Analaysis Of Agro Processing Industry In Punjab, India

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Abstract: Punjab is a state dominated by agriculture, an agro-processing industry can be established to boost the agricultural business system, which will enhance the completion of that procedure in any other component of the agri-business system. Economic liberalisation, globalisation, and MNCs' inclusion in the processed agro-industry have increased market and competitiveness prospects significantly, giving customers an advantage. The probable modernization and commercialization of agriculture after GATT concentrated on domestic and foreign agro value-adding products marked a promising future for the Punjab agri-food industry. The domestics of this survey took account of the evolving tastes and preferences of consumers for processed agro-products. This research focused on the domestic market. This paper analyzed the creation and financial performance of selected agro-processing industries, including food grain breaking, processing of edible oilseeds, processing sugar cane, and dairy products producing mass consumption products. It focuses on these businesses for advancement centered on performing parameters and addresses policies

Keywords: Argo, Industry, Grain, Agriculture, Processing, Consumers, Consumption

1. Introduction

1.1   Agro-processing in Punjab

- Punjab is India's agro-bowl, which accounts for more than 40% of the central wheat pool and 26% of the central rice pool.
- The economy accounts for approximately 21% of the GSDP in agriculture, compared with 14% in India.
- Punjab is the world's leading manufacturer of orange wheat, cotton, paddy, lychee and guava.\ Punjab has a strong agricultural and agricultural infrastructure in India.
- The best irrigation area in the country with 98% of the net irrigated area.

1.1.1   Class of initiative:

- Punjab is one of the few states that facilitates private mandis for businesses and organisations.
- The state illustrates modern agricultural technology and a strong logistics supply chain.
- Human Capital Dynamics:
- Best-in-class agricultural and applied education and capability infrastructure.
- There are 20 Krishi Vigyan Kendras.
- 15 colleges deliver agricultural education courses.
- There are 12 Farmers Training Centers.
- Punjab Agricultural University, the country's best agricultural university.
- Establishment of an Agri-Business Promotion Facility (PDF).
- Agricultural marketing reforms.
- State-wide creation of agri-infrastructure and food parks.
- Agricultural Producer Organizations' Special Provision (FPO).
- Agro-waste value addition
- The establishment of a new Cargo Export Centre in Mohali for export promotion.
- Based facilitation of the meat processing and poultry sectors.
- Creation of an Industrial Estate for the wood-based industry.

1.1.2   Major Cluster Parks:

- The ITC Food Park in Kapurthala.
- Phagwara Mega Food Park focused on corn.
- Fazilka's multi-dimensional super Food Park.
- A food park with modern food processing facilities in Ladhowal, Ludhiana.
- Punjab Agri Food Parks Ltd and Punjab Agro Ventures Ltd, both located in Sirhind.

1.1.3   Key Fiscal Incentives:

- MSME/Large Unit Rewards MSME – 100% Reimbursement of Net SGST, Exemption from ED and SD.
- MSME – 5% Interest Subsidy for Border and Kandi Region.
- MSME – Economical, technical, marketing, and export assistance.

- Large – 75 per cent of net SGST, 100 per cent exemption from ED, SD, and 50 per cent exemption from property tax.
- Thrust Field – 100% net SGST exemption, 100% ED, SD exemption, and 50% PTax exemption.
- Early Bird Units in New Industrial Parks – up to 125 per cent FCI on net SGST.
- Investment Grant to IT/ITES units: 50% of FCI, subject matter to a limit of INR 2.5 cr per unit.
- Full reimbursement of all taxes and fees charged for the procurement of raw materials for agro-processing units for a period of up to ten years for all categories of units.

1.1.4   Anchor Unit Fiscal Benefits:

- Repayment of 100 per cent of net SGST for 15 years up to 200 per cent of FCI.
- Exclusion from CLU/EDC.
- Employment Creation Incentive of Rs.30,000 per worker per year
- CLU in the Agriculture Zone with a minimum land area of 50 acres.
- Incentives that are not fiscal in nature
- Exclusion from PAPRA and CLU Funding for Anchor Schemes
- Non-stop service 365 days a year.
- Green Category Units are exempt from Consent Management.

2. Existing Partners:

- ITC
- Cargill
- Walmart
- Amul
- Mahindra
- Nestle
- Pepsico
- Danone
- MilkfedX. GSK
- Technico Agri Sciences
- Reticella XIII. UB Group
- Godrej Tyson
- Bunge
- Cremica
- LT Foods Ltd
- Dunar Basmati Rice

3. Upcoming Projects:

Three Mega Food Parks have been approved in Punjab under the Ministry of Agro Processing's Mega Food Park scheme.

- Mega Food Park, International Mega Food Park Ltd. Fazilka.
- Sukhjit Mega Food Park and Infra Ltd., Kapurthala
- A Food Incubation Centre and a Food Testing Centre are being developed at Ladhowal Mega Food Park.

[1]

Unless traditional agriculture is replaced by agro-processing with adequate ties between marketing and consumption, the rural Punjab economy cannot survive. There is also a need for more public-private collaborations and investments.The newly appointed Director (Research) of Ludhiana Agriculture University, M. S Bajwa, is now on the university's management board. "It is time to create new agro-based units within the villages.

"The emphasis should change from production to processing, and value add-on can revive economies and boost the wages of farmers, tiny and marginal farmers, as well as asset-less rural workers. It is time to increase the value of agricultural goods and products to compete in the worldwide market.

In this respect, it is necessary to look more broadly at agricultural exports. "This will limit the decreasing profits and improve the competitiveness of small processors who use ineffective machinery and bad packaging to manufacture fruit and vegetable products.

Bajwa reported to the Central Department of Food Processing that, up from the current Rs 460,000 crore exports, they had set the target of exporting Rs 1350 000 crore processed agricultural products by 2015.

"Punjab should take advantage of this opportunity to create special economic zones for regionally specific agricultural regions, agro-export zones and policy frameworks. The approach to agro-processing in the village must be adopted following a socio-economic analysis. It is essential to improve the relationship between agriculture training, education, and research. Quality management regulations to make agriculture a business proposal are essential to restore stability to a countryside economy, "He said.

Pavittarpal Singh Pangli, chief of the Punjab Kisan Club, reported that, because of the lack of appropriate support to competitive agricultural and remuneration markets, the presently advised farm expansion plans have failed handle decreasing profitability.

"Agro-products of calorie, protein and vitamins that are rich globally have highly competitive Punjab." [2]

4. Background of the Study:

The Agro-processing industry in developing countries such as India has a greater job creation potential through the growth of small industries (SSI). In recent years, the SSI sector has significantly surpassed the objectives, with small businesses now focusing on long-term sustainable and not on short-term survival. India's small-scale industry is extremely influential, employing almost three million small units and 24 million people.

The informal agri-processing industry in India has inherent strengths such as job creation, cluster industrial growth, regional and local development sustainability, business enterprise, sustainability, low production costs and diversified production systems. Simultaneously, there are generally no R&D cell owners or associations with independent R&D institutions at major flower mills, state-of-the-art rice factories, vegetable and fruit processing units, solvent mining units (Oil), milk production units, meat processing units or fish processing units.

On the other hand, large, informal agro-processing industries, including bakeries, pulp mills, and traditional units, rely on R&D institutions to truly explore their increased efficiency and profit margin. This is a fresh supplement. Here opportunities in horticultural products are developing quickly due to changes in the population's lifestyles, the increasing middle-class incomes and surplus production of fruit, milk, and vegetables. Opportunities are also being fostered for the agro-processing sector. [3]

In the early stages of economic development, agriculture is important. Agriculture supplies food, employment, savings and contributes to GDP in the country and foreign exchange earnings. History shows that, at one point in time, all industries worldwide were agriculturally active and have since advanced to rank among developed economies through manufacturing and services sector development.

Since independence, agriculture has been the key source of national income and employment. Farmers and associated practise until the 1960s contributed almost half of India's domestic production. The total national income farming share dropped from 50% in 1949-50 to 17.32% in 2016-17, after 70 years of independence. However, agriculture remains the largest source of employment, accounting for 48.9 per cent of total jobs.

When the Green Revolution took place in the mid-1960s, Indian agriculture was a turning point. It was not a miracle, the Green Revolution in India; rather, it was the product of sound public policies, appropriate infrastructure, inspiring leadership, hard-workers, and Indian peasantry's efforts. However, agricultural growth in different states has remained unequal, while agro productivity has increased significantly. Just some countries had the opportunity to take advantage of the Green Revolution, leading Punjab.

However, the momentum gained by the green revolution started to decay after the 1980s, and only wheat and rice crops were the only ones that were the success story of the green revolution. Due to the depletion of water tables, rising land salinity and micronutrient shortages, both followed by increased production costs, farmers' income was stagnant, agricultural productivity was growing slowly during this era. Costs of crop production increased because of high input costs.[4]

The use of modern agriculture technology by farmers since the mid-1960s has needed substantial capital investment in the form of farm machinery, irrigation equipment and other inputs such as chemical fertilizers, pesticides, and insecticides, etc.[5] To perform their development activities, farmers were forced to invest huge amounts in market-supplied farm inputs and equipment [6]. Farmers wanted both farming and subsistence funding.

Year after year, farmers borrowed but were unable to repay loans either because the loans grew larger or because agricultural products could not return the sum. [7] All these factors have raised farmers' debt to the extent that farmers have committed suicides in Punjab. [8]

The result was a controversy rather than a minimization of the Green Movement. Punjab's economic development and per capita income lead now lie in the past, and other nations have surpassed this long lead. Farmers must be relieved, and the lost glory of the State restored. Therefore, we need to imitate other Indian nations' patterns of development.

