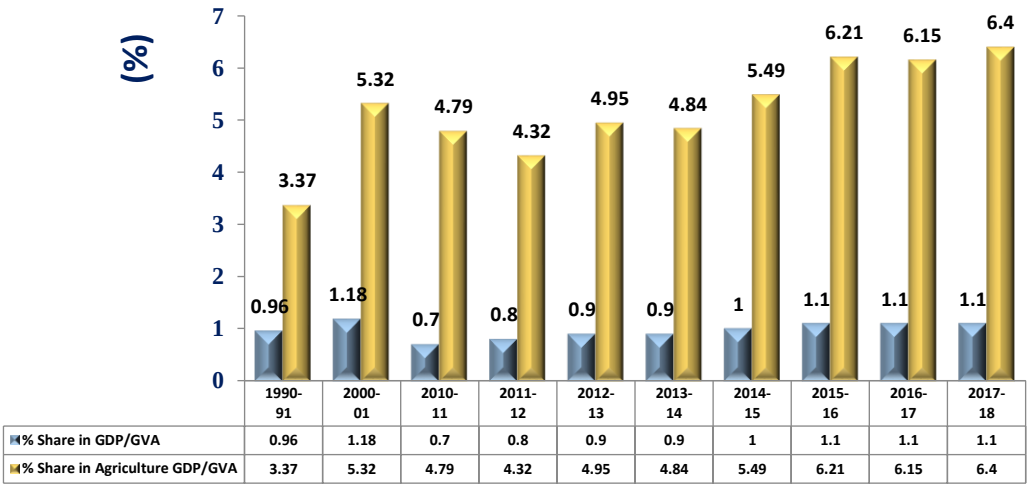
and Alappuzha (0.32 lakhs). Inland fish production faces issues like disease, less variety of species, inadequate genetic improvement, poor brood and seed, high input costs, inadequate credit and insurance coverage, environmental sustainability etc. (National Fisheries Policy, 2020).

The above discussion on the structure and production of fishery sector India and Kerala shows that Marine fish catch outweighs the inland fish catch in Kerala and vice versa in Indian fisheries production. Kerala has rich and diverse inland fisheries resources from lakes, ponds, rivers, canals, reservoirs, tanks etc. and marine resources are spread over the long and vast coastline. The unutilized and underutilized inland resources offer greater opportunities in the state for livelihood development of people especially in the rural coastal areas. The 'Blue Revolution' initiated at the national level is being taken up by Kerala especially in the development of inland fisheries with the credit support of Local Self Government (LSG) institutions.

Contribution of Fisheries Sector to Gross Value Added (GVA) of India: The contribution of fisheries sector to national GDP/GVA has slightly increased from 0.96 per cent to 1.1 per cent between 1990-91 and 2017-18 (Graph 6.7). The share of fisheries sector to agriculture GDP/GVA during the same period increased from 3.37 per cent to 6.4 per cent as against the decrease in the share of agriculture sector to national GVA from 28.42 per cent to 17.2 per cent.

The growth of Indian agriculture was a challenge to the government for the last few years due to the fluctuating growth in crop, livestock and forestry. But the fishery sector's growth was rapid and steady from 4.9 to 11.9 per cent during the last four years from 2014-15 to 2017-18. The main reason for the better performance is that over the past few years, the sector is transforming to culture fisheries from capture fisheries, to knowledge-based farming from empirical farming and to commercial farming from sustenance farming.

GRAPH 6.7 : SHARE OF FISHERIES TO GDP AND AGRICULTURE (%)

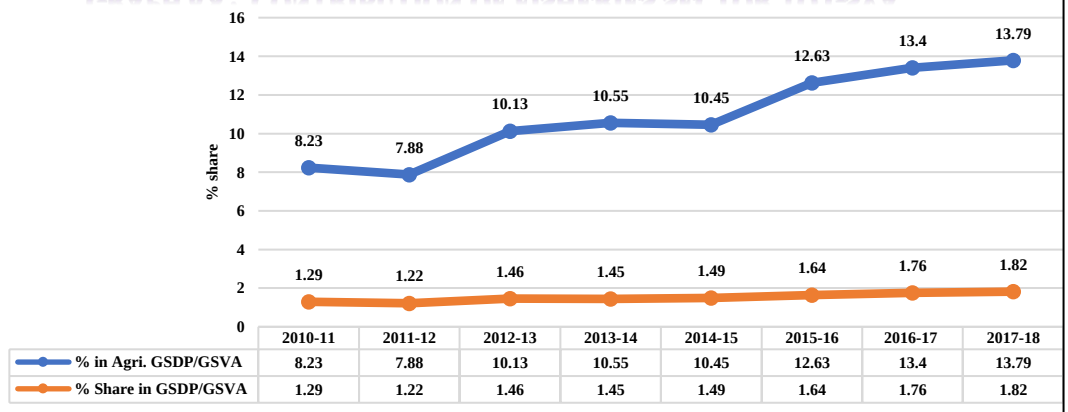


	1990-91	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
% Share in GDP/GVA	0.96	1.18	0.7	0.8	0.9	0.9	1	1.1	1.1	1.1
% Share in Agriculture GDP/GVA	3.37	5.32	4.79	4.32	4.95	4.84	5.49	6.21	6.15	6.4

Source: Central Statistical Organisation

Contribution of Kerala Fisheries Sector to Gross Value Added (GSVA): The significance and potential of fisheries sector of Kerala is visible from its contribution to state income (Graph 6.8).

GRAPH 6.8 : CONTRIBUTION OF FISHERIES SECTOR TO GSVA



	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
% in Agri. GSDP/GSVA	8.23	7.88	10.13	10.55	10.45	12.63	13.4	13.79
% Share in GSDP/GSVA	1.29	1.22	1.46	1.45	1.49	1.64	1.76	1.82

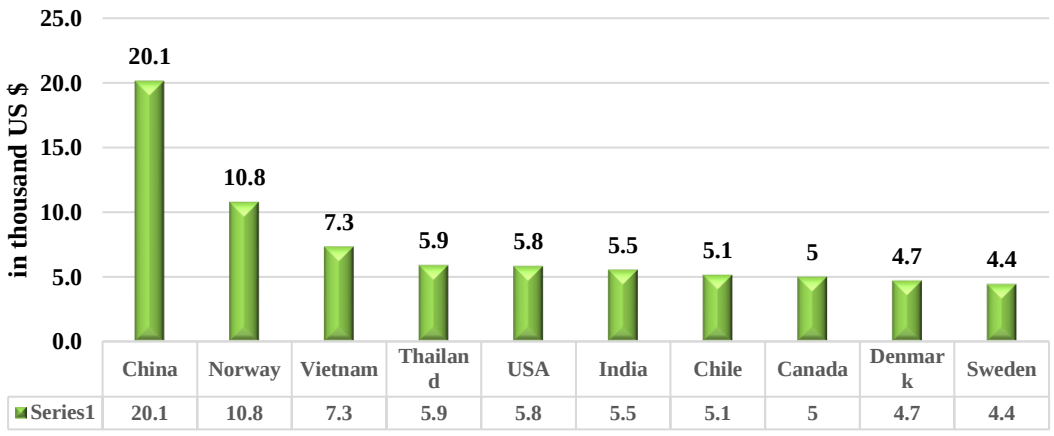
Source: Government of Kerala. Department of Fisheries

The share of fisheries sector to Gross State Value Added (GSVA) of Kerala increased at a slow rate from 1.29 per cent to 1.82 per cent between 2010-11 and 2017-18 but higher than the share of 0.7 per cent and 1.1 per cent at the national level during the same period. The percentage contribution of fisheries sector to agriculture GSVA of Kerala increased at a much faster rate from 8.23 per cent to 13.79 per cent than the corresponding increase in agriculture GVA of India from 4.79 per cent to 6.4 per cent during the same period.

The above discussion reveals the significance of fisheries sector for the agricultural and economic development of Kerala economy. There exists further scope for expansion in inland fisheries and being a state subject, Local Self Government Institutions of Kerala together with Kerala State Co-operative Federation for Fisheries Development Ltd. (Matsyafed), can adopt and implement policies and programmes for the development of fishery sector agribusiness in the rural areas of Kerala.

Contribution of Indian Fisheries Sector to Exports: As per the FAO 2018 estimates, India contributes only 5 per cent to global fish trade. India occupies 6th position in the exports of fish products with $ 5.5 thousand after China ($20.1 thousand), Norway ($10.8 thousand), Thailand ($7.3 thousand), Vietnam ($5.9 thousand) and USA ($5.8 thousand) (Graph 6.9).

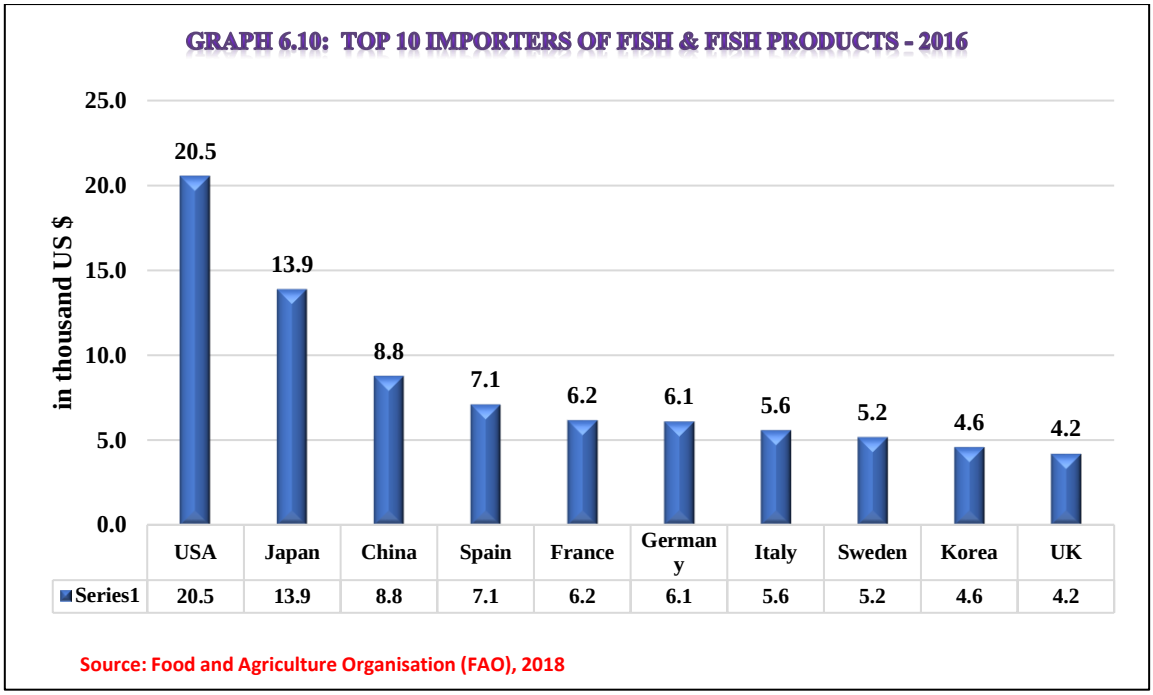
GRAPH 6.9 : TOP 10 EXPORTERS OF FISH & FISH PRODUCTS - 2016



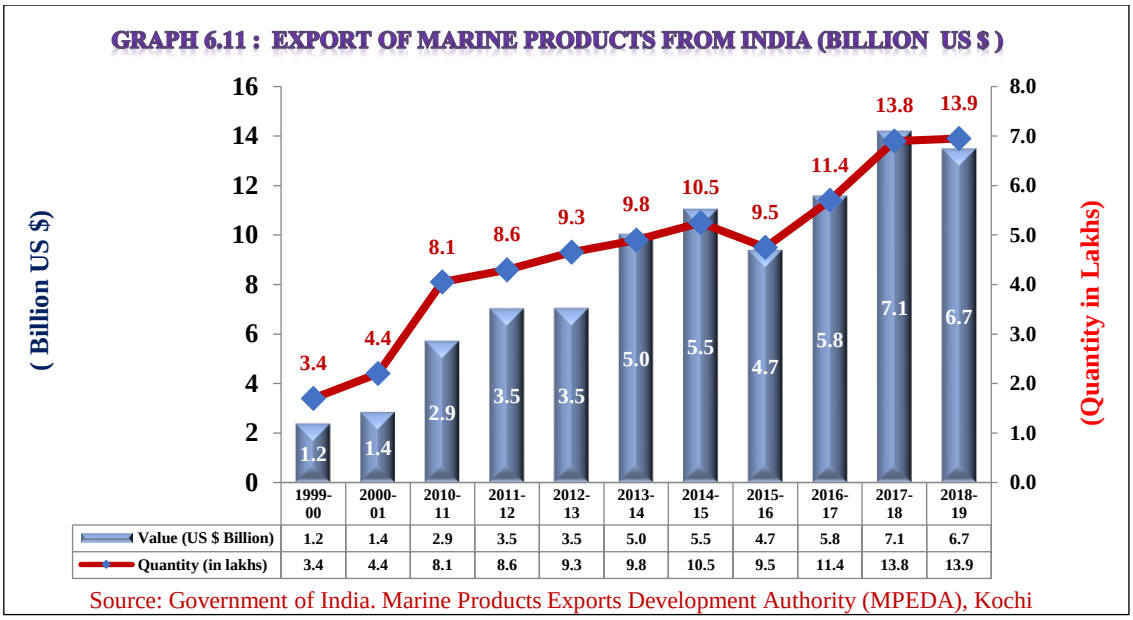
	China	Norway	Vietnam	Thailand	USA	India	Chile	Canada	Denmark	Sweden
Series1	20.1	10.8	7.3	5.9	5.8	5.5	5.1	5	4.7	4.4

Source: Food and Agriculture Organisation (FAO), 2018

Exports of fish and fisheries products from developing countries like India are badly affected by the selective application of sanitary and phytosanitary measures in the post-reform period on the issues of poor quality, muddy smell and traces of antibiotics by the developed nations. But with respect to imports, India is not in the top 10 countries where USA with $ 20.5 thousand ranks first followed by Japan with $ 13.9 thousand and China with 8.8 thousand (Graph 6.10)



The export of marine products from India shows an increasing trend both in quantity and value terms between 1999-00 and 2018-19 with the exception of 2015-16 (Graph 6.11).



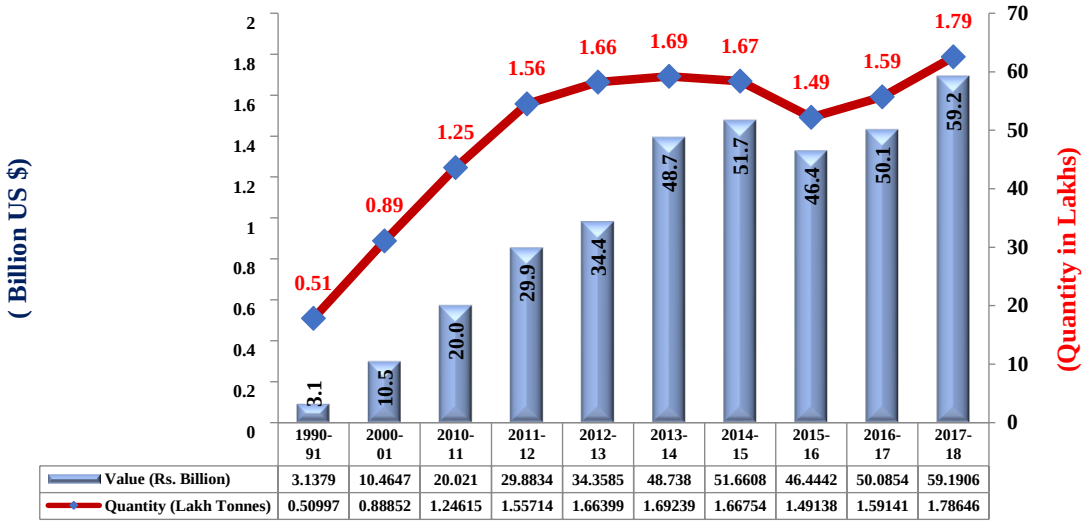
During 2018-19, India has exported over 13.9 lakh tonnes of marine products worth over US$ 6.7 as against 3.4 lakh tonnes and US$1.2 respectively in 1990-91. Marine products have emerged as the largest group in agricultural exports of India which is around 2.1 per cent of total exports and 17.8 per cent of agricultural exports.