Different countries in recent decades have caused major changes in Indian agriculture's patterns of development, consumption, and trade. The transition to high-value foodstuffs including fruit and vegetables, milk and milk products, meats, eggs, fish and refined agricultural produce is a step away from food cereals and consumption. The export of traditional commodities like rice, sugar, tea, coffee, and tobacco quickly moves from the trade of high-value items.

With the number of working couples increasing, married women have less time to cook foods that require ready-to-cook food. High-value crops are becoming more and more relevant day after day. As technology advances, physical input has decreased their lifestyle and reducing their lives.

Consequently, people are increasingly health sensitive and depend on organic agri-food and low-carbohydrate, edible low-cholesterol oils. Zero-trans-fat snacks and cookies, slim milk, whole-wheat goods, peas, soybeans, maize flakes, etc. In demanding cheaper, safer, and more affordable farm products, consumers are more committed and are willing to pay a higher price for health and comfort. The agri-processing sector was strengthened.

The overall economic structure of a country depends on a strong and dynamic agro-processing market. The industry has key links and synergies between agriculture and industry and has been identified as a sector with immediate economic growth potential. Processing also contributes to rural work, and processed fruits and vegetables are an exchange source. [9].

Given the problems inherent in Indian farming, researchers such as Dr Johl, Dr Sucha and Singh Gill, among others,[10] have presented the case for the establishment of agro-processing industries in the state in warfare extensively.[11] This study is aimed at evaluating the state's food processing industry's performance and quality.[12][13].

5. Literature of Review

This paper deals with literature reviews, which are different articles and reports from various journals and magazines to provide a perspective on many studies on various aspects of agri-foods. A summary of the selected studies and papers related to the proposed studies is given in this section. These studies are reviewed critically to understand the various aspects of the issue.[14]

Hollingsworth (2000) dealt with the increase in nutritious and food sales in the US and with the key demographic groups aimed at buying these foods and promoting smaller niche-specific enterprises to promote healthy food products. Aspects considered include balanced nourishment groups with increasingly growing marketplaces (new-age beverages; normal foods like organic and agro-processed foods without added salt, calories, or preservatives, meat substitutes, frozen natural foods, organic frozen foods, and speciality teas); and the value of the teen populace as current and potential buyers.[15]

Neff (2002) said in his editorial Time to Go to Market that 2002 might have been one of the best days for the launch of new food items and advertising strategies because customers wasted more time eating at home, watching TV and taking even more care of advertising. They would also notice that clients would be open to their calls and food retailers. Food retailers said it was the ideal time to launch a significant new product or product strategy, like ready-to-agro food, since so many more people remained in their homes. The number of consumers in food retailers grew in over ten years.[16]

Arya (1992) defined comfort agro-alimentary products as products. All or a significant part of the preparation is transferred from the customer kitchen to the processing facility in his article 'Convenience Agricultural Food - Emerging Scenario.' He noticed the dramatic changes in the excellence and the number of crops available and the packing techniques used in the manufacture of agri-food products globally in the past two decades.

Many goods previously marketed through agri-food facilities or tiny-size artists are now sold in India's desirable MNC packets.[17]

Reinhardt (1996) debated traits that contribute to innovative processed agro products' success and success in the agri-food industry. Aspects considered include innovative definitions; factors that affect the success of innovations (e.g. innovation and efficiency, effective use of scientific information, management and marketing

knowledge); indicators of success (e.g. marketplace performing, do research and advancement activities, patent applications) (e.g., light, convenient).[18]

Srivastava and Patel (1994), agro-business delivers a link between farmhouse industries that contributes to accelerated agricultural growth by creating backwards links (provision of credit, inputs, and other services for the improvement of production) and forward links (compliance, marketing).[19]

Sundareson (1990) noted that the Indian agri-processing business has long been promising but has short-term performance, except where the reasons are apparent in certain industries, for example, milk products, cocoa products, instant coffee, and baking.

These include high rates of packaging, extremely high administration taxes and levies of nearly 50 per cent of the commodity cost, low farm productivity and errant agricultural production volume due to over-dependence on mountains and weak irrigation growth near-inexistent cold storage. The weak transport infrastructure leads to the high cost of distribution and uneven retail delivery, low availability and low energy cost, inadequate production of products that match ethnic and regional tastes, excessive controls on certain items such as small bakery products, lack of data on population consumption patterns and preferences and the research. This thesis was, however, concluded before Indian economic liberalization.[20]

6. Scope of the Study:

Since Punjab is an agriculturally dominant state, the agri-processing industry has a great opportunity to strengthen the agri-business system, enhancing all other elements of the agri-firm system to complete the procedure. Economic liberalisation, globalisation and the entry of multinational enterprises (MNCs), which provide customers with a competitively advantaged, has significantly increased their business prospects and competitiveness.

The likely upgrading and marketing of agriculture in the post GATT time frames a solid future for Punjab agribusiness, emphasising value-added agro-based goods for domestic and foreign markets. This study focused on the domestic market, considering the rapidly evolving preferences and the preference for agro-processed products.

Many of the leading agro-industry players work hard to address each marketing aspect's needs, regardless of the different levels and structures of the company. In this quest, a crucial aspect of product challenges and opportunities, client preferences, the product itself marketing factors, brand recognition and so on is highlighted.

All selected companies gave this important factor due to consideration to assess the policies of selected agro-processing organisations. As part of the product line, many of the chosen organisations deal with a range of products, and the study has concentrated on fundamental products.

7. Population of the Study:

The study provides factual results on agro-processing industries in Punjab. This study's population is composed of selected small and medium-sized Punjab milk processing units, calculated by further comparison from such units. The Punjab Directorate of Industries and the Punjab Small Scale Industries & Export Corporation have been provided with a list of units. However, there was no such detailed list. Senior managers from several dairy processing plants were asked to compile the list.

8. Design and size of sample:

Samples of small and medium-sized units will be selected for operations. The total number of specified units, only those chosen units were prepared to exchange information, as were the consumer and industrial products produced. Among these selected milk-producing units for the analysis were selected.

The current study exclusively focuses on the dairy industry, as the agro-processing industry includes many industries such as milk, grain, vegetables, fruit etc. In the state of Punjab, many companies are involved in the field. For this article, its products' branding and the commercial exchange was only addressed to the organised market. For example, for the same reason, the chilling of milk is not included. However, the milk chilling centres are for large companies, only feeding/assistant devices. They are not involved; they are not listed in domestic or export markets. Apart from some large and small companies in the milk processing industry, the co-operative sector is the main component. It has only been taken into account in co-operatives and SMEs. Select organisations producing domestic consumer products across the domestic supply chain is taken care of. Some of the companies have engaged in exports.

9. Sampling for Industry-Related Targets:

An unlikely sampling design was used for the collection of agro-processing companies. A concerted effort was made to draw up the list of all the food processing industries in Punjab through Industry, Punjab, CII, CSIDC, PSIEC and other organisations. To plan sampling frameworks, personal interviews were conducted with officers from many organisations and firms to obtain addresses of the units.

The study included medium or small-scale agro-processing units operating in the state of Punjab's private and co-operative sectors. Considering the expense, time and other factors involved in the survey process, such as availability of published reports, the desire for corporate authorities to exchange info, and access to books from many firms, it was decided to carry out a thorough study on companies operating only in Punjab. As this study aimed solely on medium to small-scale marketing problems and prospects, huge companies in Punjab, such as Nestle and SmithKline Beecham, were not chosen to do so. The selected companies are.

- Punjab State Cooperative Milk Producers.
- Federation Ltd. (Milkfed), Chandigarh (All units).
- Herman Milkfood, Manimajra (HM).
- Hygienic Foods Ltd., Khanna.
- Milk specialities Ltd., Chandigarh.
- Milkfoods Ltd., Patiala.
- Kang Milk products, Ludhiana.
- Baba.
- Mukand, Malerkotla.
- Supreme.

The selection process involved companies with similar product ranges. Moreover, companies not interested in exchanging information due to their strategic existence were omitted despite best efforts. As marketing strategies are not shared in-depth, and most companies regard the methods as confidential, the companies that have been willing to share this data have been selected for the present-day report.

10. Collection of Data:

Statistics were collected from two sources, milk processing facilities and consumers, as stated earlier. Industrial business organisations The collection of data emphasised the group of qualitative information connecting to dissimilar features and prospects of advertising issues, such as product information, price decisions, marketing and distribution, sales and export performance information, pricing, packaging and distribution of finished goods.

Information was collected from a detailed standardised questionnaire with input from a desk review to search the libraries available and to list the different criteria for the study. The data were obtained using the standardised questionnaire. A questionnaire subsequently developed to obtain detailed answers from the managers of chosen agro-handling organisations and customers.

A pilot survey was conducted to pre-test the questionnaire final form. The survey was well-structured and clear. Also, unstructured interviews with senior management from different companies and a review of corporate literature have given some details. Any questions the companies could not share were asked in an unstructured format for a disguised interview.

A standardised, undisguised questionnaire was used to collect the primary data. The questionnaire was completed by directly consulted with senior and middle marketing and production managers. They have been classified as managers (marketing), managers (production and sales officers), although respondents' classification varies depending on the organisation. Any organisation that refused to provide details was not eligible to participate. It was also excluded companies that had badly stored records/data.

All interested persons were contacted and asked to fill out the standardised and undisguised questionnaire sections. Secondary data were derived from the other records and their websites of the businesses. The websites of recognised and authentic agencies such as the Punjab government have also been visited to gather information.

Factor Evaluation

Factor analysis is an interdependence statistical technique widely used to become popular in advertising research (Luck, 1987. p.542). Reason study is considered the Queen of Analytic Techniques as of its intensity and elegance (Dwivedi, 1997, p.199).

It is a method of measuring the variance of a common factor in a set of measures. The number of steps is reduced to the lowest possible. It shows which measures go hand in hand and implies similarities in the fundamental characteristics behind different actions.

(1) simplifies data collection by reducing many measures – some of which may be interrelated, resulting in multi-collinearity for a set of respondents – into a smaller, manageable number of factors that do not link up while retaining most of the information in the original data set and

(2) improves data the primary reasons for using Factor Analytical are

11. Data Analysis:

To achieve the report's goals, a thorough evaluation of the advertising difficulties and the chances of chosen agro-processing businesses in Punjab and the responses of customers were conducted, along with data interpretation/analysis and a review of the literature. As marketing strategies are not comprehensive, and methods are considered part of their proprietary information by most companies, companies that would like to share this information were chosen for the current study.

11.1　　Problems encountered during product promotion:

As a result of matrix rotation, the first part has heavy loads from four problem areas: government regulations and prices, high fiscal rate, low support infrastructure and high exceptional costs. The factor can be called the governmental and infrastructural problem factor based on the problem areas—variable tastes and preferences, sourcing raw materials, future demand, etc.

Variables are closely related to the second part. This is known as the element of uncertainty, as customer preferences and expectations, the availability of raw materials and the outlook for demand are uncertain. The third factor is closely related to the distribution problems, seasonal variations, and different demand for exports. Variable distribution and demand issues can be established by looking at the problem areas. Fourthly, the shortage of human resources and competition from the unaccompanied market are intimately related. The actor can be called a competition resource factor based on the problem areas. Fifth, the unfair competition practises between competitors and the attitudes of intermediaries are closely related. The factor can be called the human factor when looking at the problem areas. When time goes on, it is harder to interpret the variables. [14]

12. Methodology and Database:

Productivity is defined as the volume measurement ratio of output to input measurement volume (OECD Manual, 2001:11). This article refers to a systematic metric, Total Factor Productivity (TFP), involving all production factors. The Industrial TFP is measured using four common methods. The following are an accounting approach to growth, a less square econometric model performance, a border approach of stochastic development and a non-parametric approach. The paper discusses Punjab's productivity growth in the food industry using a non-parametric data analysis (DEA). Initially, DEA was designed to investigate the relative effectiveness of different companies or management units supposed to have similar production technology best practices. This method distinguishes between companies based on how the technologies are efficiently used in the manufacture of output. However, the DEA technique was used to study the output at the aggregate country level. The two-digit production sector performance across regions and the time series collection data relating to the aggregate manufacturing industry are appropriate. In India, for estimates of Malmquist and the Tornqvist productivity indexes showing productivity growth, Ray uses state-level inputs and outputs for the years 1985–86 to 1995–96. According to him, throughout the post-change era, the yearly rate of output growth is greater than in the pre-reform period. A convergence of productivity growth rates in each country is evident. The study's use of DEA is mainly the implicit assumption that all food processing industries share an identical output in Punjab. After subtracting intermediate inputs and power and fuel expenditures from the gross production, practise analysis took gross value-added output. Thus, we neutralise the heterogeneity effect by using diverse production functions for various industries using gross added value as output and labour and capital as inputs in the production function.

Based on the annual time series data for 2015–16, the Malmquist indices are determined using the Dea. There are several advantages of the Malmquist index: no need to identify a specific functional category, no market structure assumption or economic activity, no price information required and no inefficiency. DEA allows us to break down the Malmquist index of productivity change into elements of changes in pure technological output, technical progress, and scale production. So, our research allows us to identify productivity growth drivers and remove the leading industries from the lagging industries.

Malmquist's TFP Indices and Estimation Procedure in DEA

The following description is mainly based on Fare et al. Distance function explains the Malmquist productivity index. There are two kinds of distance functions: input- and output-focused. Input-oriented distance functions are designed to reduce the amount of input without changing the output proportionally.

Distance functions based on output consider that the output volume should be proportionately increased without altering the input amount. Most often used for comparison of outputs is the Malmquist process. In this paper, we are, therefore, adopting a TFP computing performance method. However, the output and input-orientated measures have the same technical efficiency measures concerning the consistent returns to size (CRS). We conclude that all sectors function on an optimal scale in this article.

However, this is solved with the Data Envelopment Analysis. The TFP change index of Malmquist is followed by Fare et al. By measuring each point's distance ratios relative to popular technology, the Malmquist TFP index calculates the change in productivity between two points.

The TFP input-oriented input Malmquist shift indices from base period t to next period t+1 are:

$$M(y_t, x_t, y_{t+1}, x_{t+1}) = \left[\frac{d_{t+1}(Y_{t+1}, X_{t+1})}{d_t(Y_t, X_t)} \times \frac{d_t(Y_{t+1}, X_{t+1})}{d_{t+1}(Y_{t+1}, X_{t+1})} \right]^{1/2}$$

A value of M greater than unit shows an improvement in the TFP from t to t+1. Another alternative would be to decrease the value of M below 1 for the TFP. The geometric mean for two TFP indices is equation (1). The first index for the t technological period will be calculated, while the second index for the t+1 technology period will be evaluated.

The Malmquist Index is advantageous to make it possible to distinguish the changes at the performance limit (technological change, TC) from changes to the technical efficiency change (TEC), which are the product of the Malmquist Index. Technological efficiency measurement must range from 0 to 1.

Total Factor Productivity Change Index=

$$\frac{D^t(y^t, x^t)}{D^{t+1}(y^{t+1}, x^{t+1})} \times \left[\frac{D^{t+1}(y_{t+1}, x_{t+1})}{D^t(y^{t+1}, x^{t+1})} \times \frac{D^{t+1}(y^t, x^t)}{D^t(y^t, x^t)} \right]^{1/2}$$

$$\text{Technological Change Index} = \left[\frac{D^{t+1}(y_{t+1}, x_{t+1})}{D^t(y^{t+1}, x^{t+1})} \times \frac{D^{t+1}(y^t, x^t)}{D^t(y^t, x^t)} \right]^{1/2}$$

$$\text{Technical Efficiency Change Index} = \left[\frac{D^{t+1}(CRS)(y_{t+1}, x_{t+1})}{D^t(CRS)(y^t, x^t)} \right]$$

$$\text{Pure Technical Efficiency Change Index} = \left[\frac{D^{t+1}(VRS)(y_{t+1}, x_{t+1})}{D^t(VRS)(y^t, x^t)} \right]$$

$$\text{Scale Efficiency Change Index} = \left[\frac{D^{t+1}(CRS)(y_{t+1}, x_{t+1})}{D^t(CRS)(y^t, x^t)} \right] /$$

$$\left[\frac{D^{t+1}(VRS)(y_{t+1}, x_{t+1})}{D^t(VRS)(y^t, x^t)} \right] \tag{1}$$

13. Dominance and expansion:

From 1980-81 to 2015-16, Grain Mill products, starches, and starch products were the dominant industry among Punjab's total agro-processing industries (Table 1).

The following growth table illustrates the growth of the meal industry in Net Value Added and Profits between 1980 and 1991 to about 2 per cent, NBA and Profits to about 6 per cent between 1990 and 2001 and NVA and Profits 20 per cent between 2000 and 2016. The meat sector estimates that the number of factories has increased by 23 per cent from 1980 to 1991, that of 1990 to 2001, from 2000 to 2016, from 2000 to 2016 and, overall, that of 1980 to 2016, that of 2 per cent. NVA and income increased by 16 per cent between 1980 and 2016 in the meat industry. (Table 2).

In Table 3, Net Value Added and Profits increased by approximately 28 per cent between 1980 and 1991. NBA and Profits increased by approximately 22 per cent between 1990 and 2001, and NVA decreased by approximately 4 per cent from 2000 to 2016 and NVA yields decreased by 20 per cent. Around 1980 and 2016, NVA grew by 11%, and revenue increased by 3% in the dairy industry.

Table 4 shows that from 1980 to 1991, the number of factories has risen by 18%, from 1990 to 2001 by 10% and from 2001 to 2016 just by 2%. Around 1980 and 2016, the total number of plants grew by 5%.

The output of grain mills, starch and other starch products, and the prepared animal feed industry increased by about 12% for net added value and 4% for profits between 1990 and 2001, 14% for NVA and 7% for NVA and 60% for profit between 2001 and 2016, from 1980 to 1991.

Table 5 shows that the output of grain mills, starch and other starch products and prepared feed industries increased 4%, 12% in production, 11% in NVA and 38% in benefit between 1980 and 2016.