The Major fish products exported from India during 2019 are shrimp, squid and cuttlefish. India is the world's largest exporter of shrimp about 125.4 thousand tonnes during 2019 with an increase of 6.5 per cent over 2018. Top three destinations of shrimp exports from India are USA, China and Vietnam (FAO, 2019).

It is estimated that the post-harvest losses in fisheries is about 20 to 25 per cent. Considerable attention is needed to handle fresh fish with minimum spoilage. The unutilized export potential can be tapped through increased, diversified and sustainable aquaculture production, processing and value addition. Thus, it is urgent to modernize agribusiness in fish processing and strengthen the value chain through increased investment to reduce post-harvest losses and enhance the standard of living of the fisher folk community.

Share of Kerala Fisheries Sector to Exports: Kerala has made vital contributions to the export of marine products from the country (Graph 6.12). The Quantity and value of exports of marine products from Kerala shows an increasing trend from 0.51 to 1.79 lakh tonnes and $3.1 to $59.2 billion respectively between 1990-91 and 2017-18. However, share of Kerala in national marine products exports reduced from 35 to 13.12 per cent in value terms during the same period.

GRAPH 6.12: EXPORT OF MARINE PRODUCTS FROM KERALA (BILLION US $)



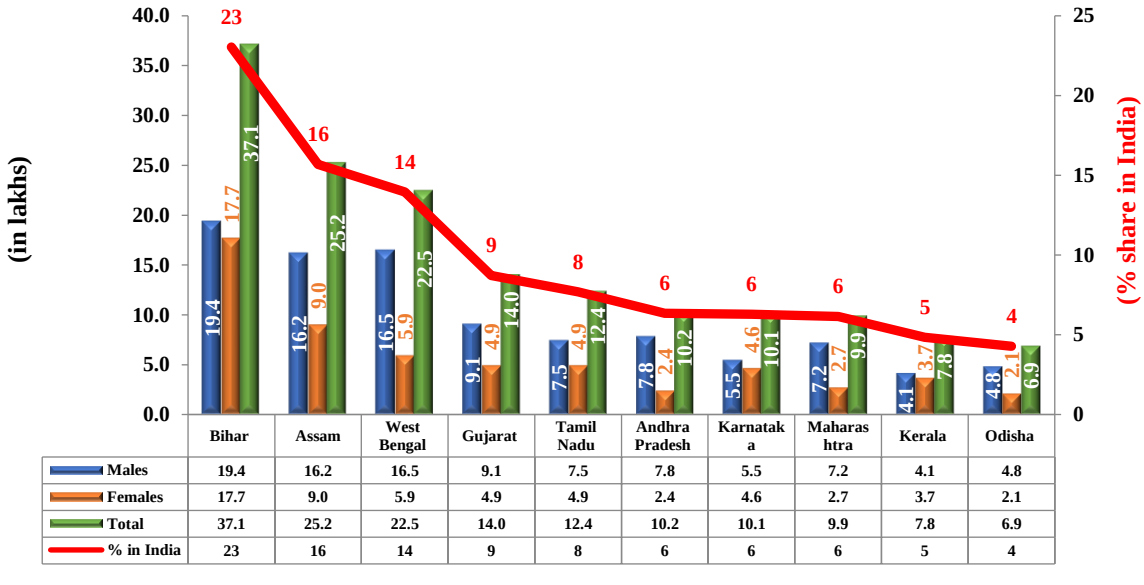
	1990-91	2000-01	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Value (Rs. Billion)	3.1379	10.4647	20.021	29.8834	34.3585	48.738	51.6608	46.4442	50.0854	59.1906
Quantity (Lakh Tonnes)	0.50997	0.88852	1.24615	1.55714	1.66399	1.69239	1.66754	1.49138	1.59141	1.78646

Source: Government of India. Marine Products Exports Development Authority (MPEDA), Kochi

The above analysis on the performance of fisheries sector shows that Kerala's contribution to national marine export is negligible. The benefits of increasing fish production in the country are not received by the fisher folk community. The per capita income of fisherman (1.074 lakhs) is much lower than the per capita income of Kerala (1.99 lakhs). New generation is shifting from fishing to other areas where they are expecting promising returns. Thus, untapped fish potential is to be utilized through the promotion of agribusiness ventures in fishery sector.

Contribution of Indian Fisheries Sector to Employment: Indian fisheries sector provides income and employment to 160.97 lakh people at the primary level and many more through the secondary production linkages. The state-wise analysis of fisher folk in the country in 2017 shows that Bihar ranks 1st with 37.1 lakhs fishermen contributing about 23 per cent of fisher folk population of the country followed by Assam (16 per cent), West Bengal (14 per cent) and Kerala ranks 9th with 5 per cent (Graph 6.13). Gender analysis of the fisher folk population in India shows that 35 per cent of the total fisher folk population is constituted by females.

GRAPH 6.13: STATE WISE FISHERMEN POPULATION - 2017



	Bihar	Assam	West Bengal	Gujarat	Tamil Nadu	Andhra Pradesh	Karnataka	Maharashtra	Kerala	Odisha
Males	19.4	16.2	16.5	9.1	7.5	7.8	5.5	7.2	4.1	4.8
Females	17.7	9.0	5.9	4.9	4.9	2.4	4.6	2.7	3.7	2.1
Total	37.1	25.2	22.5	14.0	12.4	10.2	10.1	9.9	7.8	6.9
% in India	23	16	14	9	8	6	6	6	5	4

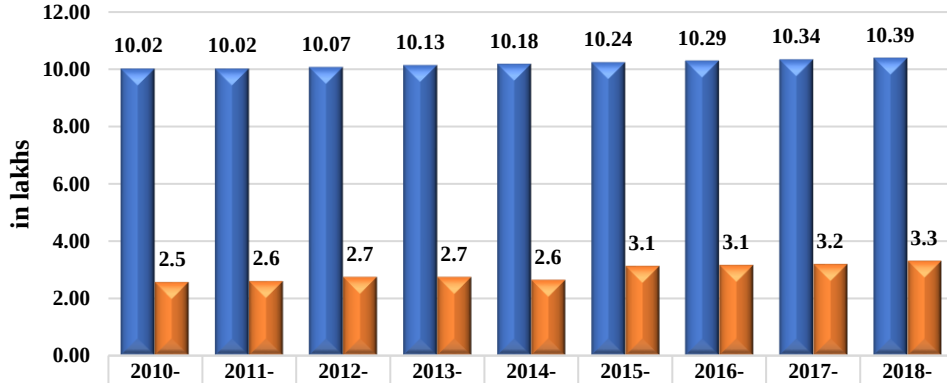
Source: Government of Kerala. Kerala Fisheries Handbook, 2019

Considering the resource potential and possibilities of fisheries sector, government constituted a separate Department of Fisheries in February 2019.

Government merged all the previous fisheries schemes under an umbrella scheme "Blue Revolution: Integrated Development and Management of Fisheries". The new scheme focuses on increasing inland and marine fish production from aquaculture and fisheries.

Share of Kerala Fisheries Sector to Employment: The fisher folk population of Kerala during 2018-19 is estimated to be 10.39 lakhs which includes 8 lakhs in the marine sector and 2.39 lakhs in the inland sector contributing to around 5 per cent of national fisher folk population. The number of estimated fishermen increased from 10.02 lakhs in 2010-11 to 10.39 in 2018-19 registering a growth of 3.7 per cent over the last 9 years (Graph 6.14). The number of registered fishermen is only 3.3 lakh during 2018-19 consisting of 2.4 lakhs active fishermen and 0.9 lakh allied workers including men, women and children. The number of registered fishermen increased from 2.5 lakhs in 2010-11 to 3.3 lakhs in 2018-19 registering an annual average growth of 3.6 per cent over the last 9 years. The increasing trend visible in the number of both estimated and registered fishermen population of Kerala is very mild.

GRAPH 6.14: ESTIMATED & REGISTERED FISHERMEN IN KERALA



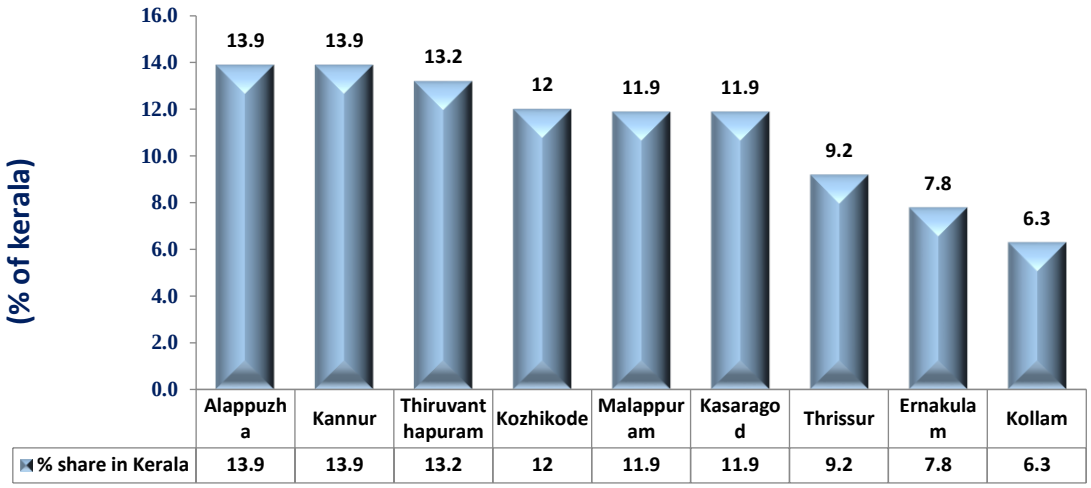
	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Estimated Fishermen	10.02	10.02	10.07	10.13	10.18	10.24	10.29	10.34	10.39
Registered Fishermen	2.5	2.6	2.7	2.7	2.6	3.1	3.1	3.2	3.3

Source: Government of Kerala. Department of Fisheries

The district profile of Kerala fisheries in 2018-19 shows the length of coastline, number of fishing villages and fishermen population. A district-wise analysis of the length of coastline shows that Alappuzha and Kannur share the credit

to have the longest coastline of 82 Km each constituting 13.9 per cent of the total coastline of Kerala (Graph 6.15).

GRAPH 6.15: DISTRICT-WISE LENGTH OF COASTLINE (% OF KERALA)

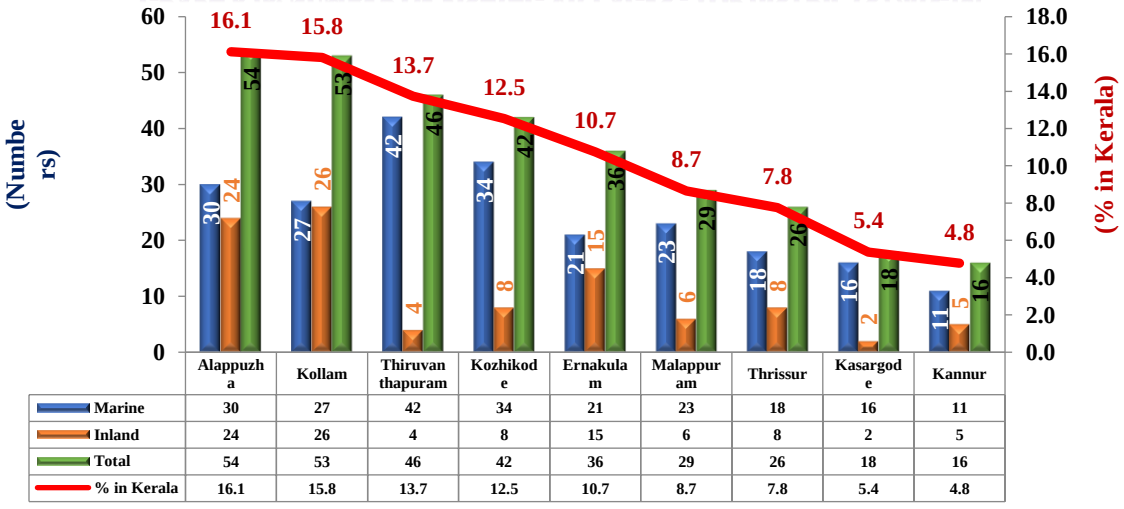


	Alappuzha	Kannur	Thiruvanthapuram	Kozhikode	Malappuram	Kasaragod	Thrissur	Ernakulam	Kollam
% share in Kerala	13.9	13.9	13.2	12	11.9	11.9	9.2	7.8	6.3

Source: Government of Kerala. Department of Fisheries

Thiruvananthapuram with 78Km (13 per cent) ranks the 2nd followed by Kozhikode with 71Km, Malappuram and Kasaragod with 70Km (12 per cent) each. The fisher folk in Kerala reside in 335 fishing villages of which 222 are marine villages and 113 inland villages. District-wise analysis of fishing villages in 2018-19 shows that Alappuzha ranks 1st with 54 fishing villages (16.1 per cent) followed by Kollam (15.8 per cent) and Thiruvananthapuram (13.7 per cent) (Graph 6.16).

GRAPH 6.16: NUMBER OF FISHIHG VILLAGES - TOP DISTRICTS (2018-19)

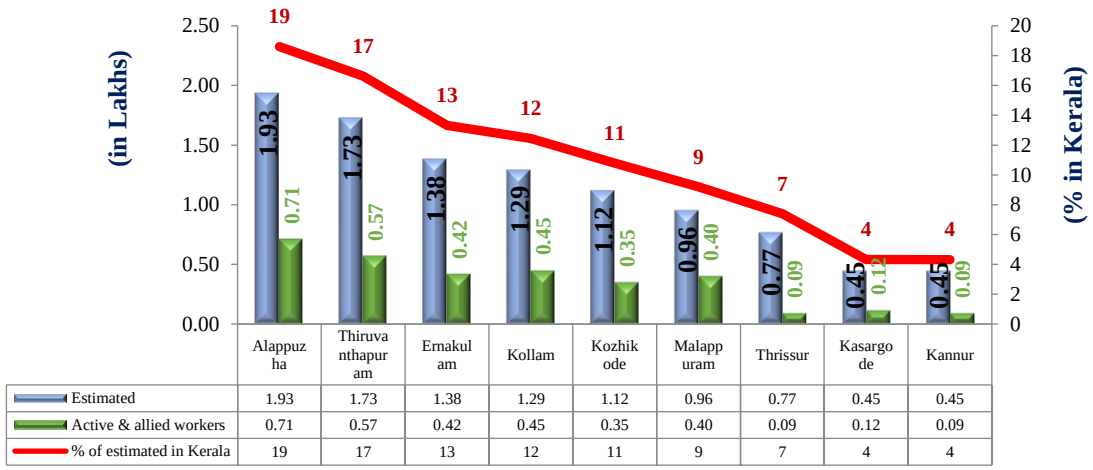


	Alappuzha	Kollam	Thiruvanthapuram	Kozhikode	Ernakulam	Malappuram	Thrissur	Kasargode	Kannur
Marine	30	27	42	34	21	23	18	16	11
Inland	24	26	4	8	15	6	8	2	5
Total	54	53	46	42	36	29	26	18	16
% in Kerala	16.1	15.8	13.7	12.5	10.7	8.7	7.8	5.4	4.8

Source: Government of Kerala. Department of Fisheries

The number of inland fishing villages are more in Kollam (26) followed by Alappuzha (24) and Ernakulam (15). Marine fishing villages are more in Thiruvananthapuram (42) followed by Kozhikode (34) and Alappuzha (30). The estimated fisher folk population in Kerala during 2018-19 is 10.39 lakhs which is around 5 per cent of the total fisher folk population in India. The district-wise analysis of the fishermen population shows that Alappuzha ranks 1st with 19 per cent of fisher folk population followed by Thiruvananthapuram (17 per cent) and Ernakulam (13 per cent) (Graph 6.17).