Industry	Characteristics/Year	Number of factories (no.)	Number of workers (no.)	Invested capital	Total output	Total inputs	Net value added	Profit
Slaughtering, preparation and preservation of meat	1980-81	17.33	10.95	17.56	33.33	34.9	18.72	22
	1990-91	13.49	12.93	18.94	37.98	41.17	18.37	20.18
	2000-01	5.39	7.09	14.06	24.07	26.94	8.16	8.51
	2010-11	10.95	12.12	24.05	25.5	27.52	6.17	1.49
	2015-16	7.89	12.76	14.47	23.02	20.17	50.31	160.23
Manufacture of dairy product	1980-81	1.47	3.5	16.17	11.89	11.28	17.51	26.16
	1990-91	1.41	6	17.51	13.83	11.57	31.46	48.81
	2000-01	3.03	8.23	12.61	23.49	18.78	52.24	88.96
	2010-11	2.05	6.6	5.88	12.99	13.41	9.14	1.21
	2015-16	2.14	8.77	11.86	14.82	15.36	9.87	1.82
Manufacture of grain mill products, starches and starch products, and prepared animal feeds	1980-81	72.8	56.83	44.64	42.75	43.66	34.67	20.58
	1990-91	78.12	61.5	33.67	31	32.25	17.7	-4.36
	2000-01	82.2	60.48	30.53	32.99	35.81	16.47	-0.13
	2010-11	79.86	61.09	46.14	34.12	36	15.25	1.03
	2015-16	84.04	57.93	48.01	40.85	43.5	17.6	-51.92
Manufacture of other food products	1980-81	6.13	24.72	16.2	8.54	6.87	24.39	28.71
	1990-91	3.61	12.65	22.21	10.08	9.17	15.37	6.7
	2000-01	5.8	16.69	31.19	11.94	11.19	15.33	-1.05
	2010-11	3.23	11.21	11.67	9.89	9.61	12.04	-0.95
	2015-16	2.79	12.58	14.84	9.37	9.13	11.43	-15.99
Manufacture of beverages	1980-81	2.27	3.99	5.42	3.49	3.29	4.72	2.55
	1990-91	3.37	6.93	7.67	7.11	5.85	17.1	28.67
	2000-01	3.57	7.51	11.61	7.51	7.28	7.8	3.71
	2010-11	3.91	8.98	12.25	17.51	13.45	57.4	97.22
	2015-16	3.14	7.95	10.81	11.93	11.85	10.78	5.86

Table 1: Dominance table.

Characteristics/ year	Number of factories (no.)	Number of workers (no.)	Invested capital	Total output	Total inputs	Net value added	Profit
1980-81	130	3792	2423.89	18508.76	17429.48	927.69	433.38
Def 1980-81	130	3792	1213.51	9266.35	8726.01	464.45	216.97
1990-91	172	6889	17732.7	108854.92	102339.42	5651.59	2669.9
Def 1990-91	172	6889	8877.82	54497.88	51235.91	2829.45	1336.68
Growth	2.84	6.15	22.02	19.38	19.36	19.81	19.94
1990-91	172	6889	17732.7	108854.92	102339.42	5651.59	2669.9
Def 1990-91	172	6889	8396.99	51546.2	48460.91	2676.2	1264.28
2000-01	80	6325	48681	214428	201416	10383	5139
Def 2000-01	80	6325	23051.97	101538.36	95376.77	4916.67	2433.48
Growth	-7.37	-0.85	10.63	7.01	7.01	6.27	6.77
2000-01	80	6325	48681	214428	201416	10383	5139
Def 2000-01	80	6325	23478.78	103418.35	97142.67	5007.71	2478.53
2015-16	229	13602	266849	878728	677628	189544	149421
Def 2015-16	229	13602	128700.93	423809.37	326819.1	91416.82	72065.55
Growth	6.79	4.9	11.22	9.22	7.88	19.9	23.44
1980-81	130	3792	2423.89	18508.76	17429.48	927.69	433.38
Def 1980-81	130	3792	277.15	2116.28	1992.88	106.07	49.55
2015-16	229	13602	266849	878728	677628	189544	149421
Def 2015-16	229	13602	30511.38	100473.31	77479.64	21672.36	17084.72
Overall growth	1.59	3.61	13.95	11.32	10.7	15.92	17.62

Table 2: Growth Table: Industry Group-I Slaughtering, preparation and preservation of meat.

Characteristics/Year	Number of factories (no.)	Number of workers (no.)	Invested capital	Total output	Total inputs	Net value added	Profit
1980-81	11	1212	2232.3	660188	5633.27	867.81	515.31
Def 1980-81	11	1212	1117.59	330521.06	2820.28	434.47	257.99
1990-91	18	3197	16395.35	3963072	28747.09	9679.46	6458.86
Def 1990-91	18	3197	8208.28	1984099.6	14392.14	4845.99	3233.61
Growth	5.05	10.19	22.07	19.63	17.7	27.27	28.77
1990-91	18	3197	16395.35	3963072	28747.09	9679.46	6458.86
Def 1990-91	18	3197	7763.71	1876638.39	13612.65	4583.53	3058.47
2000-01	45	7334	43669	209282	140432	66467	53705
Def 2000-01	45	7334	20678.64	99101.56	66498.94	31474.2	25431
Growth	9.8	8.66	10.29	-25.48	17.19	21.25	23.59
2000-01	45	7334	43669	209282	140432	66467	53705
Def 2000-01	45	7334	21061.5	100936.44	67730.17	32056.95	25901.85
2015-16	62	9348	218792	565677	516114	37199	1698
Def 2015-16	62	9348	105523.1	272825.28	248921.11	17941.03	818.94
Growth	2.02	1.53	10.6	6.41	8.48	-3.56	-19.42
1980-81	11	1212	2232.3	660188	5633.27	867.81	515.31
Def 1980-81	11	1212	255.24	75485.56	644.11	99.22	58.92
2015-16	62	9348	218792	565677	516114	37199	1698
Def 2015-16	62	9348	25016.56	64679.22	59012.21	4253.31	194.15
Overall Growth	4.92	5.84	13.58	-0.43	13.37	11	3.37

Table 3: Industry group-II manufacture of dairy product.

Other agricultural products manufactured in Net added value at a rate of about 14% and a 5% increase in profit between 1980 and 1991, NVA at 15% between 1990 and 2001, and NVA at 3% and profit at 22% between 2000 and 2016. Between 1980 and 2016, other food industries manufactured by NVA by 10% and earnings by 33 per cent increased.

Table 6 also shows that the number of plant firms grew by 6% from 1990 to 2001, the average growth rate in factory numbers rose by about 2%, and the number of workers increased by 1% from 1980 to 2016.

The drinks industry has grown by approximately 36% in net added value between 1980-1991, and 54% in profits, 6% in NVA between 1990 and 2001 and 9% in NVA and 6% in income from 2001-2016.

Production of other agricultural products Between 1980 and 2016, NVA grew by 15 per cent and profit increased by 14 per cent. The number of factories and the numbers of workers between 1980 and 2016 also increase by 5 per cent in Table 6.

13.1 Market share

Table 7 shows the market share of different food processing industries in Punjab and the pattern between 1980-81 and 2015-16. There has been an increased market share for the dairy, grain, starch and beverage industry while meat and other agri-products have been reduced. The following diagrams illustrate the market share trends for different agro-processing industries in Punjab and all state-owned industries from 1980-81 until 2015-16. (Table 1 and Table 2).

Characteristics/Year	Number of factories (no.)	Number of workers (no.)	Invested capital	Total output	Total inputs	Net value added	Profit
1980-81	546	19674	6162.94	23742.58	21802.48	1718.45	1405.44
Def 1980-81	546	19674	3085.46	11886.65	10915.34	860.34	703.62
1990-91	996	32778	31524.15	88840.78	80150.37	5444.68	423.05
Def 1990-91	996	32778	15782.47	44477.86	40127.03	2725.86	211.8
Growth	6.2	5.24	17.73	14.11	13.9	12.22	-11.31
1990-91	996	32778	31524.15	88840.78	80150.37	5444.68	-576.95
Def 1990-91	996	32778	14927.67	42068.88	37953.7	2578.23	-273.2
2000-01	1219	53929	105716	293900	267705	20956	-76
Def 2000-01	1219	53929	50059.83	139170.83	126766.68	9923.32	-35.99
Growth	2.04	5.11	12.86	12.71	12.82	14.43	-18.35
2000-01	1219	53929	105716	293900	267705	20956	-76
Def 2000-01	1219	53929	50986.69	141747.59	129113.77	10107.05	-36.65
2015-16	2438	61739	885477	1558944	1461634	66312	-48414
Def 2015-16	3657	61739	427064.4	751876.66	704944.18	31982.19	-23350.01
Growth	7.11	0.85	14.21	10.99	11.19	7.47	49.71
1980-81	546	19674	6162.94	23742.58	21802.48	1718.45	-594.56
Def 1980-81	546	19674	704.67	2714.71	2492.88	196.49	-67.98
2015-16	2438	61739	885477	1558944	1461634	66312	-49414
Def 2015-16	2438	61739	101244.98	178248.85	167122.48	7582.08	-5649.97
Overall Growth	4.24	3.23	14.8	12.33	12.39	10.68	13.06

Table 4: Industry group-III manufacture of grain mill products, starches and prepared animal feeds.

Characteristics/Year	Number of factories (no.)	Number of workers (no.)	Invested capital	Total output	Total inputs	Net value added	Profit
1980-81	46	8558	2237.06	4742.48	3432.47	1208.95	565.49
Def 1980-81	46	8558	1119.98	2374.31	1718.46	605.26	283.11
1990-91	46	6742	20794.53	28891.92	22780.77	4730.11	887.16
Def 1990-91	46	6742	10410.72	14464.65	11405.12	2368.11	444.15
Growth	0	-2.36	24.98	19.81	20.84	14.62	4.61
1990-91	46	6742	20794.53	28891.92	22780.77	4730.11	1587.16
Def 1990-91	46	6742	9846.86	13681.23	10787.41	2239.85	751.57
2000-01	86	14886	108008	106336	83660	19507	64
Def 2000-01	86	14886	51145.16	50353.42	39615.62	9237.17	30.31
Growth	6.46	8.24	17.91	13.92	13.89	15.22	-27.46
2000-01	86	14886	108008	106336	83660	19507	-636
Def 2000-01	86	14886	52092.12	51285.71	40349.11	9408.2	-306.74
2015-16	81	13405	273677	357656	306715	43044	-14916
Def 2015-16	81	13405	131994.06	172497.02	147928.25	20760.07	-7193.97
Growth	-0.37	-0.65	5.98	7.88	8.46	5.07	21.8
1980-81	46	8558	2237.06	4742.48	3432.47	1208.95	-434.51
Def 1980-81	46	8558	255.78	542.25	392.47	138.23	-49.68
2015-16	81	13405	273677	357656	306715	43044	-15916
Def 2015-16	81	13405	31292.09	40894.2	35069.63	4921.63	-1819.82
Overall Growth	1.58	1.25	14.28	12.76	13.29	10.43	10.52

Table 5: Industry Group-IV Manufacture of other food products.

14. Empirical Results:

The Malmquist performance indices of productivity shifts are determined using the DEA. The mean (geometric means) estimates for various Punjab agro-processing industries for Malmquist indices from 1980–81 to 2015-16 are given in Table 8. The above table shows that TFP has increased significantly due to the Punjab agro-processing industries' growth (Total Factor Productivity). All agribusiness sectors show a negative increase in TEC except for the meat industry (Technical Efficiency Change). The meat and drink industry (PTEC) (Pure technological Efficiency Change) stays stable. In contrast, for the beef, grain, starch and other food products industry, it is negative, which shows a lack of the educational mechanism for these industries. On the other hand, the meat industry size efficiency is positive, showing that its productivity has increased its scale. The findings show that both the Total Change Factor and the Change in Technology led to increased meat, beverages, and other agri-products industries.

Characteristics/Year	Number of factories (no.)	Number of workers (no.)	Invested capital	Total output	Total inputs	Net value added	Profit
1980-81	17	1383	748.83	1936.73	1641.7	233.93	50.31
Def 1980-81	17	1383	374.9	969.62	821.91	117.12	25.19
1990-91	43	3692	7176.78	20377.46	14543.41	5261.01	3793.32
Def 1990-91	43	3692	3593.03	10201.91	7281.11	2633.91	1899.11
Growth	9.72	10.32	25.36	26.53	24.38	36.52	54.08
1990-91	43	3692	7176.78	20377.46	14543.41	5261.01	3793.32
Def 1990-91	43	3692	3398.43	9649.36	6886.76	2491.25	1796.26
2000-01	53	6693	40221	66941	54401	9925	2238
Def 2000-01	53	6693	19045.9	31698.65	25760.57	4699.8	1059.76
Growth	2.11	6.13	18.81	12.63	14.1	6.55	-5.14
2000-01	53	6693	40221	66941	54401	9925	2238
Def 2000-01	53	6693	19398.54	32285.56	26237.53	4786.81	1079.38
2015-16	91	8472	199394	455416	398216	40630	5466
Def 2015-16	91	8472	96167.47	219646.54	192059.06	19595.8	2636.24
Growth	3.44	1.48	10.52	12.73	13.25	9.21	5.74
1980-81	17	1383	748.83	1936.73	1641.7	233.93	50.31
Def 1980-81	17	1383	85.62	221.44	187.71	26.75	5.75
2015-16	91	8472	199394	455416	398216	40630	5466
Def 2015-16	103	9488	22798.61	52072.03	45531.81	4645.61	624.98
Overall Growth	5.13	5.5	16.78	16.38	16.48	15.4	13.91

Table 6: Industry group-V manufacture of beverages.

	1980-81	1990-91	2000-01	2010-11	2015-16
Meat industry	1850876	10885492	214428	714012	878728
Meat industry % share (F P I)	33.33	37.98	24.06	25.49	23.02
Meat industry % share (Overall)	7.43	8.721	6.12	4.8	4.74
Dairy industry	660188	3963072	209282	363635	565677
Dairy industry % share (F P I)	11.89	13.83	23.42	12.99	14.82
Dairy industry % share (Overall)	2.65	3.17	5.98	2.45	3.05
Grain, starch industry	2374258	8884078	293900	955372	1558944
Grain, starch industry % share (F P I)	42.75	30.99	32.99	34.12	40.85
Grain, starch industry % share (Overall)	9.53	7.12	8.39	6.43	8.4
Other food products industry	474248	2889192	106336	276825	357656
Other food products industry % share (F P I)	8.54	10.08	11.94	9.89	9.37
Other food products industry % share (Overall)	1.9	2.31	3.03	1.86	1.93
Beverages industry	193673	2037746	66941	490315	455416
Beverages industry % share (F P I)	3.48	7.11	7.51	17.51	11.93
Beverages industry % share (Overall)	0.78	1.63	1.92	3.3	2.45
Total FPI	5553243	28659580	890887	2800159	3816421
Total FPI % share	22.23	22.96	25.44	18.83	20.57
Overall industries	24910451	124810046	3501849	14866258	18552084

Table 7: Market share analysis.

Table 9 shows the increase in TFPs in Punjab before the reform and after it. The TFP shows an increase in TFPs. According to the findings, the mean TFP has slowed compared with the pre-reform period in the meat and dairy industries in the post-reformation era. The TFP has been enhanced after reforms by improving beverage, granules, starch, and other agricultural products.

In comparison to the post-reform era, the technological change in the agro-processing industry was positive. Since the reform era compared to the pre-reform period, improvements in the meat and drink industry have improved in scale quality. The post-reform age of technological efficiency improvement has shown greater growth than the pre-reform period in different food processing industries.

Total Factor Productivity (TFP), Technical Efficiency and diverse efficiencies average growth rates per annum for all industries shift from 1998-99 to 2015-16, compared to 1980-81 to 1997-98. Table 10 shows five different industries of agro-processing. The findings show that TFP growth was adverse from 1998-99 to 2013-14 in two out of five industries, compared with 1980-81 to 1997-98.

There are only three sectors in which productivity growth has been positive between 1998-1999 and 2013-2014: beverages, milk, starch and other foods. Meat and milk products, the two leading sectors, also demonstrate negative increases in production compared to previous cycles between 1998 and 1999 and 2013-14.

Following a reform over pre-reform periods, a positive change in technical competitiveness and size is fascinating in most industries. Overall, the results show that productivity growth is mainly affected by the post-reform periods' technological transition.
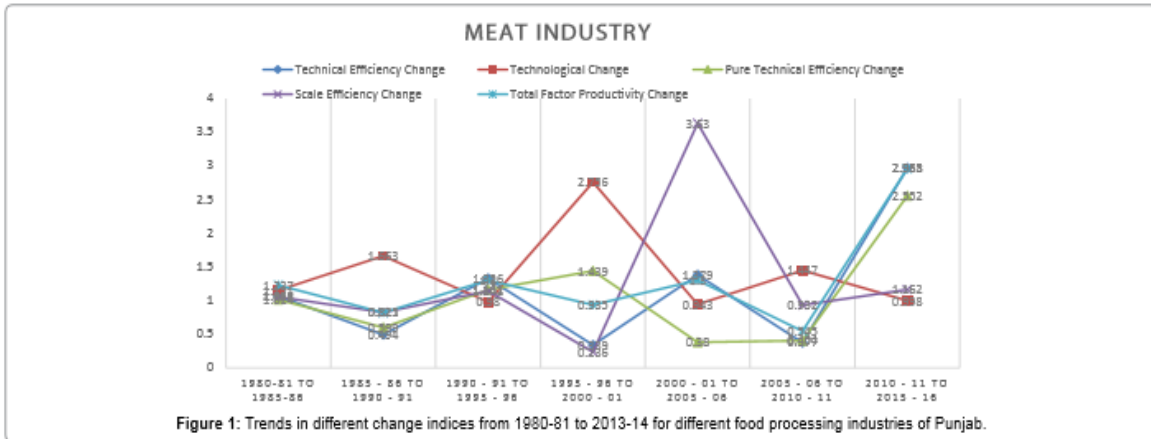
Figure 1: Trends in different change indices from 1980-81 to 2013-14 for different food processing industries of Punjab.
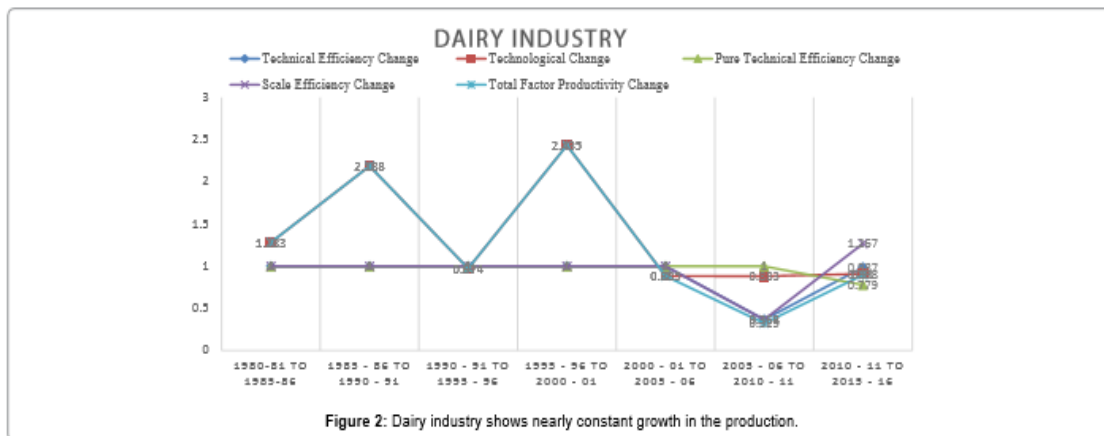

Figure 2: Dairy industry shows nearly constant growth in the production.