GRAPH 6.17: DISTRICT-WISE FISHERMEN POPULATION IN KERALA (2018-19)



	Alappuzha	Thiruvananthapuram	Ernakulam	Kollam	Kozhikode	Malappuram	Thrissur	Kasargode	Kannur
Estimated	1.93	1.73	1.38	1.29	1.12	0.96	0.77	0.45	0.45
Active & allied workers	0.71	0.57	0.42	0.45	0.35	0.40	0.09	0.12	0.09
% of estimated in Kerala	19	17	13	12	11	9	7	4	4

Source: Government of Kerala. Department of Fisheries

The above discussion on the potential of fisheries sector reveals that there exist untapped inland fisheries resources in Kerala and there is scope for further expansion. Inadequate infrastructure, cold chain distribution systems, inadequate value addition and processing, wastage, lack of skilled manpower, seasonal nature of fishing, lack of technological know-how and inadequate credit are the factors limiting the growth of fisheries in Kerala. The support of Local Self Government to promote fishery sector agribusiness can be a solution to make fisheries a profitable business.

The above analysis necessitates the need and scope of agribusiness in fishery products for inclusive and sustainable development of fishery sector. It provides food and nutritional security, gainful employment to women and youth, meets the

diversified needs of consumers for processed fish products, reduce wastage of fish resources, and eradicate poverty of fisher folk community and export earnings.

6.3 FEASIBILITY OF AGRIBUSINESS IN FISH PRODUCTS

The above analysis on the fishery sector proves that Kerala has rich production potential in fisheries which is not optimally utilized. Profitable agribusiness in fish products will give a further boost to fish production and productivity. People in rural areas still prefer raw fish due to its taste and freshness. Opening up of Malls and Supermarkets with cold storage facilities increased the demand for value added and processed fish products. Emerging agribusiness in quality processed fish products can tap the increased demand potential of advanced countries. Higher rates of literacy, female employment and income and growth of urban cities will create greater demand for processed and value-added fish products. Efficient agribusiness can offer better price to fishermen, reduce wastage, provide employment opportunities, women empowerment and uplift the socio-economic status of fishermen families. Thus, present study tries to identify the investment opportunities, technical and financial feasibilities of agribusiness in the fishery sector of Kerala.

Agribusiness in Fish Products: A variety of modern and traditional healthy and tasty processed fish products with enhanced shelf-life fare available in the market to meet the requirements of different generations. Processed and value- added fish has a wide range of ready-to-eat, ready-to-cook and ready-to-fry fish products. They include, varieties of shrimp marinated, shrimp fry, shrimp pickle, shrimp curry, squid marinated, squid stuffed, squid rings, squid strips, frozen crab meat, stuffed crab, crab cakes, fish fingers, fish strips, frozen fish cutlet, fish pickle, fish soup, fish powder, fish nuggets, fish sausage, fish slices, fresh chilled fish, frozen fish, ribbon fish etc. These products have greater demand due to its high nutritional value, simple and easy to cook, greater shelf life, healthy and tasty and transportable to longer distances. Therefore, present study develops a micro model fish unit that produces three selected processed fish products based on data collected from the Base Fish unit located at Kochi in Ernakulam district of Kerala state.

Model Fish Unit: The Model Fish Unit produces Fish Cutlet, Fish Pickle and Prawns Pickle. The required initial investment, quantity, price and cost of variables used in the analysis are computed based on the data collected from the Base Fish Unit located in Ernakulam District.

Assumptions: Reasonable and valid assumptions on the technical parameters of the Model Fish Unit are made through direct discussions with scientists, engineers, technicians, teachers, researchers, input suppliers, entrepreneurs, office staff in retail outlets and other experts related to the Base Fish Unit.

1. The Model Fish Unit requires an initial investment of Rs. 3, 68,100 which is equally divided among the three products to calculate the product-wise cash flow.
2. The viability and feasibility of the Unit is assessed based on the cash flow of 3 years.
3. The discount rate is 11 per cent which is based on the lending rate of banks.
4. The Unit produces 963Kg Fish cutlet, 706Kg Fish pickle and 555Kg Prawns pickle and Tuna is used to produce first two products.
5. The annual fixed cost of Rs.54, 000 is the rent for land and building which is equally divided among the three products to calculate product-wise cash flow.
6. The result is analysed based on average values of the variables in the initial year.
7. Wastage during production process is assumed to be zero.
8. Excluded the commission/tax in sales price.
9. Annual average sale is assumed to be 100 per cent and marketing is done through direct sales outlets.
10. Annual average working days are taken as 256 days i.e., 70 per cent of 365 days.
11. Shelf life of each final product is assumed to be constant throughout the year.
12. Annual average depreciation rate of equipment, building and vessels is kept as constant.

13. The risk of the Unit is evaluated by incorporating the possible changes in the values of key variables under different pessimistic and optimistic scenarios.

Initial Investment: The Model Fish Unit is established with an initial investment of Rs. 3, 68,100 (Table 6.1).

Table 6.1: Initial Investment of the Model Fish Unit

Sl. No	Particulars	Qty (No)	Rate (Rs)	Cost (Rs)	%
1	Advance for land and building		30,000	30,000	8
2	Stainless Steel Tables	2	20,000	40,000	11
3	Double Door Hard Top Deep Freezer (500litre)	1	30,000	30,000	8
4	Cooking Vessels (1 Set)		75,000	75,000	20
5	Mixer Grinder	1	12,000	12,000	3
6	Stainless Steel Commercial Two Burner Cooking Range	1	10,000	10,000	2
7	Gas Cylinders	3	1,200	3,600	1
8	Heavy Duty Continuous Band Sealer for Packets	1	25,000	25,000	7
9	Labelling Machine	1	50,000	50,000	14
10	Cutlet Mould	1	2,500	2,500	1
11	Planetary mixer	1	40,000	40,000	11
12	Others (Unexpected Repair, Maintenance etc.)	1	50,000	50,000	14
Total				3,68,100	100

Source: Data compiled from the Base Fish Unit

The fish processing and storage equipment like double door hard top deep freezer, stainless steel commercial two burner cooking range, mixer grinder, gas cylinders, heavy duty continuous band sealer for packets, labelling machine, cutlet mould and planetary mixes constitute the major share of the initial investment (47 per cent) followed by stainless steel tables and cooking vessels (31 per cent) and advance for land and building and other expenses for unexpected repair and maintenance (22 per cent) of building equipment and vessels. The initial investment is financed through bank loans.

Financing of Initial Investment: Initial investment is financed through a bank loan with a principal amount of Rs.3, 68,100 for tenure of 3 years (Table 6.2).

Table 6.2: Loan (Rs.) Repayment Schedule

Year	EMI	%	Interest	%	Principal	%
1	103780	24	37752	52	66028	18
2	168360	38	25323	35	143036	39
3	168359	38	9323	13	159036	43
Total	440498	100	72398	100	368100	100

Source: State Bank of India

The rate of interest is 10.65 per cent and the moratorium period is 6 months. The total interest paid during the moratorium period is Rs.19601/- with a monthly break up of Rs.3267/-. The total equated monthly instalment (EMI) including the principal and interest amounts to Rs.4, 40,498/- which is paid in 30 monthly instalments of Rs.14, 030/- after 6 months moratorium period.

The total interest payable over the loan term is Rs.72398/- which is paid with an annual break up share of 52 per cent, 35 per cent and 13 per cent respectively in three years. The principal is paid with an annual break up share of 18 per cent, 39 per cent and 43 per cent respectively in three years.

Results of Cash Flow Analysis: The Net Cash Flow (NCF) shows the profitability of the Model Fish Unit based on the initial year cash flows of the Base Fish Unit (Table 6.3).

Table 6.3: Result Summary of Cash Flows (Rs.) of Model Fish Unit

Variables	Fish Cutlet	Fish Pickle	Prawns Pickle	Fish Unit
Initial Investment (Rs)	1,22,700	1,22,700	1,22,700	3,68,100
Volume (Kg/year)	963	706	555	
Unit Selling Price (Rs/Kg)	238	356	532	
Unit Variable Cost (Rs/Kg)	113	224	352	
Annual Fixed Cost (Rs)	18,000	18,000	18,000	54,000
Discount Rate (%)	11	11	11	11
Cash Outflow (Rs)	1,26,819	1,76,144	2,13,360	5,16,323
Cash Inflow (Rs)	2,29,194	2,51,336	2,95,260	7,75,790
Net Cash Flow (NCF) (Rs)	**1,02,375**	**75,192**	**81,900**	**2,59,467**

Source: Primary Data

The Model Fish Unit has an average operating profit of Rs.2, 59,467 in 3 years which is contributed by Fish Cutlet (39 per cent), Prawns Pickle (32 per cent) and Fish pickle (29 per cent). Prawns pickle has the highest contribution margin of Rs.180 followed by Fish pickle with Rs.132 and the lowest of Rs.125 for Fish cutlet. But fish cutlet has the highest contribution margin ratio of 53 per cent compared to Fish pickle (37 per cent) and prawns' pickle (34 per cent). Thus, an increase in the volume of fish cutlet is a good choice followed by fish pickle and prawns' pickle to increase the operating profit of the Model Fish Unit**.** The favourable cash flows indicate the ability and flexibility of the Model Fish Unit for product expansion through operating profits in the fish processing plants in Kerala.

6.4 FINANCIAL FEASIBILITY ANALYSIS

The financial feasibility of the Model Fish Unit is assessed through the methods of Net Present Value (NPV), Benefit Cost Ratio (BCR) and Payback Period by taking the cash flows for a period of 3 years.

Results and Interpretation of NPV Analysis: NPV analysis results show that Model Fish Unit has an NPV of Rs.2, 65,963 in 3 years contributed by 48 per cent **from Fish cutlet, 29 per cent from Prawns pickle and 23 per cent from Fish pickle** (Table 6.4). Fish cutlet with the highest NPV is the most profitable product of the Unit followed by Prawns pickle and Fish pickle. The positive expected return of the Model Fish Unit shows the financial feasibility of agribusiness investment in processed fish products.

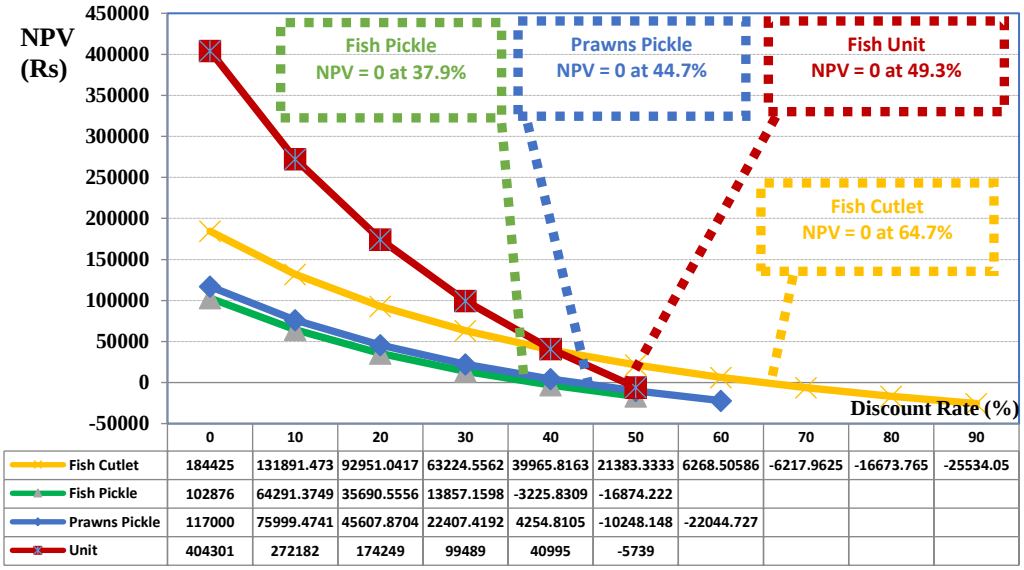
Table 6.4: Result Summary of NPV (Rs.) Calculation

Items	$C_1/(1+r)^1$	$C_2/(1+r)^2$	$C_3/(1+r)^3$	C_0	NPV (Rs)
Cutlet	92,230	83,090	74,856	1,22,700	1,27,475
Fish Pickle	67,741	61,028	54,980	1,22,700	61,048
Prawns Pickle	73,784	66,472	59,885	1,22,700	77,440
Model Unit	2,33,754	2,10,589	1,89,720	3,68,100	2,65,963

Source: Primary Data

The inverse relationship between NPV and discount rate is illustrated in Graph 6.18. The NPV result of the Model Fish Unit shows that NPV becomes zero at the discount rates of 64.7 per cent for fish cutlet, 44.7 per cent for fish pickle, 37.9 per cent for prawns' pickle and 49.3 per cent for Model Fish Unit. Further increase in discount rate makes the NPV negative.

GRAPH 6.18: RELATION BETWEEN NPV & DISCOUNT RATE

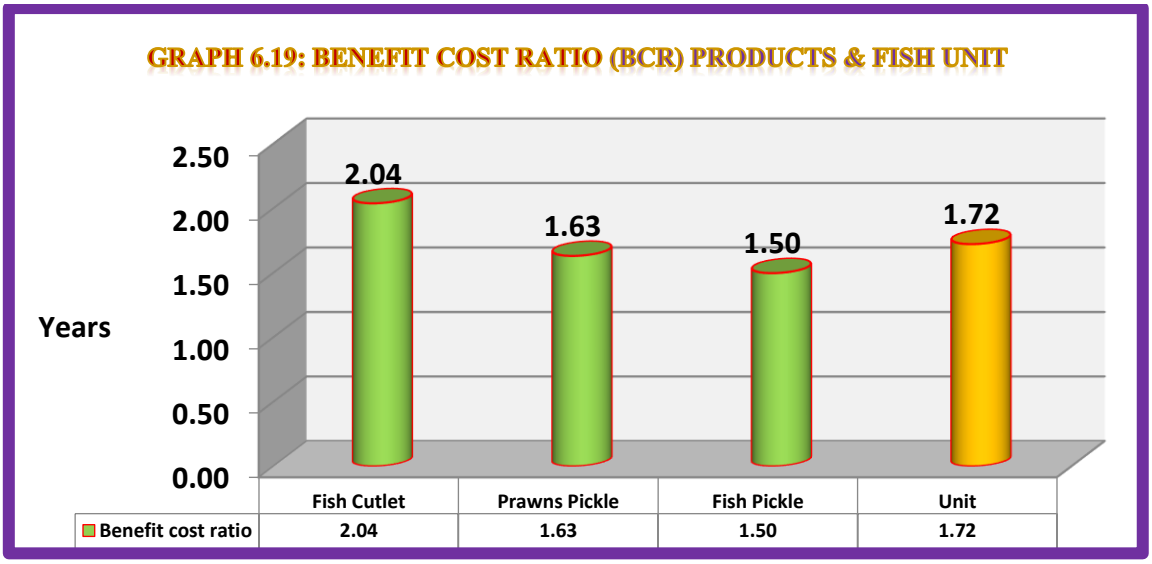


	0	10	20	30	40	50	60	70	80	90
Fish Cutlet	184425	131891.473	92951.0417	63224.5562	39965.8163	21383.3333	6268.50586	-6217.9625	-16673.765	-25534.05
Fish Pickle	102876	64291.3749	35690.5556	13857.1598	-3225.8309	-16874.222				
Prawns Pickle	117000	75999.4741	45607.8704	22407.4192	4254.8105	-10248.148	-22044.727			
Unit	404301	272182	174249	99489	40995	-5739				

Source: Primary Data

The investment is financially feasible as the NPV is positive both for the products and Unit. The summary of NPV study result prove that agribusiness in fish products is a financially viable and promising investment venture in Kerala especially in the post Covid 19 pandemic phase of the economy.