Industry	Technical efficiency change	Technological change	Pure technical efficiency change	Scale efficiency change	Total factor productivity change
Meat	1.008	1.21	1.001	1.006	1.219
Dairy	0.903	1.162	0.951	0.949	1.049
Grain, Starch	0.873	1.049	0.93	0.939	0.916
Other Food Products	0.873	1.17	0.874	0.999	1.021
Beverages	0.946	1.184	1	0.946	1.12
Mean	0.919	1.154	0.95	0.967	1.06

Table 8: Malmquist index summary of firm means.

	Period					Period				
	1980-81 to 1997-98					1998-99 to 2015-16				
Industry	Technical Efficiency Change	Technological Change	Pure Technical Efficiency Change	Scale Efficiency Change	Total Factor Productivity Change	Technical Efficiency Change	Technological Change	Pure Technical Efficiency Change	Scale Efficiency Change	Total Factor Productivity Change
Meat	0.909	1.72	0.975	0.932	1.563	1	1.099	1	1	1.099
Dairy	1	2.072	1	1	1.437	0.943	1.005	0.905	1.042	0.948
Grain, Starch	0.641	1.346	0.684	0.938	0.863	0.874	0.972	1.007	0.868	0.85
Other Food Products	0.773	1.713	1	0.773	1.324	1.009	1.014	1.012	0.998	1.023
Beverages	0.896	1.593	0.828	1.082	1.427	0.905	1.083	1.032	0.877	0.979
Mean	0.834	1.676	0.888	0.939	1.398	0.945	1.034	0.99	0.954	0.976

Table 9: Total factor productivity change and various efficiency change across the three-digit industries.

In the Punjab agro-processing industry from 1980-1981 to 2013-14, Figures 3 and 4 show trends in various change indices.

The above chart indicates that the Total Factor Productivity Change has increased significantly from 1980-81 to 2015-16, implying improved efficiency or output, as seen in rising technical efficiency and technical change indices.

The optimism of the change in scale efficiency demonstrates optimum manufacturing output in the industry. In contrast, the positive development of the change in pure technical efficiency portrays the industry's impressive, learned process.

The above diagram illustrates that the milk sector is rising almost continuously. The learning process in the industry is increasing continuously, but the shift in productivity is not occurring. The overall increase in the productivity factor decreased slightly between 1980-81 and 2015-16.

Growth Rates in Percentage				
Industry	Technical Efficiency Change	Technological Change	Pure Technical Efficiency Change	Scale Efficiency Change	Total Factor Productivity Change
Meat	10.01	-36.1	2.56	7.3	-29.69
Dairy	-5.7	-51.5	-9.5	4.2	-34.03
Grain, Starch	36.35	-27.79	47.22	-7.46	-1.51
Other Food Products	30.53	-40.81	1.2	29.11	-22.73
Beverages	1	-32.02	24.64	-18.95	-31.39
Mean	13.31	-38.31	11.49	1.6	-30.19

Table 10: Productivity Growth, TP, and Efficiency Change during 1998-99 to 2015-16 as compared to the period from 1980-81 to 1997-98.
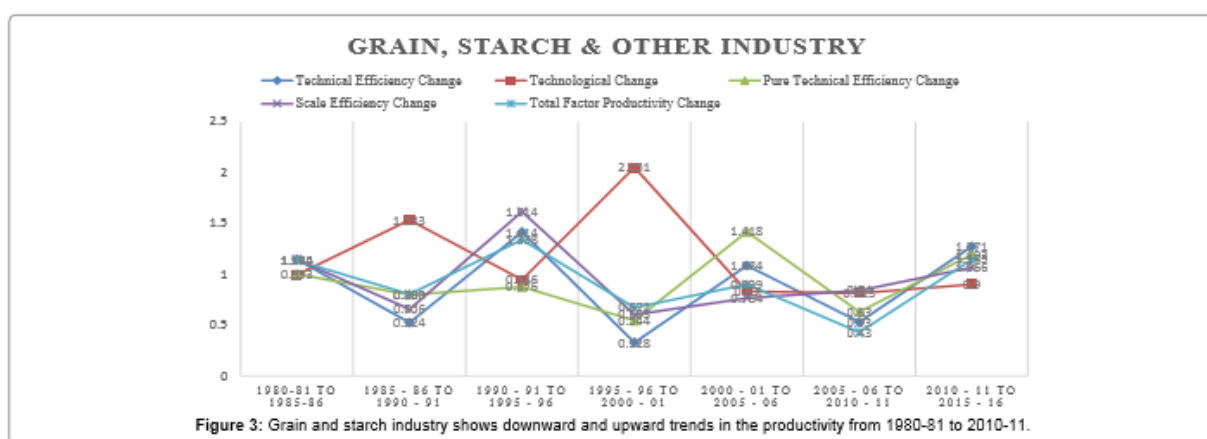
Figure 3: Grain and starch industry shows downward and upward trends in the productivity from 1980-81 to 2010-11.
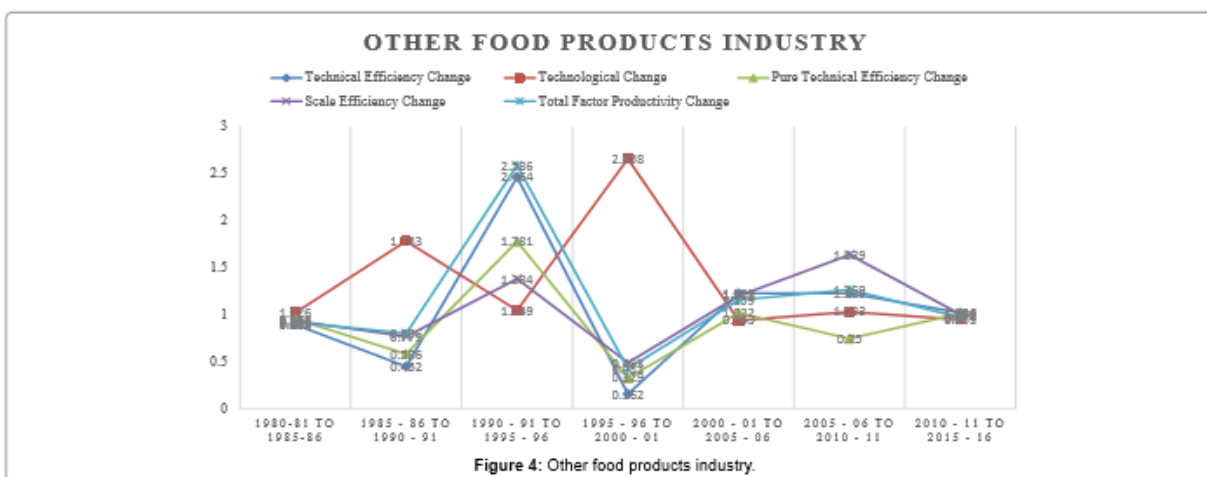
Figure 4: Other food products industry.

The Grain and Starch industries' productivity shows declining and rising patterns between 1980-81 and 2010-2011, as the overall productivity transition, technology, and scale change has fluctuated, while the production shows an upward trend between 2010-11 and 2015-16.

The other agro products industry zigzags' performance due to the slow growth of various indices of productivity change. From 1990-91 to 1995-96, production improved significantly, as seen by a steady increase in overall productivity improvements, techniques, and the shift in size.