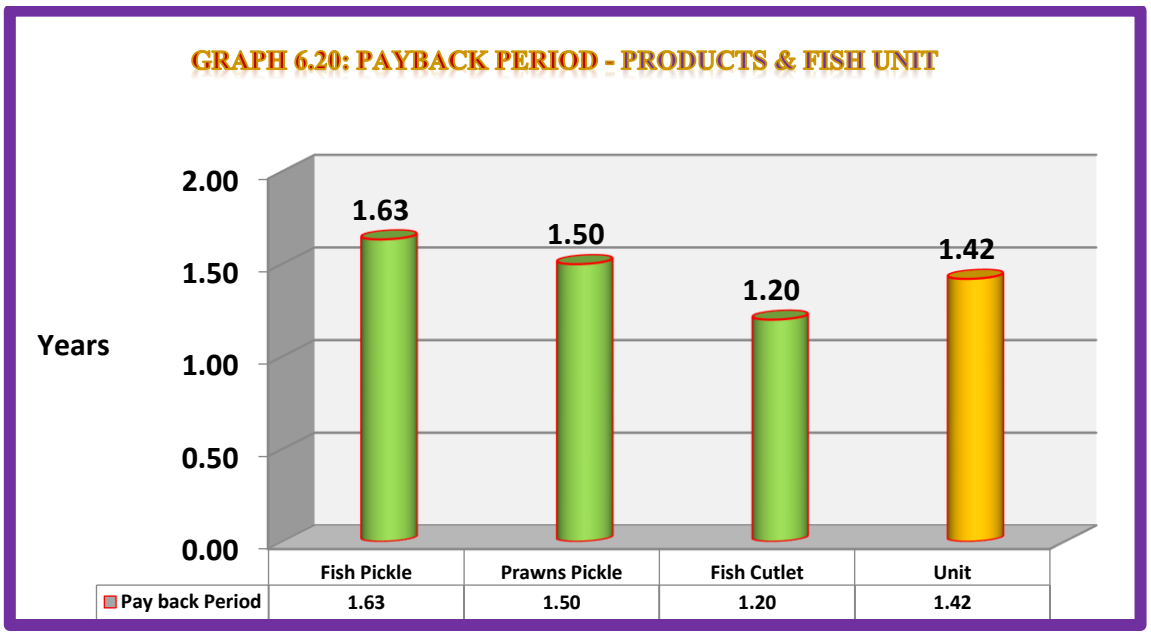
Results and Interpretation of Benefit Cost Ratio (BCR) Analysis: The BCR analysis illustrated in Graph 6.19 shows the profitability index of each product as well as the Model Fish Unit as a whole. The BCR of Model Fish Unit is 1.72 per cent contributed by Fish cutlet with the highest ratio of 2.04 per cent followed by Prawns pickle (1.63 per cent) and by Fish pickle (1.5) per cent. BCR result summary indicate that investment in fish processing is financially viable with a high entrepreneurial potential especially in the rural areas of Kerala.



Source: Primary Data

Post-Covid phase of Kerala economy is looking for job opportunities agribusiness entrepreneurship and nutritional food security especially to the vulnerable sections of the rural areas.

Results and Interpretation of Payback Period Analysis: The Payback period analysis illustrated in Graph 6.20 shows the time taken to recover the initial investment by each product and the Model Fish Unit.



Source: Primary Data

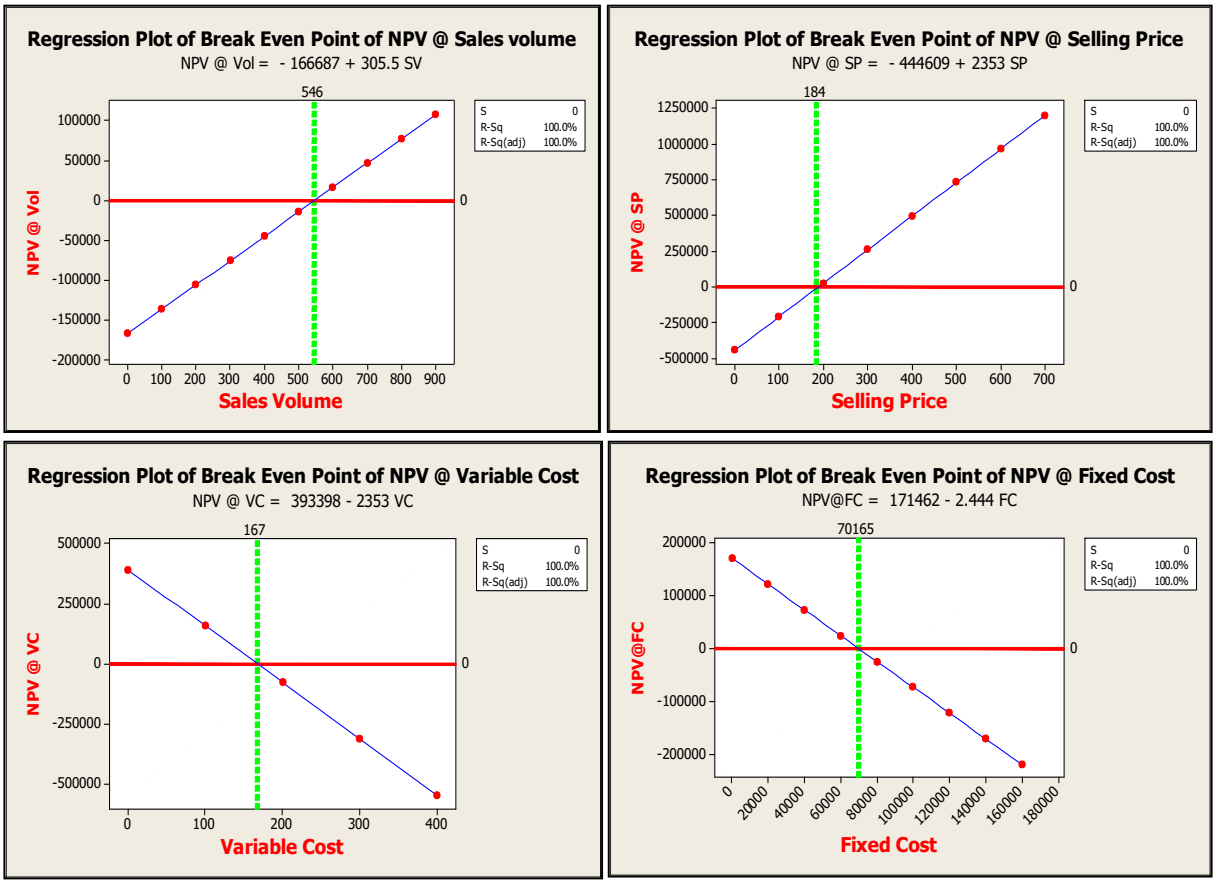
The Model Fish Unit is able to recover its initial investment of Rs.3, 68,100 within 1.42 years. Among the products Fish cutlet has the lowest payback of 1.20

years followed by Prawns pickle (1.50 years) and Fish pickle (1.63 years). The Payback period result summary also proves that the environment for starting agribusiness in the fishery sector of Kerala is favourable. Thus, Agri-entrepreneurship in fish products is a promising opportunity for gainful employment to those who become jobless due to the Covid 19 pandemic.

The financial feasibility analysis presented in the previous section is based on the values of variables with certainty. But, in reality, we know that Model Fish Unit's cash flows are uncertain due to fluctuations in input/output prices, fixed /variable costs and volume of production/sales etc. Therefore, the variability in the Model Fish Unit's financial feasibility is assessed using the Break-even, Sensitivity and Scenario methods of risk and uncertainty analysis.

DCF Break-even Analysis: A linear Regression Model study using Minitab has been conducted for Cutlet as shown in the Graph 6.21.

Graph 6.21: Fitted Line Plot Regression Model for Break-even (Fish Cutlet)



Source: Primary Data

The Break-even point of NPV is calculated with respect to a single variable like Sales Volume (SV), Selling Price (SP), Variable Cost (VC) and Fixed Cost (FC). The rationale behind this study is to estimate the regression line intersection point with X axis, which is the break-even point of the subject variable. Similar study has been conducted for all the products and the break-even point of each product's volume, unit selling price, unit variable cost and annual fixed cost are summarized in Table 6.5

Results and Interpretation of DCF Break-even Analysis: The results of DCF Break-even analysis shows how many units to be sold at what price and at what cost to break-even of each product of the Model Fish Unit. The Break-even volume for Fish cutlet is 43.3 per cent (417Kg) less than the Base Case volume. Similar reduction in Base Case volume possible for Break-even of Prawns pickle and Fish pickle are 31.7 per cent (176Kg) and 26.7 per cent (189Kg) respectively.

Table 6.5: Result Summary of DCF Break-even (Rs.) of Model Fish Unit

Variables	Cutlet		Fish Pickle		Prawns Pickle	
	Base Case	Break-even	Base Case	Break-even	Base Case	Break-even
Volume (Kg)	963	546	706	517	555	379
Unit Selling Price (Rs/Kg)	238	184	356	321	532	475
Unit Variable Cost (Rs/Kg)	113	167	224	259	352	409
Annual Fixed Cost (Rs)	18,000	70,165	18,000	42,981	18,000	49,690

Source: Primary Data

The break-even unit selling price for Fish cutlet falls at 22.6 per cent (Rs.54) less than the Base Case selling price. Similar reduction in price possible to Break-even the Prawns pickle and Fish pickle are 10.7 per cent (Rs.57) and 9.8 per cent (Rs.35) less respectively. The result summery of Break-even selling price shows that price can fall from Rs.9.52 to Rs7.36 per cutlet of 40g, from Rs.133 to Rs.119 per 250g bottle of Prawns pickle and Rs.89 to Rs.80 per 250g bottle of Fish pickle.

The production will turn away from profit if its unit variable cost increases by 47.7 per cent (Rs.54) for Fish cutlet, 16.1 per cent (Rs.57) for Prawns pickle and 15.6 per cent for (Rs.35) for Fish pickle than the Base Case. The production will turn away from profit if its annual fixed cost increases by 290 per cent (Rs.52, 165) for Fish cutlet, 176 per cent (Rs.31, 690) for Prawns pickle and 139 per cent (Rs.24981) for Fish pickle than the Base Case.

DCF Break-even analysis result summary reveals that agribusiness in fish products is a financially feasible venture in Kerala since the break-even volume and selling price of each product is much lower and the break-even variable and fixed cost is much higher in the Model Fish Unit than the Base Case. Thus, agribusiness in fish products can mitigate the long-term impact of Covid-19 pandemic on nutritional food security and by contributing to income and employment in the rural areas of Kerala.

Sensitivity Analysis: The study makes use of sensitivity analysis to measure the risk and uncertainty of investment in the Model Fish Unit (Table 6.6).

Table 6.6: Sensitivity Analysis (Fish Cutlet)

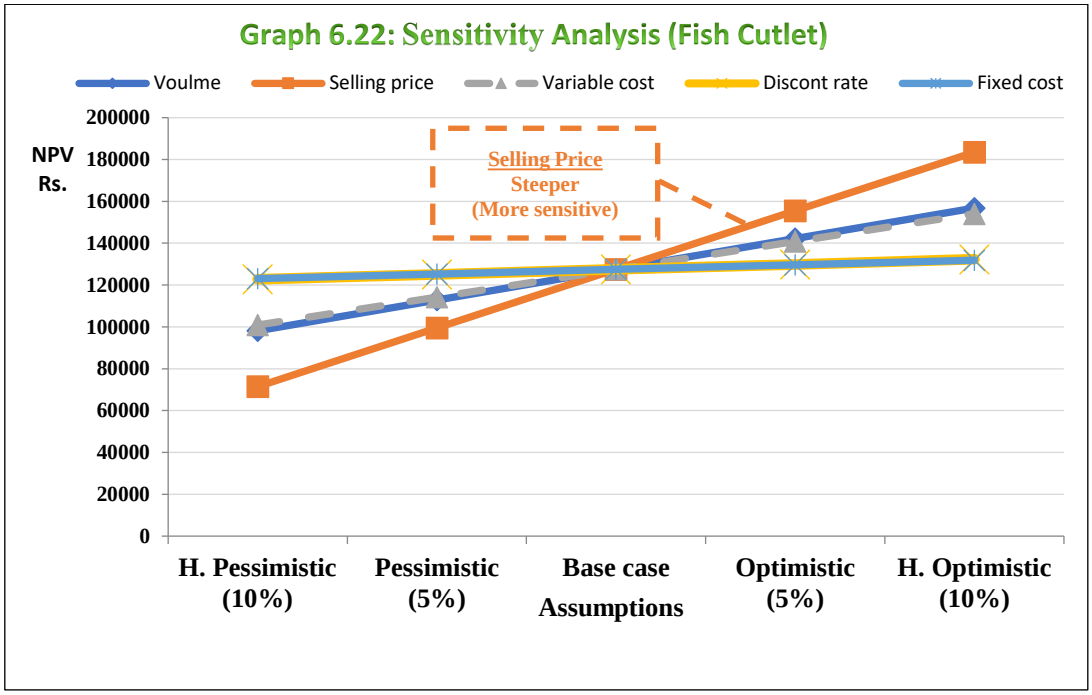
Changing Variables	H. Pessimistic Assumptions	Pessimistic Assumptions	Base Case Assumptions	Optimistic Assumptions	H. Optimistic Assumptions	% Change
Volume (Kg)	867	915	963	1012	1059	5
NPV (Rs)	98151	112813	127475	142138	156800	12
Selling Price (Rs)	214	226	238	250	262	5
NPV (Rs)	71467	99471	127475	155480	183484	22
Variable Cost (Rs)	124.3	118.65	113	107.35	101.7	5
NPV (Rs)	100883	114179	127475	140771	154068	-10
Discount Rate (%)	12.10	11.55	11	10.45	9.90	5
NPV (Rs)	122766	125101	127475	129888	132340	-2
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200	5
NPV (Rs)	123077	125276	127475	129675	131874	-2

Source: Primary Data

The analysis helps to make desirable changes in investment decisions due to changes in the key variables independently.

Results and Interpretation of Sensitivity Analysis for Fish Cutlet: The sensitivity analysis for Fish cutlet shows that for every 5 per cent change in Volume and Selling Price from the Base Case, NPV response is 12 per cent and 22 per cent respectively. Sensitivity of 5 per cent change in Variable Cost, Discount Rate and Annual Fixed Cost results in -10 per cent and -2 per cent each change in respective NPVs.

Sensitivity of Fish cutlet is illustrated in Graph 6.22 with respect to the slope of the curves for each variable under various optimistic and pessimistic values.



Source: Primary Data

The most sensitive variable for Fish cutlet is shown by the steeper selling price curve followed by less steep variable cost and volume curves.

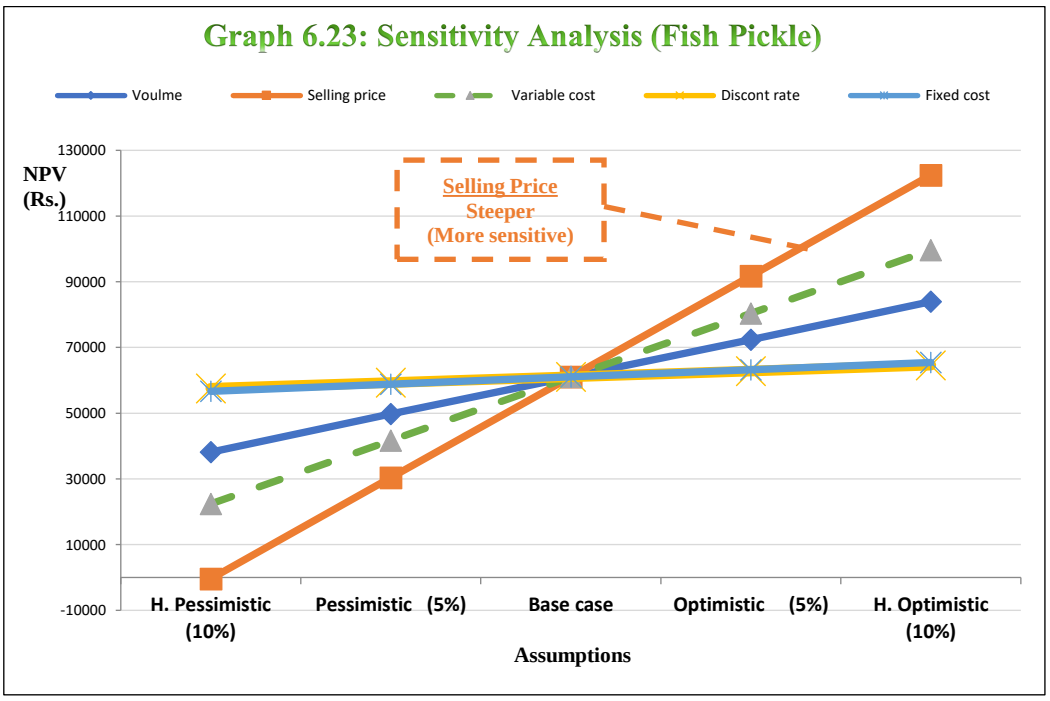
Results and Interpretation of Sensitivity Analysis for Fish Pickle: The sensitivity analysis for Fish pickle is shown in Table 6.7. For every 5 per cent change in Volume and Selling Price from the Base Case, NPV response is 18 per cent and 50 per cent respectively. Sensitivity of 5 per cent change in Variable Cost, Discount Rate and Annual Fixed Cost results in -32 per cent, -3 per cent and -4 per cent change in respective NPV.

Table 6.7: Sensitivity Analysis for Fish Pickle

Changing Variables	H. Pessimistic Assumptions	Pessimistic Assumptions	Base Case Assumptions	Optimistic Assumptions	H. Optimistic Assumptions	% Change
Volume (Kg)	635	671	706	741	777	5
NPV (Rs)	38145	49758	61048	72338	83950	18
Selling Price (Rs)	320.4	338.2	356	373.8	391.6	5
NPV (Rs)	-372	30338	61048	91757	122467	50
Variable Cost (Rs)	246.4	235.2	224	212.8	201.6	5
NPV (Rs)	22402	41725	61048	80371	99694	-32
Discount Rate (%)	12.10	11.55	11.00	10.45	9.90	5
NPV (Rs)	57589	59304	61048	62820	64621	-3
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200	5
NPV (Rs)	56649	58848	61048	63247	65446	-4

Source: Primary Data

Sensitivity of Fish pickle is illustrated in Graph 6.23 with respect to the slope of the curves for each variable under various optimistic and pessimistic values. The most sensitive variable for Fish pickle is shown by the steeper selling price curve followed by less steep variable cost and volume curves.



Source: Primary Data

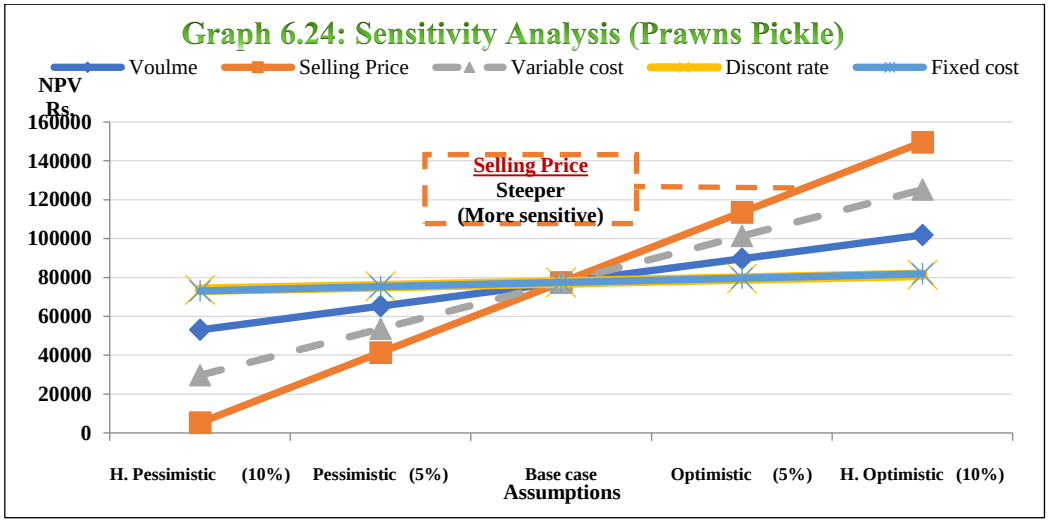
Results and Interpretation of Sensitivity Analysis for Prawns Pickle: The sensitivity analysis for Prawns pickle (Table 6.8) shows that for every 5 per cent change in Volume and Selling Price from the Base Case, NPV response is 16 per cent and 47 per cent respectively. Sensitivity of 5 per cent change in Variable Cost, Discount Rate and Annual Fixed Cost results in -31 per cent, -2 per cent and -3 per cent change in respective NPV.

Table 6.8: Sensitivity Analysis for Prawns Pickle

Changing Variables	H. Pessimistic Assumptions	Pessimistic Assumptions	Base Case Assumptions	Optimistic Assumptions	H. Optimistic Assumptions	% Change
Volume (Kg)	499.5	527.25	555	582.75	610.5	5
NPV (Rs)	53028	65234	77440	89647	101853	16
Selling Price (Rs)	478.8	505.4	532	558.6	585.2	5
NPV (Rs)	5287	41364	77440	113517	149593	47
Variable Cost (Rs)	387.2	369.6	352	334.4	316.8	5
NPV (Rs)	29700	53570	77440	101310	125181	-31
Discount Rate (%)	12.10	11.55	11	10.45	9.90	5
NPV (Rs)	73672	75541	77440	79370	81332	-2
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200	5
NPV (Rs)	73042	75241	77440	79640	81839	-3

Source: Primary Data

Sensitivity of Prawns Pickle is illustrated in Graph 6.24 with respect to the slope of the curves for each variable under various optimistic and pessimistic values.



Source: Primary Data

The most sensitive variable for Prawns pickle is shown by the steeper selling price curve followed by less steep variable cost and volume curves. It is very clear from the above analysis that fish processing units in Kerala are more sensitive to selling price and variable cost which are mostly decided by the market forces.

In spite of the high sensitivity to price and cost, the unit is making profits and the state has promising opportunities in agribusiness in processed fish products especially in the post Covid-19 phase of Kerala economy.

Scenario Analysis: The risk and uncertainty of investment in Model Fish Unit may arise due to the simultaneous changes in volume, price, cost and discount rate on each dairy product's NPV under different scenarios.

Results and Interpretation of Scenario Analysis: Scenario summary of Fish cutlet is illustrated under five different scenarios in Table 6.9. The Base Case scenario NPV of Fish cutlet is around Rs.1.27 lakhs range between a profit of Rs.16.65 thousands under highly pessimistic and Rs.2.59 lakhs under highly optimistic scenarios.

Table 6.9: Scenario Summary of Fish Cutlet

Changing Variables	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario
Volume (Kg)	867	915	963	1012	1059
Selling Price (Rs)	214	226	238	250	262
Variable Cost (Rs)	124	119	113	107	102
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Discount Rate (%)	12.10	11.55	11	10.45	9.90
Result - NPV (Rs)	**16,646**	**69,491**	**1,27,475**	**1,90,865**	**2,59,441**

Source: Primary Data

Scenario summary of Fish pickle (Table 6.10) shows that the Base Case scenario NPV of around Rs.61.05 thousand declines to a loss of Rs.58.04 and Rs1.23 thousands under highly pessimistic and pessimistic scenarios respectively.

Table 6.10: Scenario Summary of Fish Pickle

Changing Variables	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario
Volume (Kg)	635	671	706	741	777
Selling Price (Rs)	320	338	356	374	392
Variable Cost (Rs)	246	235	224	213	202
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Result - NPV (Rs)	**-58,045**	**-1,233**	**61,048**	**1,29,578**	**2,04,534**

Source: Primary Data

Scenario summary of Prawns pickle (Table 6.11) shows that the Base Case scenario NPV of around Rs.77.4 thousand declines to a loss of Rs.60.47 thousand under highly pessimistic scenario.

Table 6.11: Scenario Summary of Prawns Pickle

Changing Variables	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario
Volume (Kg)	500	527	555	583	611
Selling Price (Rs)	479	505	532	559	585
Variable Cost (Rs)	387	370	352	334	317
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Result - NPV (Rs)	**-60,469**	**4,863**	**77,440**	**1,57,466**	**2,45,152**

Source: Primary Data

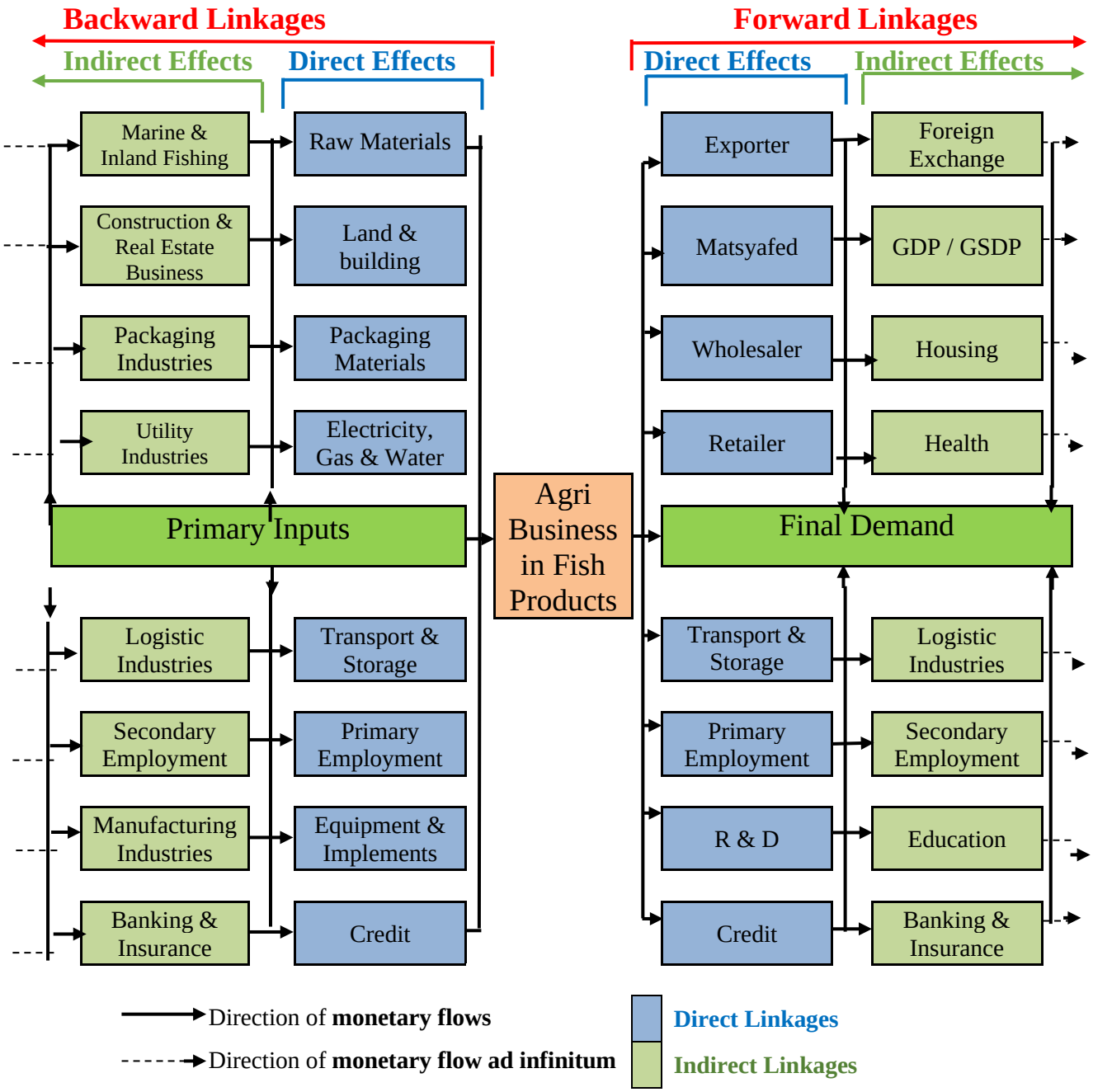
The results of scenario summary show that Fish cutlet is the most profitable product of the Unit followed by Prawns pickle and fish pickle.

Thus, there exists promising opportunities of investments in the processing of fish products in Kerala. Agribusiness in fish products can contribute to the wellbeing of a large number of fisher folk households of Kerala. The post Covid phase of Kerala economy will find opportunities to do business in fish products with the support of local self-government institutions.

6.5 LINKAGE EFFECTS OF AGRIBUSINESS IN FISH

The earlier discussions prove that profitable agribusiness in fish products can play a vital role in the inclusive and sustainable development of Kerala economy. In this context, it is inevitable to discuss the agribusiness linkages as shown in Flow Chart 6.1.

Flow Chart 6.1: Agribusiness Linkages of Model Fish Unit



The inter sectoral, intra-sectoral, direct-indirect and urban-rural linkages of agribusiness in fish products are analysed based on the information collected through the discussions with the fishermen, processors, distributors, scientists and local shop owners. Growth of agribusiness in fish products open up the opportunities for strong backward and forward linkages directly and indirectly.