Beverages industry

Thanks to improved productivity change indexes, the beverage industry increased considerably from 1990-1991 to 1995-1996 and from 2005-2006 to 2010-2011. Changes in production and quality of the overall factor suggest rapid growth from 2000-01 to 2010-11. (Table 5). (Table 3).
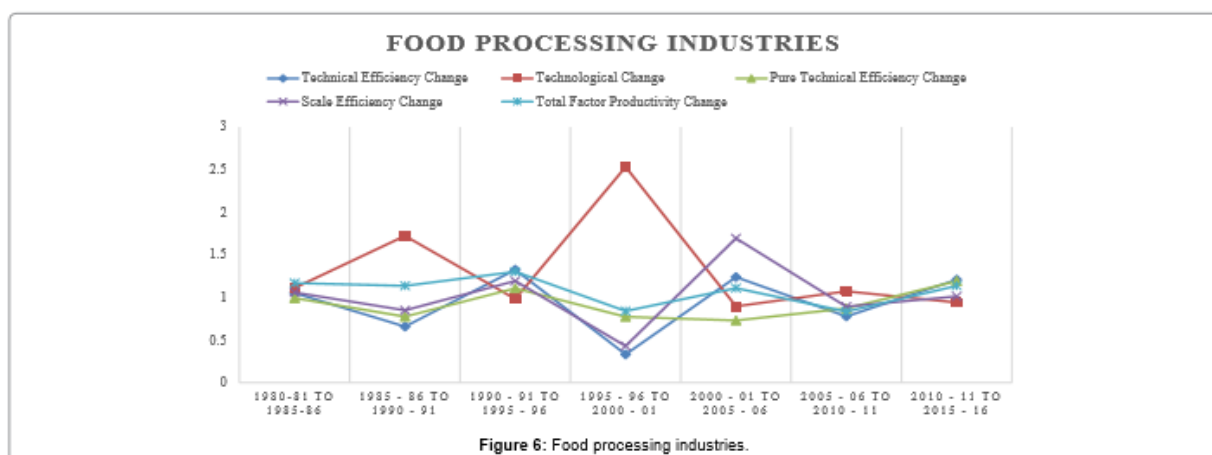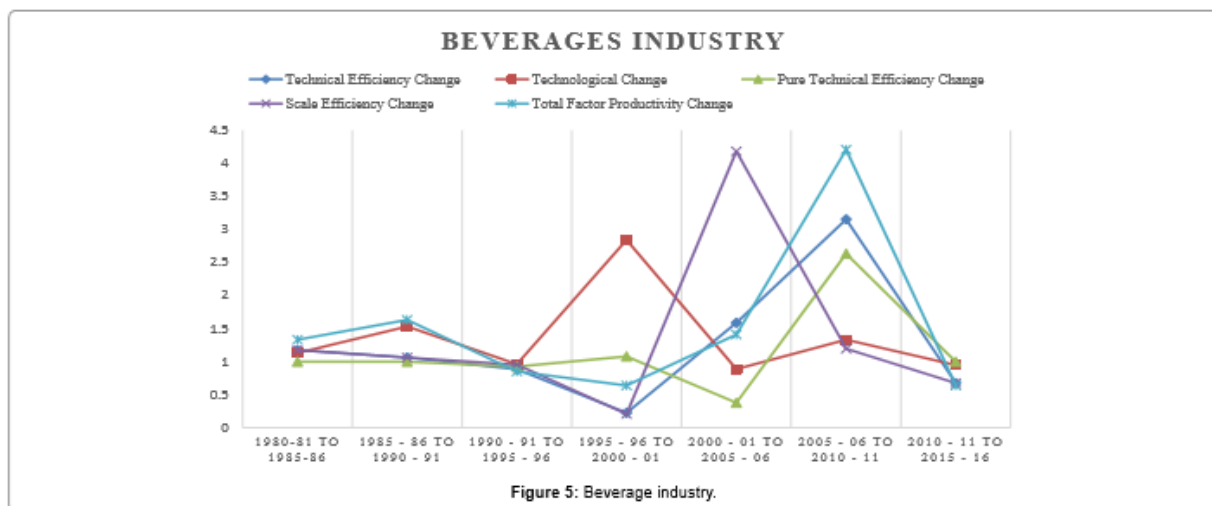
Agro-processing the productivity sector has shown down and upward patterns between 1980-81 and 2010-11, due to swinging growth in total change of the factor, strictly technological efficiency improvements and changes in the scale of efficiency and an increasing pattern between 2010-11 and 2015-16. (Figure 6).

The meat and grain industry, Starch Industry, has undergone rapid technological change between 1980 and 81 and 2015-16, with nearly steady growth for the rest of the industries (Figure 7).

From 1990-1991 to 1995-1996, technological transformation is rapidly occurring in all the agro-processing industries. The poultry, milk, grain and starch, drink and other agro products industries have almost constantly grown between1980-81 and 2015-16. (Figure 8).
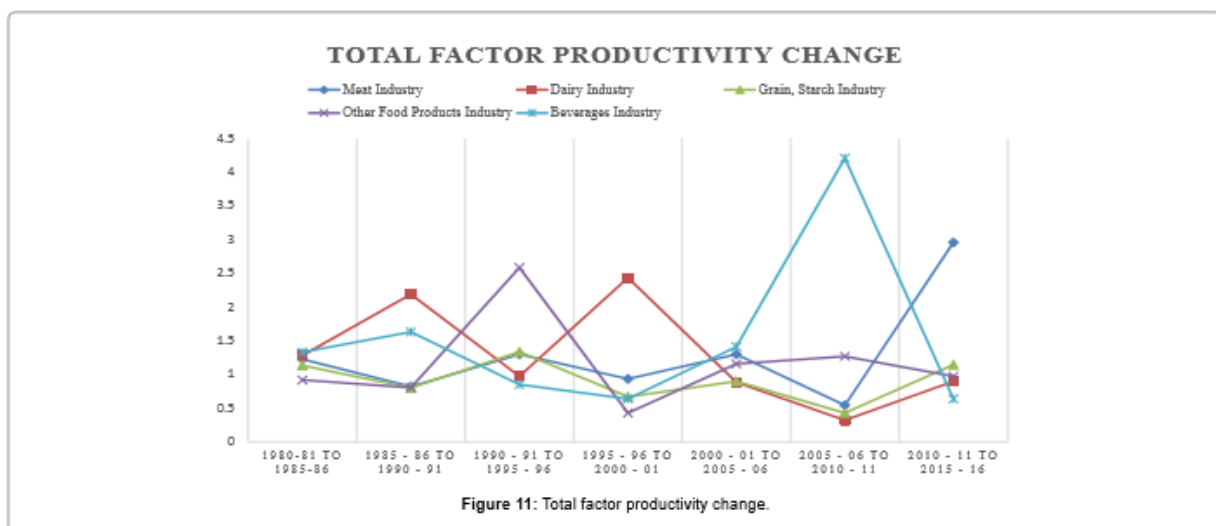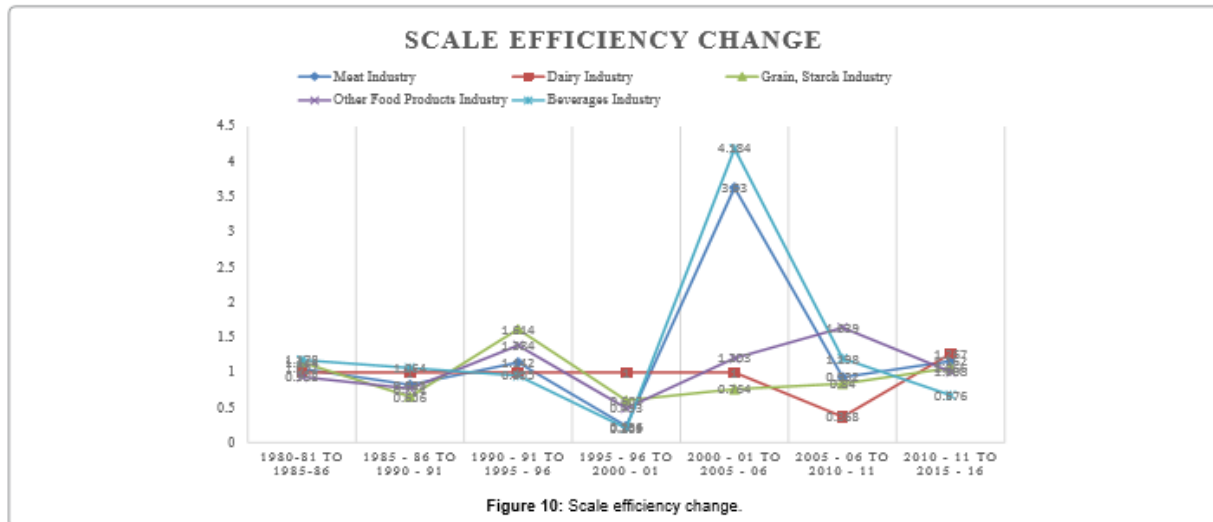
The poultry, grain and starch industries developed rapidly from 1980 to 1981 and continued development in the rest of the agro-processing industries. (Figure 9).

Between 1995-96 and 2005-06, the move to scale efficiency shows fast growth for the industry of meat and other agricultural products. (Figure 10).

Figure 5: Beverage industry.

Figure 6: Food processing industries.

Figure 7: Technical efficiency.

Figure 8: Technological change.

Figure 9: Pure technical efficiency change.

Figure 10: Scale efficiency change.