Direct & Indirect Backward Linkage Effects: The backward linkage effects of agribusiness in fish products directly increase the demand for primary inputs and indirect multiplier effect on secondary inputs.

Stimulus for Fishery and Crop Sector: Increased demand for raw fish creates multiplier effect on primary and secondary production in marine fishing and inland fish farming. Agribusiness gives stimulus to fish farmers to modernize the production system and crop cultivators to find an alternate income through fish farming in between crops. Greater demand for raw fish and crop variant enhances the negotiating ability of fish and crop farmers for a higher price. Positive impact on the standard of living of fish farmers in terms of higher income, nutritious food, better education, employment, health and housing. Growth of agribusiness in fish products increase the demand for land and building to start agribusiness units and inland fish farming. This has an indirect positive impact on the price of land and building materials which encourages the growth of real estate and construction sector. Long term contracts signed between the fish processing units and raw fish suppliers avoids middlemen, marketing uncertainty and maintains better quality.

Boost to Banking and Manufacturing Sector: Growth of agribusiness creates increased credit requirements from fisher folk and fish processing entrepreneurs. This necessitates the growth of banking services for loans and settling down trade transactions. The fish processing units require equipment and implements like freezer, cooking range, mixer grinder, sealing and labelling machines, cutlet mould, gas cylinders, and planetary mixer, stainless-steel tables and vessels etc. This gives indirect stimulus to the manufacturing industries supplying machines and implements to the agribusiness units.

The demand for agribusiness products depends on quality and the shelf life on the efficiency in packing. Growth of agribusiness increases the demand for packing materials and this give stimulus to the industries supplying packaging materials like, boxes, bottles, lids, covers, stickers etc. Growth of agribusiness increases the demand for raw materials and avoids wastage of fish resources.

Due to the low shelf life, the success of agribusiness in fish processing depends on the efficiency of cold storage, supply chain linkages. Increased requirement for transportation, storage and communication services led to the expansion of logistics industries.

Processing in agribusiness requires utility services and the greater demand for cooking gas, electricity and water lead to the growth of utility industries. Increased demand for raw fish by fish processors lead to the expansion of fish farming and fish catch which in turn raise the demand for fish feed. This gives a stimulus to the fish feed plants to modernize and expand the production system.

Employment Generation: Agribusiness in fish products creates a multiplier effect on primary and secondary employment in fishery, manufacturing, logistics and service sectors. Inter sectoral and intra- sectoral employment opportunities will emerge through agribusiness in fishery sector.

Stimulus to Scientific Research and Technical Institutions: Kerala government fishery policy aims to promote inland fish farming through the transfer of knowledge from lab to farm. Technical and institutional support and guidance by scientists, engineers, researchers and better varieties of fish supply increase the productivity and quality of fish products. Thus, fishery sector agribusiness gives a stimulus to fishery and oceanic research and technical institutions.

Direct & Indirect Forward Linkage Effects: Traditional fishermen sell raw fish directly to nearby houses and hotels at a low price. The forward linkages start from the fishermen and continue with fish vendor, cooperatives and ends with final consumers. With the emergence of modern agribusiness, direct and indirect forward linkages of processed and value-added fish products start from the fish processors.

Expansion of Domestic and Export Markets: Production of diversified ready to eat, ready to cook and ready to fry fish products directly widens the domestic as well as export market through retailer, wholesaler, cooperatives and exporters. The growth of malls and supermarkets with better infrastructure and a wide range of products offer market for agribusiness fish products in urban cities. Enhances the negotiating ability of fish-entrepreneur for a higher output price, and stability in input supply and price. Industrialization, urbanization, high literacy, nuclear family set up, higher percentage of middle-income families and changing food habits widens the market for processed fish products. Expansion of markets reduces middlemen and wastage of fish resources. Commercial fish farming increases the volume of marketable surplus and the capacity to export. Export earnings are used for importing advanced technological know-how for greater productivity.

Growth of Professional Agri-entrepreneurship and Employment Generation: Enhances healthy competition among Agri-entrepreneurs in processing of fish products which provides adequate profit to producers and ensures better quality products to consumers at reasonable prices. Fisheries Universities produce agribusiness and agri-entrepreneur professionals who excel in their profession and this give a professional touch to agribusiness. Multiplier effect on secondary and tertiary employment generation in processed fish units especially in rural areas. Can attract large number of unemployed youth and women in rural areas towards fish processing. Can absorb workers from other sectors who face disguised unemployment.

Nutritional Food Security, Sustainable and Inclusive Development: Better employment, income and standard of living lead to changes in the taste and preferences of the people. Inclusion of a variety of nutritious processed fish products in the diet ensures market for agribusiness products and helps to attain food security. Agribusiness helps to achieve the goals of sustainable economic development through rural-urban linkages, women empowerment and inclusive growth of economically deprived fisher folk community in rural areas.

Stimulus to Research and Development: The innovations through the expansion of research and development reach the fish entrepreneurs. This helps them to produce diversified nutritive fish products with different flavour acceptable to consumers of all ages.

Growth of Banking and Insurance: Growth of agribusiness increases the credit requirements and necessitates the growth of banking and services. Since fishing is a seasonal and weather-based activity there arises uncertainty and risk in investment decisions which necessitates the growth of insurance sector. Banking sector development gives a positive economic linkage through credit support in the form of subsidies and tax concessions.

Stimulus to Manufacturing Industries: Agribusiness enhances the income and standard of living of the people which in turn increase the demand for household equipment, transportation and communication facilities like vehicles, mobiles, television etc. Fertilizer companies develop with the expansion of fishery sector agribusiness. Value addition and processing increase the value and shelf life of fish products. It increases productivity and prevents food wastage. Processed dairy products require less storage space and can be transportable to long distances.

The above discussion reveals that if the untapped fishery resources are explored and utilized through systematic agribusiness ventures, it can accelerate economic growth through the forward and backward linkages. Promotion of efficient agribusiness linkages enhance better production, transportation, cold storage and marketing facilities, expand employment opportunities, more export earnings, increase rural income, reduce rural poverty and ultimately leads to the sustainable and inclusive development of Kerala economy.

6.6 CHALLENGES FACED BY AGRI-ENTREPRENEURS OF FISH

The earlier discussions strongly argue that fishery sector agribusiness play a significant role in the agricultural and economic development of Kerala. It is undoubtable that local self-government institutions at the district, block and

panchayat levels are supporting and encouraging Agri-entrepreneurs through their developmental planning and policies. Kerala government is considering fishery sector agribusiness as one of the thrust areas to ensure long-term nutritional food security and a means to reallocate the reverse migrants in gainful employment in the post Covid 19 pandemic development phase.

In spite of the government schemes and institutional support to promote fish processing, fishery sector agri-entrepreneurs of the state face many challenges. In this context, it relevant to discuss the challenges and problems faced by the fish entrepreneurs of Kerala.

The socio-economic conditions of the fisher folk community in Kerala are low and lack of credit is the greatest challenge faced by them. Mechanization and modernization of fishery agribusiness activities require huge capital investment. Low level of fish processing and absence of modern processing plants in fish product is mainly due to lack of investment.

Uninterrupted supply of raw fish to processing units is not possible due to seasonal variations in production and impact of climatic vagaries. Low shelf life and high chances of contamination of fish products due to inadequate infrastructure is another challenge. Agri-entrepreneurs face difficulty in cold chain maintenance due to high electricity cost and frequent power failure.

Poor disease diagnosis facilities, health and hygiene maintenance adversely affects the domestic production potential of fish sector. The seasonality in the supply of raw fish and seasonal fluctuations in demand creates instability in profits.

Insufficient modern infrastructure for production, processing and distribution of fish products leads to wastage. At the same time, they have to face stiff competition from advanced countries with modernized systems of production, storage and distribution.

Frequent changes in the domestic as well as international policy regulations and restrictions with respect to trade is another big challenge faced by agri-entrepreneurs. Marine exporters face the challenges of post-World Trade Organization (WTO) Non-tariff barriers (NTBs) by the prominent world importers like USA, Japan and European Union. These countries set sanitary and

phytosanitary standards at a higher level than at the international level to safeguard the health of their consumers which in turn badly affects Indian exports. Shrimp exports from India affected adversely on the issues of poor quality, muddy smell and traces of antibiotics.

Thus, agricultural policy reforms should be directed towards supporting the large number of small agri-entrepreneurs. At the same time agri-entrepreneurs should be competent enough to produce the products as per the aspirations of consumers regarding attributes like nutritive value, taste, colour, flavour, convenient packing, and easy availability.

Agribusiness regulations all over the world are focusing on consumer welfare, environmental protection, food health, safety standards and child labour issues. It is imperative to strive together for a sustainable agribusiness by safeguarding the welfare of both producers and consumers. Thus, the prevailing functional and institutional inefficiencies need to be addressed and online marketing facilities need to be promoted and coordinated in the present Covid- 19 pandemic Phase of Kerala economy.

6.7 A COMPARISON OF AGRICULTURE AND ALLIED SECTOR AGRIBUSINESS UNITS

The previous discussions underlined the scope, significance, opportunities and linkages of agriculture and allied sector agribusiness units in the agricultural and economic development of Kerala. In this context, let us consolidate the analysis of the above-mentioned Model Agribusiness Units by using Expected Monetary Value to select the best choice among the group of opportunities.

Tables 6.12 shows the result summary of NCF calculation of each product with 5 to 10 per cent decrease/increase in each of the variables under each pessimistic and optimistic scenario from the Base Case scenario.

Table 6.12: Net Cash Flow (NCF) Calculation of Model Rice Unit Products

NCF Calculation of Puttu Podi Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	6451.2	6809.6	7168	7526.4	7884.8
Unit Selling Price (Rs/Kg)	46.8	49.4	52	54.6	57.2
Unit Variable Cost (Rs/Kg)	41.8	39.9	38	36.1	34.2
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Cash Inflow (Rs/year)	301916	336394	372736	410941	451011
Cash Outflow (Rs/year)	289460	290603	290384	288803	285860
NCF (Rs/year)	**12456**	**45791**	**82352**	**122138**	**165150**
NCF Calculation of Avalose Podi Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	2304	2432	2560	2688	2816
Unit Selling Price (Rs/Kg)	99.9	105.45	111	116.55	122.1
Unit Variable Cost (Rs/Kg)	79.2	75.6	72	68.4	64.8
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Cash Inflow (Rs/year)	230170	256454	284160	313286	343834
Cash Outflow (Rs/year)	202277	202759	202320	200959	198677
NCF (Rs/year)	**27893**	**53695**	**81840**	**112327**	**145157**
NCF Calculation of Idly/Dosa Podi Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	2764.8	2918.4	3072	3225.6	3379.2
Unit Selling Price (Rs/Kg)	91.8	96.9	102	107.1	112.2
Unit Variable Cost (Rs/Kg)	63.8	60.9	58	55.1	52.2
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Cash Inflow (Rs/year)	253809	282793	313344	345462	379146
Cash Outflow (Rs/year)	196194	196631	196176	194831	192594
NCF (Rs/year)	**57614**	**86162**	**117168**	**150631**	**186552**

Source: Primary Data

Expected Monetary Value (EMV) Calculation Method: EMV is used to calculate the expected outcomes of each product and Unit by assigning a probability and impact for identified risks under each pessimistic and optimistic scenario.

The formula for calculating EMV is:

EMV = Chosen Level of Probability x Impact.

As a first step, the impact of changing variables on Net Cash Flows (NCF) of each agribusiness product under different scenarios is to be calculated.

The study assumed that under normal situations, there is a possibility for a 5 to 10 per cent change in the volume of output, selling price, variable cost, annual fixed cost and discount rate from the base case scenario as assumed in the sensitivity and scenario analysis.

EMV method helps to make a comparison of the various units and products. Accordingly, Net Cash Flows of each product under the Model Rice Unit is calculated by considering a simultaneous change in these variables. It is visible from the table that Idly/Dosa Podi is the best choice among the Model Rice Unit products, since the changing variables have the lowest impact on the NCF of idly/dosa podi.

Similar calculations are done for each product under the Model Beef Unit as shown in Table 6.13. The result summary of NCF calculation of each beef product with 5 to 10 per cent decrease/increase in variables under pessimistic and optimistic scenario from the Base Case reveals that beef cutlet is the best choice among the products of the Model Beef Unit products followed by beef Pickle and Keema.

But with respect to volumes of sales, Keema tops the position followed by cutlet and pickle. At the same time profit margin is highest for beef pickle followed by beef cutlet and keema. Among the Indian states Kerala tops in the demand for the consumption of value added and processed beef products.

Table 6.13: Net Cash Flow (NCF) Calculation of Model Beef Unit Products

NCF Calculation of Beef Cutlet Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	560	600	640	680	720
Unit Selling Price (Rs/Kg)	450	475	500	525	550
Unit Variable Cost (Rs/Kg)	225	215	205	195	185
Annual Fixed Cost (Rs)	26000	25000	24000	23000	22000
Discount Rate (%)	13.00%	12.00%	11.00%	10.00%	9.00%
Cash Inflow (Rs/year)	252000	285000	320000	357000	396000
Cash Outflow (Rs/year)	152000	154000	155200	155600	155200
NCF (Rs/year)	**100000**	**131000**	**164800**	**201400**	**240800**
NCF Calculation of Beef Pickle Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	270	290	310	330	350
Unit Selling Price (Rs/Kg)	667	700	733	766	799
Unit Variable Cost (Rs/Kg)	281	274	267	260	253
Annual Fixed Cost (Rs)	26000	25000	24000	23000	22000
Discount Rate (%)	13.00%	12.00%	11.00%	10.00%	9.00%
Cash Inflow (Rs/year)	180090	203000	227230	252780	279650
Cash Outflow (Rs/year)	101870	104460	106770	108800	110550
NCF (Rs/year)	**78220**	**98540**	**120460**	**143980**	**169100**
NCF Calculation of Beef Keema Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	2500	2700	2900	3100	3300
Unit Selling Price (Rs/Kg)	350	355	360	365	370
Unit Variable Cost (Rs/Kg)	315	310	305	300	295
Annual Fixed Cost (Rs)	26000	25000	24000	23000	22000
Discount Rate (%)	13.00%	12.00%	11.00%	10.00%	9.00%
Cash Inflow (Rs/year)	875000	958500	1044000	1131500	1221000
Cash Outflow (Rs/year)	813500	862000	908500	953000	995500
NCF (Rs/year)	**61500**	**96500**	**135500**	**178500**	**225500**

Source: Primary Data

Similar calculations are done for each product under the Model Dairy Unit as shown in Table 6.14. Among the dairy processed and value-added products Paneer has the highest profit margin and ghee has the lowest.