Figure 11: Total factor productivity change.
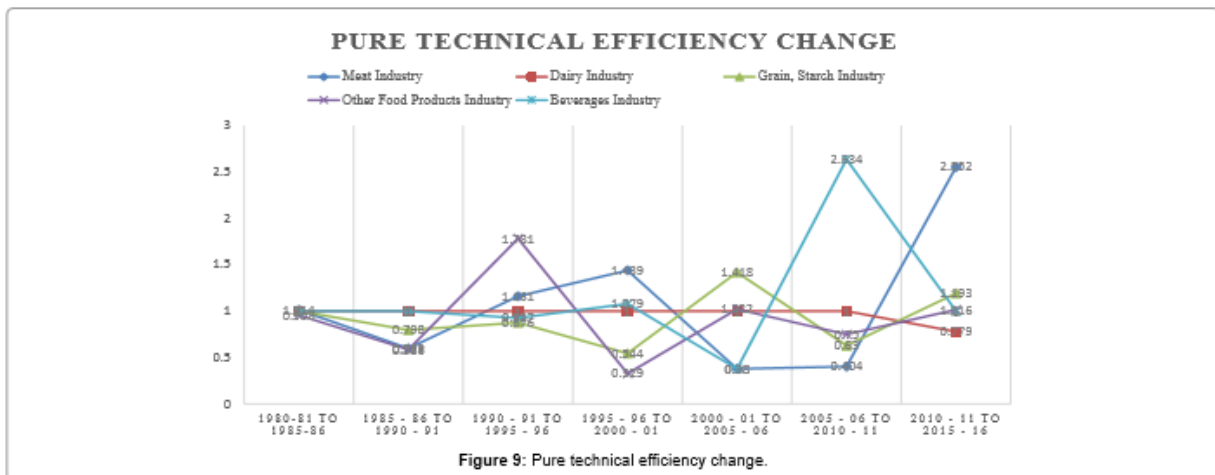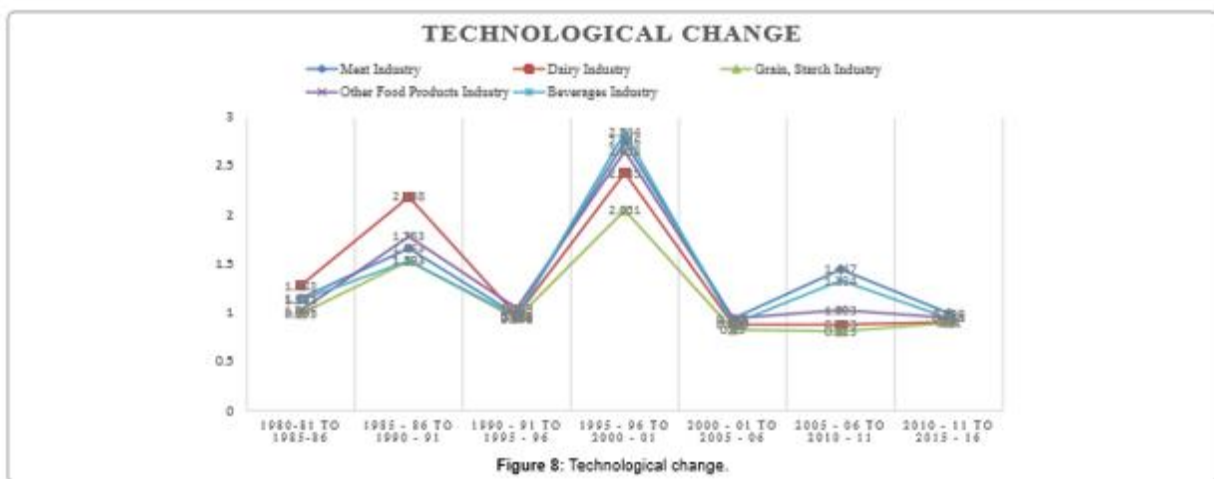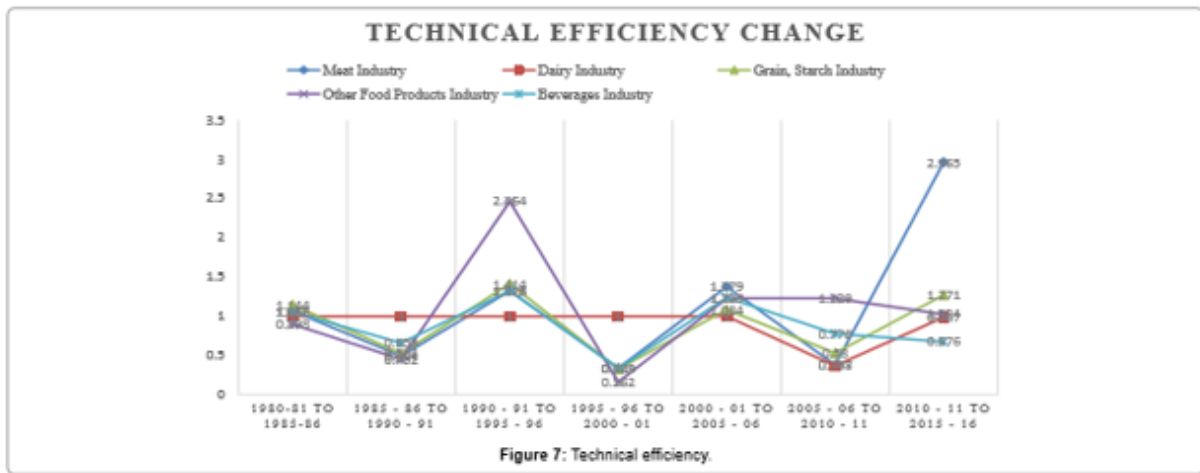
The shift in the total productivity factor in other agricultural products industries is rapidly increasing between 2001 and 2010 and 11, with a sharp growth in the meat and grain industry between 2010/11 and 2015/16. (Figure 11).

15. Conclusion

Given the diversity and extent of agribusiness issues, the prospects of the Punjab industry must be addressed. Challenges should not be ignored until they are defined, a decision is taken, and an effective marketing strategy implemented. In developing a product strategy and the context of customer relations, brand image, and engagement, the quality of the product was ranked first. At the bottom of the ladder was the low price. The high-priority sales point, quality, is a priority of national players with large areas such as Verka, MilkFood, Milk Specialties and Hygienic. The relationship with the customer has become the most critical aspect for local or small players. The low-price tag gave the national players the minimum weight

References

https://pbindustries.gov.in/static/manufacture_industry;Key=Food_Processing_Industries

1. Puneet Pal Singh Gill (2013), "Agro processing key to Punjab rural revival: Expert' business standard updated date February 14, 2013 Retrieved date 12/03/2021. https://www.business-standard.com/article/economy-policy/agro-processing-key-to-punjab-rural-revival-expert-106041801111_1.html.

2. Singh, H., & Bansal, M. (2013). major Problems and Prospects of food Processing Industry in Punjab. International Journal of Management Excellence, 1(0), 1.

3. Shah SL, Aggrawal SC (1970) Impact of new technology on the level of income, pattern of income, distribution and savings of farmers in central Uttar Pradesh. Indian Journal of Agricultural Economics 25:

4. Rangi PS, Sidhu MS (2000) Problems and Prospects of Agriculture in Punjab in Bawa RS, Raikhy PS editors. Punjab Economy: Emerging Issues, Guru Nanak Dev University, Amritsar.

5. Shergill HS (1998) Rural credit and indebtedness in Punjab. Institute for Development and Communication, Chandigarh.

6. Tewari SC (1969) Agriculture Indebtedness in hilly farmers of UP: Indian Journal of Economics 49: 447-452.

7. Ali J, Singh SP and Safdar M (2006) High-Value Agriculture and Structural Changes in Indian Meat Industry: Implications for Agribusiness and Small Farmers. Presented at the Annual Conference of Food Distribution Research Society, Quebec.

8. Murthy KS, Himachalam D (2011) Problems of fruit processing industry in Andhra Pradesh – A case study of select units in Chittoor district. International Journal of Research in Commerce & Management 2: 46-52.

9. Johl SS, Mohinder SM (1974) The Dynamics of Institutional Change and rural development in Punjab, New York.

10. Johl SS (2002) Agriculture production pattern adjustment programme in Punjab for productivity and growth, Government of Punjab. Chandigarh.

11. . 9. Gill, Sucha S (2004) Contract farming hurts farmers: area under wheat, paddy increases. The Tribune, Chandigarh.

12. Tubene, Stephan (2000) Efficiency and Productivity Measures across Countries: A Nonparametric Approach. National Association of African American Studies, Texas.

13. Arya, S. S. (1992), "Convenience Foods - Emerging Scenario," India Food Industry, 11(4): 31-40.

14. Hollingsworth, J. R. (2000). Doing institutional analysis: implications for the study of innovations. Review of international political economy, 7(4), 595-644.

15. Neff, J. M. (2002). Bioaccumulation in marine organisms: effect of contaminants from oil well produced water. Elsevier.

16. Luepker, R. V., Perry, C. L., McKinlay, S. M., Nader, P. R., Parcel, G. S., Stone, E. J., ... & Verter, J. (1996). Outcomes of a field trial to improve children's dietary patterns and physical activity: the Child and Adolescent Trial for Cardiovascular Health (CATCH). Jama, 275(10), 768-776.

17. Srivastava, U. K., & Patel, N. T. (1994). Managing food processing industries in India.(Indepth case studies of manufacturer exporters and analysis). Managing food processing industries in India.(Indepth case studies of manufacturer exporters and analysis).

18. Hathcock, J. N., Hattan, D. G., Jenkins, M. Y., McDonald, J. T., Sundaresan, P. R., & Wilkening, V. L. (1990). Evaluation of vitamin A toxicity. The American journal of clinical nutrition, 52(2), 183-202

19. Books:

20. Asokan, S. R., & Singh, G. (2003). Role and constraints of contract farming in agro-processing industry. Indian Journal of Agricultural Economics, 58(3), 566-576.

21. Dhesi, A. S., & Singh, G. (Eds.). (2020). Rural development in Punjab: A success story going astray. Taylor & Francis.

22. Gill, M. S. (Ed.). (2003). Punjab society: perspectives and challenges. Concept Publishing Company.

23. Marwaha, S. S., & Arora, J. K. (Eds.). (2003). Biotechnological Strategies in Agroprocessing. Asiatech Publishers.
24. Singh, R. V. (2015). Book Review: Socio-Economic Profile of Rural India, Series II, Volume Five: North and Central India, Edited by Raj Mohini Sethi, Concept Publishing Company Pvt. Ltd., New Delhi, 2011. Indian Journal of Agricultural Economics, 70(902-2016-68373), 210-213.
25. Singh, M., & Kaur, H. (2005). Punjab today. Deep and Deep Publications.
26. Singh, S. (2013). Book Review: Modern Food Value Chains in India: Emerging Potential for the Poor.
27. Sharma, H. K., & Panesar, P. S. (Eds.). (2018). Technologies in Food Processing. CRC Press.
28. Sharma, A. (1998). Dynamics of cropping pattern (a regional study of Punjab. Northern Book Centre.
29. Pal, D. (2012). Book Review: Agricultural Value Chain Finance: Tools and Lessons