Table 6.14: Net Cash Flow (NCF) Calculation of Model Dairy Unit Products

EMV Calculation of Milk Peda Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	684	722	760	798	836
Unit Selling Price (Rs/Kg)	432	456	480	504	528
Unit Variable Cost (Rs/Kg)	308	294	280	266	252
Annual Fixed Cost (Rs)	22000	21000	20000	19000	18000
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Cash Inflow (Rs/year)	295488	329232	364800	402192	441408
Cash Outflow (Rs/year)	232672	233268	232800	231268	228672
NCF (Rs/year)	**62816**	**95964**	**132000**	**170924**	**212736**
EMV Calculation of Paneer Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	803.7	848.35	893	937.65	982.3
Unit Selling Price (Rs/Kg)	396	418	440	462	484
Unit Variable Cost (Rs/Kg)	246	235	224	213	202
Annual Fixed Cost (Rs)	22000	21000	20000	19000	18000
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Cash Inflow (Rs/year)	318265	354610	392920	433194	475433
Cash Outflow (Rs/year)	220032	220532	220032	218532	216032
NCF (Rs/year)	**98234**	**134078**	**172888**	**214662**	**259402**
EMV Calculation of Ghee Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	878	926	975	1024	1073
Unit Selling Price (Rs/Kg)	468	494	520	546	572
Unit Variable Cost (Rs/Kg)	470	448	427	406	384
Annual Fixed Cost (Rs)	22000	21000	20000	19000	18000
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Cash Inflow (Rs/year)	410904	457444	507000	559104	613756
Cash Outflow (Rs/year)	434397	436172	436325	434386	430354
NCF (Rs/year)	**-23493**	**21272**	**70675**	**124718**	**183402**

Source: Primary Data

Similarly, Table 6.15 shows the result summary of NCF calculation of each fish products with 5 to 10 per cent decrease/increase in variables under pessimistic and optimistic scenario from the Base Case. Fish cutlet is the best choice among the Model Fish Unit products.

Table 6.15: Net Cash Flow (NCF) Calculation of Model Fish Unit Products

NCF Calculation of Fish Cutlet Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	866.7	914.85	963	1011.5	1059.3
Unit Selling Price (Rs/Kg)	214.2	226.1	238	249.9	261.8
Unit Variable Cost (Rs/Kg)	124.3	118.65	113	107.35	101.7
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Cash Inflow (Rs/year)	185647	206848	229194	252774	277325
Cash Outflow (Rs/year)	127531	127447	126819	125685	123931
NCF (Rs/year)	**58116**	**79401**	**102375**	**127089**	**153394**
NCF Calculation of Fish Pickle Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	635.4	670.7	706	741.3	776.6
Unit Selling Price (Rs/Kg)	320	338.2	356	373.8	391.6
Unit Variable Cost (Rs/Kg)	246.4	235.2	224	212.8	201.6
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Cash Inflow (Rs/year)	203328	226831	251336	277098	304117
Cash Outflow (Rs/year)	176363	176649	176144	174849	172763
NCF (Rs/year)	**26965**	**50182**	**75192**	**102249**	**131354**
NCF Calculation of Prawns Pickle Under Different Scenarios					
Variables/Scenarios	**H. Pessimistic (-10)**	**Pessimistic (-5)**	**Base Case (0)**	**Optimistic (5)**	**H. Optimistic (10)**
Volume (Kg/year)	499.5	527.25	555	582.75	610.5
Unit Selling Price (Rs/Kg)	478.8	505.4	532	558.6	585.2
Unit Variable Cost (Rs/Kg)	387.2	369.6	352	334.4	316.8
Annual Fixed Cost (Rs)	19800	18900	18000	17100	16200
Discount Rate (%)	12.10%	11.55%	11.00%	10.45%	9.90%
Cash Inflow (Rs/year)	239161	266472	295260	325524	357265
Cash Outflow (Rs/year)	213206	213772	213360	211972	209606
NCF (Rs/year)	**25954**	**52701**	**81900**	**113553**	**147658**

Source: Primary Data

As a second step, Expected Monetary Value (EMV) of each product and Unit is calculated by giving equal probability for each pessimistic/optimistic scenario impact on NCF as shown in Table 6.16.

Table 6.16: Expected Monetary Value (EMV) of Products and Units with Equal Probability

Model Units	Assumptions	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario	EMV (Rs)
	Probability (%)	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	
Rice Unit	NCF (Puttu Podi) (Rs)	12456	45791	82352	122138	165150	**85578**
	EMV (Rs)	2491	9158	16470	24428	33030	
	NCF (Avalose Podi) (Rs)	27893	53695	81840	112327	145157	**84182**
	EMV (Rs)	5579	10739	16368	22465	29031	
	NCF (Idli/Dosa Podi) (Rs)	57614	86162	117168	150631	186552	**119626**
	EMV (Rs)	11523	17232	23434	30126	37310	
	NCF (Rice Unit) (Rs)	97963	185649	281360	385097	496859	**289386**
	Rice Unit EMV (Rs)	**19593**	**37130**	**56272**	**77019**	**99372**	
Beef Unit	NCF (Beef Cutlet) (Rs)	100000	131000	164800	201400	240800	**167600**
	EMV(Rs)	20000	26200	32960	40280	48160	
	NCF (Beef Pickle) (Rs)	78220	98540	120460	143980	169100	**122060**
	EMV(Rs)	15644	19708	24092	28796	33820	
	NCF (Beef Keema) (Rs)	61500	96500	135500	178500	225500	**139500**
	EMV(Rs)	12300	19300	27100	35700	45100	
	NCF (Beef Unit) (Rs)	239720	326040	420760	523880	635400	**429160**
	Beef Unit EMV (Rs)	**47944**	**65208**	**84152**	**104776**	**127080**	
Dairy Unit	NCF (Milk Peda)	62816	95964	132000	170924	212736	
	EMV (Rs)	12563	19193	26400	34185	42547	**134888**
	NCF (Paneer)	98234	134078	172888	214662	259402	
	EMV (Rs)	19647	26816	34578	42932	51880	**175853**
	NCF (Ghee)	-23493	21272	70675	124718	183402	
	EMV (Rs)	-4699	4254	14135	24944	36680	**75315**
	NCF (Dairy Unit)	137557	251314	375563	510305	655540	
	Dairy Unit (EMV)	**27511**	**50263**	**75113**	**102061**	**131108**	**386056**
Fish Unit	NCF (Fish Cutlet) Rs	58116	79401	102375	127089	153394	**104075**
	EMV (Rs)	11623	15880	20475	25418	30679	
	NCF (Fish Pickle) Rs	26965	50182	75192	102249	131354	**77189**
	EMV (Rs)	5393	10036	15038	20450	26271	
	NCF (Prawns Pickle)	25954	52701	81900	113553	147658	**84353**
	EMV (Rs)	5191	10540	16380	22711	29532	
	NCF (Fish Unit) Rs	111036	182283	259467	342891	432406	**265617**
	Fish Unit (EMV) Rs	**22207**	**36457**	**51893**	**68578**	**86481**	

Source: Primary Data

Results and Interpretation of EMV Analysis: The EMV method of comparison of different products and Model Units made in this study help to compare and choose

the best product and unit. The EMV of various products and Units are also calculated under unequal probabilities as illustrated in Table 6.17.

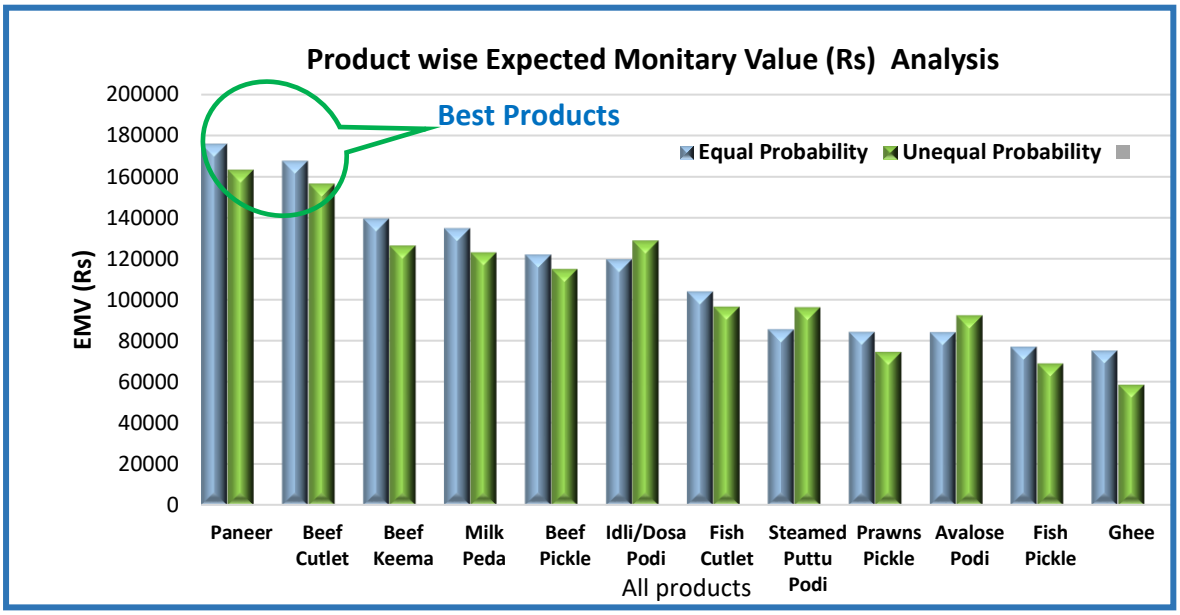
Table 6.17: Expected Monetary Value (EMV) of Products and Units with Unequal Probability

Model Units	Assumptions	H. Pessimistic Scenario	Pessimistic Scenario	Base Case Scenario	Optimistic Scenario	H. Optimistic Scenario	EMV (Rs)
	Probability (%)	**0.1**	**0.1**	**0.4**	**0.2**	**0.2**	
Rice Unit	NCF (Puttu Podi) (Rs)	12456	45791	82352	122138	165150	**96223**
	EMV (Rs)	1246	4579	32941	24428	33030	
	NCF (Avalose Podi) (Rs)	27893	53695	81840	112327	145157	**92392**
	EMV (Rs)	2789	5370	32736	22465	29031	
	NCF (Idli/Dosa Podi) (Rs)	57614	86162	117168	150631	186552	**128682**
	EMV (Rs)	5761	8616	46867	30126	37310	
	NCF (Rice Unit) (Rs)	97963	185649	281360	385097	496859	**317296**
	Rice Unit EMV (Rs)	**9796**	**18565**	**112544**	**77019**	**99372**	
Beef Unit	**Probability (%)**	**0.2**	**0.2**	**0.4**	**0.1**	**0.1**	
	NCF (Beef Cutlet) (Rs)	100000	131000	164800	201400	240800	**156340**
	EMV (Rs)	20000	26200	65920	20140	24080	
	NCF (Beef Pickle) (Rs)	78220	98540	120460	143980	169100	**114844**
	EMV (Rs)	15644	19708	48184	14398	16910	
	NCF (Beef Keema) (Rs)	61500	96500	135500	178500	225500	**126200**
	EMV (Rs)	12300	19300	54200	17850	22550	
	NCF (Beef Unit) (Rs)	239720	326040	420760	523880	635400	**397384**
	Beef Unit EMV (Rs)	**47944**	**65208**	**168304**	**52388**	**63540**	
Dairy Unit	**Probability (%)**	**0.2**	**0.2**	**0.4**	**0.1**	**0.1**	
	NCF (Milk Peda)	62816	95964	132000	170924	212736	**122922**
	EMV (Rs)	12563	19193	52800	17092	21274	
	NCF (Paneer) (Rs)	98234	134078	172888	214662	259402	**163024**
	EMV (Rs)	19647	26816	69155	21466	25940	
	NCF (Ghee) (Rs)	-23493	21272	70675	124718	183402	**58638**
	EMV (Rs)	-4699	4254	28270	12472	18340	
	NCF (Dairy Unit) (Rs)	137557	251314	375563	510305	655540	**344584**
	Dairy Unit (EMV) (Rs)	**27511**	**50263**	**150225**	**51030**	**65554**	
Fish Unit	**Probability (%)**	**0.2**	**0.2**	**0.4**	**0.1**	**0.1**	
	NCF (Fish Cutlet) Rs	58116	79401	102375	127089	153394	**96502**
	EMV (Rs)	11623	15880	40950	12709	15339	
	NCF (Fish Pickle) Rs	26965	50182	75192	102249	131354	**68867**
	EMV (Rs)	5393	10036	30077	10225	13135	
	NCF (Prawns Pickle) (Rs)	25954	52701	81900	113553	147658	**74612**
	EMV (Rs)	5191	10540	32760	11355	14766	
	NCF (Fish Unit) Rs	111036	182283	259467	342891	432406	**239980**
	Fish Unit (EMV) Rs	**22207**	**36457**	**103787**	**34289**	**43241**	

Source: Primary Data

The best choice of products with highest EMV in Model Units is Paneer, followed by Beef Cutlet, Idly/Dosa Podi and Fish Cutlet both under equal and unequal probabilities as illustrated in Graph 6.25.

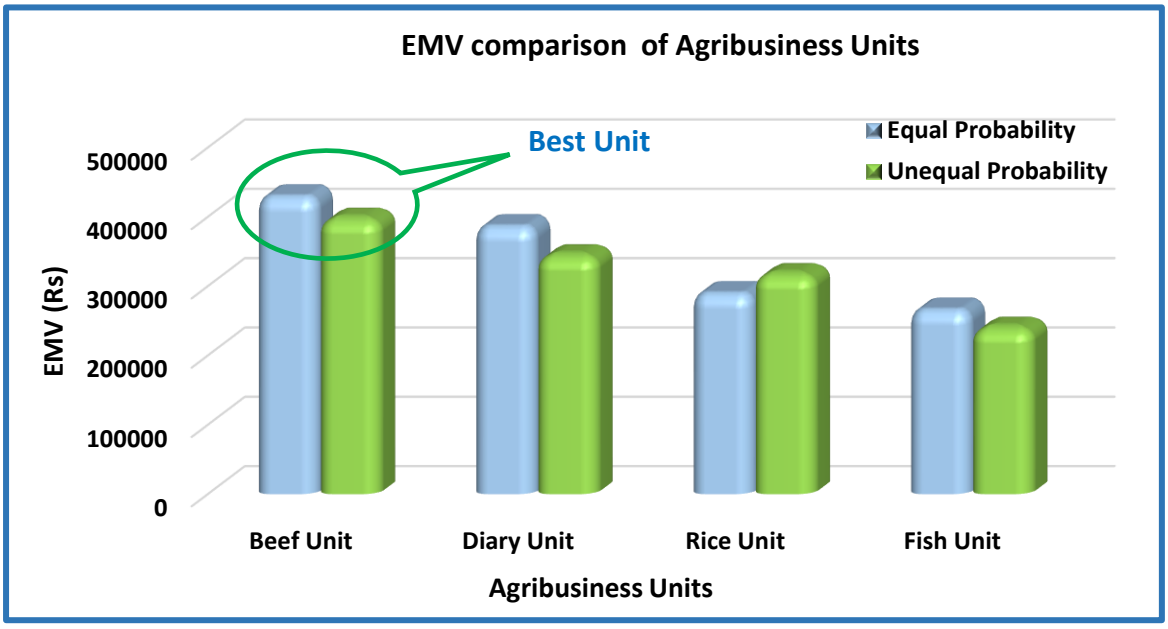
Graph 6.25: Product Wise Expected Monetary Value



Source: Primary Data

An EMV Comparison of Model Agribusiness Units reveals that the investment opportunities are safe in Beef followed by Dairy, Rice and Fish as shown in Graph 6.26.

Graph 6.26: Unit Wise Expected Monetary Value



Source: Primary Data

This also indicates the attitude and preference of the people of Kerala towards non-vegetarian value added and processed products. The study results are in conformity with the National Family Health Survey conducted in 2015-16 in which Kerala ranks first and second among Indian states with 92.8 per cent women and 90.1 per cent men are the weekly consumers of fish, chicken or meat. Traditionally people in Kerala have a greater affinity for fresh fish rather than value added and processed fish products which are very visible in the study.

6.8 CONCLUSION

Kerala, a densely populated state has been facing incremental demand for fish since long due to the ever-increasing consumer preference for highly nutritive fish products. However, the absence of a sound infrastructure base for production, processing, value addition, distribution and marketing lead to about 20 to 25 percentage wastage of fish catch in the state. Kerala fisheries sectors' contribution to the state income is very negligible. In order to tap the inland and marine fisheries potential in Kerala, taking advantage of the long coastline, progressive attitude of the educated fish farmers and to address their problems, we have to establish forward and backward linkages in which the prospects of agribusiness in processing and value addition plays a pivotal role. The EMV comparison of different Model Units highlights the fact that agribusiness opportunities are more in Beef and Milk compared to Rice and Fish. Hope, in the post Covid pandemic phase, the state's agriculture policy will be rewritten to accommodate agribusiness.

CHAPTER VII

SUMMARY, FINDINGS AND POLICY IMPLICATIONS

7.1 INTRODUCTION

A detailed discussion on the potential of agribusiness ventures in Kerala, elucidate its significance in the development of the state. It is very clear that the well-being of Kerala depends on the well-being of its rural sector where agriculture and allied sectors has a great role to play. But the performance of this sector is greatly affected by the shift in the cropping pattern, structural transformation, insufficient price, price instability, lack of market access, inadequate finance, insufficient technology, pre-harvest and post-harvest losses, inefficient systems of post-harvest management and lack of processing and value addition. Therefore, Kerala agriculture is to be linked to agribusiness aiming at zero wastage, efficient and effective post-harvest management, increased processing and value addition. Hence, farmers need to be fine turned as entrepreneurs with the support of the policy makers and local self- governments.

Several government initiatives are focusing on the sustainable and inclusive growth of agriculture and allied sectors with the objective of doubling farmer's income. In spite of these efforts, about half of the population of Kerala who derive their livelihood from agriculture and allied sectors, still remain the vulnerable sections of the society. Some of the studies observed that declining profit and low social profile keep the young generation of Kerala away from this sector. The emergence of agribusiness and agri-entrepreneurship can augment these problems through its backward and forward linkage effects. Added to this, high per capita income, high literacy, gender equality and women empowerment give an opportunity for a shift from the demand for raw products towards highly nutritious value-added food products which widens the scope of agribusiness in Kerala.

Hence, the present study is intended to examine the economic and financial feasibility and viability of agribusiness ventures in selected value-added products in Kerala. The specific objectives of the study are; to assess the pattern and trend in

the performance of agriculture sector in Kerala, to evaluate the financial and economic feasibility and viability of selected agribusiness ventures, to examine the forward and backward linkages of agribusiness and also to identify the opportunities and challenges faced by the Agri-entrepreneurs.

7.2 SUMMARY OF THE STUDY

Agribusiness is an emerging sunrise sector that connects agriculture and business for economic development. Its strong inter sectoral, intra-sectoral, rural-urban linkages pave the way for the development of rural areas especially of developing agrarian economies. It develops unique value chains from production to processing, distribution, marketing and consumption of agriculture and allied sector resources that make agribusiness different from other activities.

The present study made use of both secondary and primary data. Relevant secondary data to analyse the crop, livestock, dairy and fishery sector potential in the post liberalization period between 1990-91 and 2018-19 are compiled from Food and Agriculture Organization (FAO) and World Bank Database, RBI Handbook on Indian Statistics, Land Use Statistics, Pocket Book of Agricultural Statistics, Annual Employment-Unemployment Reports, Agricultural and Processed Food Products Export Development Authority (APEDA) Database, Marine Products Export Development Authority Database, Directorate General of Commercial Intelligence and Statistics (DGCI&S) Database, Basic Animal Husbandry Statistics, Handbook of Fisheries Statistics, National Fisheries Policy Report, Agriculture Census, Livestock Census, Indian Economic Survey and Kerala Economic Review.

Considering the technical efficiency and data availability, primary data for the analysis were collected from a Base Unit for rice, meat and milk from Thrissur district and for fish from Ernakulam district. The study collected data regarding the different types of value-added products, fixed and variable costs, prices of inputs and output and volume of production and sales during a period of three years from 2016-17 to 2018-19. Interactions with agricultural, veterinary, fishery and dairy scientists, researchers and experts working in the region contributed to make reasonable assumptions on technical parameters.

Firstly, the study analysed the economic and financial feasibility of each Model Unit based on the Net Cash Flow (NCF) for a period of three years. The discount rate is estimated based on the prevailing interest rates on bank loans given to Marginal Small and Medium Enterprises (MSME). Net Present Value (NPV), Benefit Cost Ratio (BCR) and Payback Period criteria are used in the study to assess the profitability of Model Units.

Secondly, linear regression model is used to estimate the Discounted Cash Flow (DCF) Break-even point of NPV which tells us how much the sales volume and unit selling price can go down and unit variable cost and fixed cost can go up by maintaining profit.

Thirdly, the risk of the Model Units is assessed using Sensitivity and Scenario analyses with alternative combinations of variables (volume, price, cost and discount rate), from different 'scenarios' (optimistic, highly optimistic, base, pessimistic and highly pessimistic), on the Unit's NPV.

Fourthly, the linkage effect of agribusiness and the opportunities and challenges faced by Agri-entrepreneurs are analysed based on the information collected through the discussions with the farmers, processors, distributors, local shop owners and exporters.

Finally, Expected Monetary Value (EMV) Method is used to consolidate the analysis by comparing and identifying the best Unit and product which highlights the safer investment opportunities.

7.3 MAJOR FINDINGS

The sincere and continuous efforts by Kerala Government to modernise agriculture and allied sectors with the establishment of labs, institutional mechanisms for marketing, crop insurance, strengthening agri-service centres and extension activities open up opportunities for agribusiness. However, more efforts are needed to bring professionalism in agribusiness to catch up with international standards. The major findings of the study can be summarised under each objective as follows.

Findings with respect to the pattern and trends in the performance of agriculture sector:

- The analysis on agribusiness potential in crop sector reveals that a disproportionate growth in cash crops without an adequate base of food crops increase the dependency of Kerala on other states which retard the sustainable development of the state.
- To keep the prominent role of agriculture in the state, agriculture productivity is to be enhanced through greater investments and the application of modern technology. This necessitates the need for agribusiness in value added and processed agriculture products.
- In Kerala, livestock rearing is characterized by production by masses compared to mass production in advanced countries. The study identified that livestock sector plays a significant role in Kerala economy in terms of nutritious food, income, employment and export earnings.
- Instability in price, insufficient infrastructure, inadequate processing, value addition and marketing facilities lead to wastage and underutilization of livestock resources. Emergence of agribusiness and agri-entrepreneurship can augment this problem through its backward and forward linkages.
- The significance of dairy sector in Kerala is evident from the fact that it is an important primary/secondary source of livelihood for millions of rural families in Kerala.
- Milk and milk products are an unavoidable item in the diet of the people in Kerala but the daily per capita availability of milk in the state is only 189 grams per day as against the national availability of 394 grams.
- Kerala depends on the adjacent states to bridge the demand supply gap in milk production. In order to reduce the dependency on other states for milk and to utilize the untapped dairy potential of the state, agribusiness ventures in dairy sector is to be promoted through local level planning.
- The analysis on the potential of fisheries sector reveals that there exist untapped inland fisheries resources in Kerala and there is scope for further expansion.

- Fisheries sector provides food and nutritional security, gainful employment to women and youth, meets the diversified needs of consumers for processed fish products, reduce wastage of fish resources, and eradicate poverty of fisher folk community.
- In spite of the substantial contribution of fisheries sector to Kerala economy, the fisher folk community continues to remain as one of the most economically backward sections of the society.
- Efficient agribusiness can offer better price to fishermen, reduce wastage, provide employment opportunities, women empowerment and uplift the socio-economic status of fishermen families.

Findings with respect to the financial and economic feasibility and viability of agribusiness ventures:

- Primary data-based cash flow analysis reveals that, all Model Units are healthy with respect to their operating profit.
- The positive NPV values of products and Model Units prove that, agribusiness in 'processing and value addition' is financially viable which opens up promising investment opportunities in Kerala.
- The study results of BCR (>1) for all products and Model Units strongly supports this argument.
- Payback period (<2 years) for all products and Model Units indicates the strength of possible quick recovery of initial investment and subsequent scope for agribusiness in Kerala.
- The study also conducted a product-wise Break-even analysis to measure the risk faced by Model Units. This has been done separately for the fluctuations in output, prices and costs using linear regression model for estimating the DCF Break-even point of NPV.
- The study results reveal that investment in agribusiness products are less risky, since the break-even volume and selling price of each product is much lower than the Base Case. Similarly, the break-even point of variable cost and fixed cost are much higher than the Base Case.

- Using Sensitivity analysis, the study identified the most sensitive variables in agribusiness ventures. It is observed that selling price of the product and volume of output are more sensitive to the NPV. Hence, a fall in selling price or a reduction in output will seriously affect the profitability of the Unit.
- Scenario analysis assessed the risk of simultaneous changes in these key variables on the profitability of the product under different levels of optimistic and pessimistic situations (scenarios). The study results reveal that majority of the products recorded profitability even under pessimistic scenarios.
- The study also made a comparison of the four agribusiness units using Expected Value Method (EMV) and found that among the four Units, Agribusiness in beef in Kerala has the highest EMV followed by Dairy, Rice and Fish.
- Among the twelve products, EMV is high for Paneer, followed by Beef cutlet, Idli/Dosa Podi and fish cutlet respectively from each Unit. High literacy, progressive urbanization, women empowerment, health consciousness and better chances of income are other positive factors contributing to the development and progress of agribusiness in Kerala.

Findings with respect to the agribusiness linkages, opportunities and challenges:

- Agribusiness stimulates inclusive and sustainable economic development through various types of forward-backward, direct-indirect, rural-urban, intra-sectoral, inter-sectoral, farm-non-farm linkages.
- The agribusiness linkages enhance nutritional food security; create primary and secondary employment opportunities.
- It strengthens the bargaining ability of farmers, livestock holders, dairy farmers and fishermen for a better price for their raw products.
- It also gives stimulus to manufacturing, utility and logistics industries and lead to the growth of insurance, banking and research institutions.
- The study identified that agri-entrepreneurs of Kerala faces many challenges in the form of lack of capital, high cost of production, competition from large and established branded firms, insufficient infrastructure for production, distribution,

cold chain service for storage and marketing, poor processing technologies, inferior quality of inputs, lack of trained and skilled workers and lack of integration with government policies.

- Hence, the study suggests that corrective measures to be taken by the government and to be implemented through Krishi Bhavans and other local self-government institutions to create a profitable, sustainable and inclusive environment for agribusiness.
- The study also made a comparison of the four agribusiness units using Expected Value Method (EMV) and found that among the four Units, Agribusiness in beef in Kerala has the highest EMV followed by Dairy, Rice and Fish.
- Among the twelve products, EMV is high for Paneer, followed by Beef cutlet, Idli/Dosa Podi and fish cutlet respectively from each Unit. High literacy, progressive urbanization, women empowerment, health consciousness and better chances of income are other positive factors contributing to the development and progress of agribusiness in Kerala.

7.4 VALIDATION OF HYPOTHESES

For the purpose of the study three hypotheses was formulated. Empirical analysis assured the validity of the first two hypotheses. Secondary data indicated that only less than ten percent of the agriculture and allied sectors raw resources are processed at national and regional level. The very recent policy documents particularly post COVID 19 suggests the need for promoting agribusiness enterprises. In continuation of this the second hypothesis which states that "financially and economically feasible and viable agri business ventures strengthen the forward and backward linkages between farm and nonfarm sectors" is also found to be valid. Detailed analysis was carried out on the financial and economic feasibility and proved our claims without any doubt. This promotes forward and backward linkages which are also narrated with reasonable arguments. The study indicates the potential of youth entrepreneurship in agribusiness and hence the last hypothesis is partially validated. But this hypothesis needs further investigations and validations which are beyond the scope of this thesis.

7.5 LIMITATIONS OF THE STUDY

Whatever perfection we try, no study is free from methodological and data-based issues. This study is also not free from such limitations. The following are the major limitations

1. Even though it is a Kerala based study, due to the presence of limited number of agribusiness units in each of these products, the experimental units are confined only to two districts namely Thrissur and Ernakulam.

2. Financial and economic feasibility is done based on a number of assumptions. To minimise the errors in assumptions sufficient care is taken and also the assumptions are modified and repeated estimations are done.

4. The study concentrated only on the supply side factors of processing and value addition and does not take into consideration of the consumer preferences.

7.6 POLICY IMPLICATIONS

1. Findings suggest that, authorities should take farmer friendly policies to boost agribusiness in order to uplift the living conditions of farmers, livestock holders, dairy farmers and fishermen in the state.

2. Farmer producer companies should be promoted to procure products at local level so that intermediaries can be terminated. Farmers and farmer groups to be encouraged by giving more freedom and thereby making farmer an entrepreneur.

3. Government can attract private sector small scale agribusiness investment by giving more incentives like interest subsidies, renewal of existing loans and tax exemptions. Through mechanisation and commercial farming, economies of large-scale production can be enjoyed. Farmers can divert crop production to those agri-products that can be processed and value added.

4. Since the livestock operations are mainly concentrated in rural areas, new and existing livestock-based agribusiness start-ups should be encouraged by the local

self-governments at district, block, panchayat and village and levels. Post-Covid strategies should focus on healthy and nutritious food rather than productivity.

5. Emerging agribusiness and Agri-entrepreneurship can provide opportunities for livelihood to the unemployed reverse migrants with the investment support assured by the government. This can avoid an escalation of the pandemic from a health crisis to food crisis.

6. The area of operation of Agribusiness incubators to be extended to livestock, dairy and fishery sectors in order to accelerate the economic development of the state.

Realising the importance of agribusiness to mitigate the long-term impact of Covid pandemic on nutritional food security, hope that the state's agricultural policies in the post Covid 19 phase will accommodate inclusive agribusiness.

7.7 AREAS OF FURTHER RESEARCH

1. Studies can be extended to demand and market by considering consumer preferences.

2. There is further scope for intensive research taking each sector separately.

3. From the analysis done in this thesis, it is clear that linkages are many and strong in agribusiness. So, any studious researcher can think of doing rigorous research using an input output frame.

4. Women entrepreneurship is getting priority in these days. The scope of women entrepreneurism in promoting agri business can be attempted.

5. Studies are to be encouraged in linking agri business and decentralised planning

7.8 CONCLUSION

Present study gives an insight to the importance of household and family based small scale agribusiness in the sustainable growth of agriculture and allied sectors leading to the economic development of Kerala. Agribusiness broadens the opportunities for production, processing, distribution and marketing in crop, livestock, dairy, and fishery and forest products. It enhances professionalism in

agriculture and attracts the educated unemployed youth and women towards this sector. In order to tap the potential of this sector, we have to establish forward and backward linkages in which prospects of processing and value addition plays a significant role. Hope that the state's agriculture policy in the post-Covid phase will accommodate inclusive agribusiness by incorporating farmer and agri-entrepreneur friendly approach in decentralised planning through the support of village panchayat, Krishi Bhavan and Self-Help Groups.

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APPENDIX - 1

Sl. No	Name and Location of Units	Ownership
1	Swad Food Products at Thrissur	Private
2	Matsyafed Ice and Freezing Plant at Kochi, Ernakulam	Government
3	Kerala Veterinary and Animal Science University (KVASU) Meat Technology Unit at Mannuthy, Thrissur	Government
4	Kerala Veterinary and Animal Science University (KVASU) Dairy Plant at Mannuthy, Thrissur	Government