STUDY OF MARKET STRUCTURE, CONDUCT AND PERFORMANCE OF VEGETABLE SEED BUSINESS IN KARNATAKA

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BY

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CERTIFICATE

This is to certify that the thesis entitled "STUDY OF MARKET STRUCTURE, CONDUCT AND PERFORMANCE OF VEGETABLE SEED BUSINESS IN KARNATAKA" submitted by Mr. STEPHAN RAJ SWAMIDAS for the degree of DOCTOR OF PHILOSOPHY in AGRIBUSINESS MANAGEMENT of College of Agriculture, University of Agricultural Sciences, Dharwad is a record of bonafide research work done by him during the period of his study in this University under my guidance and supervision and the thesis has not previously formed the basis for the award of any other degree, diploma, associateship, fellowship or other similar titles.

DHARWAD,
SEPTEMBER, 2016

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…….. Gratitude is the memory of heart!

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DHARWAD

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LIST OF ABERRATIONS

1.	AICRP	: All India Co-ordinated Research Project
2.	CAGR	: Compound Annual Growth Rate
3.	CGR	: Compound Growth Rates
4.	GDDP	: Gross District Domestic Product
5.	GDP	: Gross Domestic Product
6.	GSDP	: Gross State Domestic Product
7.	ICAR	: Indian Council of Agricultural Research institution
8.	NSC	: National Seeds Corporation
9.	OPVs	: Open Pollinated Verities
10.	PD	: Product Development Personnel
11.	SFCI	: State Farm Corporation of India
12.	SSCs	: State Seeds Corporations
13.	HHI	: Herfindahal-Hirschman Index
14.	SI	: Standardized index
15.	RBQ	: Rank Based Quotient
16.	WHO	: World Health Organization
17.	FAO	: Food and Agriculture Organization
18.	NAFTA	: North American Free Trade Agreement
19.	EMEA	: Europe, Middle-East and Africa

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1. INTRODUCTION

Seed is the most important input component of productive agriculture. In the significant advances that India made in agriculture in the last four decades, the role of the seed sector has been substantial. The expansion of seed industry has occurred in parallel with growth in agricultural productivity. Given the fact that sustained growth to cope with increasing demand would depend more and more on the pace of development and adoption of innovative technologies, the seed would continue to be a vital component for decades to come. The organized seed industry of the country has been just forty years old. Yet, its growth has been phenomenal. India is one of the few countries where the seed sector is already reasonably advanced. The private seed industry is no more confined to just production and marketing of seed. It has as well acquired technological strength to cater to the varietal needs of tomorrow.

Seed is a key component among all inputs for sustainable crop production. It is estimated that quality of seed accounts for 20-25 per cent of productivity. The importance of quality seed has been realized by mankind long ago. The need for a good viable seed for prosperity of the human race is mentioned in Rigveda of ancient India. Saving of some portion of the produce as seed for the next cropping season or year in various structures is a very common and age old practice of Indian farming community. Albeit there have been few private seed industries dealing with production of vegetable seeds, the growing of crops, especially for seeds in an organized fashion to maintain quality in terms of genetic and physical purity is realized for the first time during green revolution period with the establishment of the National Seeds Corporation (NSC) in 1963. It is setup by aiming at promoting healthy development of the seed industry in India. The principle responsibilities of NSC are to establish an adequate system of quality control inspection for scientific processing, storage and marketing of seeds. It also undertakes the responsibility of multiplication of seeds of pre released varieties and production of foundation seeds of varieties. Few milestone events in seed policy by Govt. of India are described below.

The Indian seed industry has been growing in quantity and value over the past forty years. Both public and private sector corporations/companies are actively involved in quality seed production. The public sector component comprises of National Seeds Corporation (NSC), State Farm Corporation of India (SFCI) and 15 State Seeds Corporations (SSCs), Indian Council of Agricultural Research (ICAR) institutions and State Agricultural Universities. ICAR launched an All India Coordinated Research Project (AICRP) on seed production called National Seed Project in 1979 with 14 centres in different Agricultural Universities. AICRP on production of breeder seed in vegetable crops was started under National Seed Project in 1994. Twenty two State Seed Certification Agencies and 104 State Seed Testing Laboratories are involved in quality control and certification. The private sector comprises of around 150 seed companies of national and foreign origin, but only few companies are working exclusively on vegetable hybrids.

The Indian public sector seed industry used to dominate the private sector in the very beginning. The type of seeds dominating the market in terms of quantity and value has been open-pollinated varieties followed by public hybrids and private hybrids. The situation is quite reverse currently. Seeds of the private hybrids are forming a significant portion of the total vegetable seed

market. The availability of vegetable seeds with NSC as on 30.09.2013 was 133.43 tones of which 131.68 tones of varietal seeds and only 1.75 tons of hybrid seeds. Due to the advent of private seed companies with the liberalization of seed trade in 1988, the public sector seed corporations/companies have started declining and becoming inept. Now a day the public sector is mostly confined to certified seeds of high volume, low value segment of high yielding varieties of cereals, pulses and cotton with a limited presence in the high value hybrid seeds of cotton and cereals.

In vegetables, most of the public sector varieties and hybrids are replaced by private sector varieties and hybrids, seed production of which is solely done by the particular manufacturers. Corporate seed firms are mainly concentrating on vegetables like tomato, cabbage, brinjal, chilli, okra and cucurbits where the seed production of open pollinated varieties (OPVs) and hybrids are comparatively easy and more profitable. The doable explanation for moribund of the public sector can be its incapability to generate huge funds for research and development (R&D) when compared to private seed companies and lack of proper advertisement and market for public sector bred varieties and hybrids. Private seed corporations are spending 10-12 per cent of their turnover in R&D. Medium sized seed companies' annual investment in R&D is growing by 20 per cent annually.

The Indian seed industry is the fifth largest seed market in the world, accounting for 4.4 per cent of the global seed market after the U.S. (27 %), China (20 %), France (8 %) and Brazil (6 %) and other different countries contributes 39 per cent. In terms of global trade, India is almost self-sufficient in flower, fruits and vegetables and field crop seeds. India has also taken up the production of a number of exotic vegetables which are used in multi cuisines and for domestic as well as export markets. The Indian seed market has grown at 12 per cent rate where the growth rate of the global seed market is 5 per cent, while the Indian vegetable seed market is growing at a rate of 10-15 per cent per year. India with a domestic seed market size of about Rs 15,000 crore has a huge potential to become a global supplier of hybrid seeds, especially vegetables, field crops and flowers (Koundinya and Kumar, 2014).

Vegetable production has grown in leaps and bounds due to technological advancement in production by way of breeding hybrids with unique characteristics. Increasing awareness among people regarding the importance of vegetables in a healthy diet increase in population has been responsible for the augmentation of vegetable production in the country over the years. This increase in vegetable production has been possible due to new methods of raising seedlings and cultivation of vegetables. The government thrust to horticulture sector is also partially responsible for an impressive growth in vegetable production. A large number of companies have forayed into seed business and the volume of seed sale has increased.

Horticulture crops cover large varieties of fruits, vegetables, flowers and plantation or spice crops. Among these, vegetable farming is the major attraction for the farmers since it is comparatively more remunerative than field crops. The wider adaptability of vegetables to different kinds of a biotic stresses like water, soil, weather, *etc.* offers enormous scope for growing these vegetables in stress prone areas of dry land, desert, high altitudes, high rainfall and saline waste land areas. They are playing an important role in commerce and economy, particularly through processing and export trade.

Vegetables are grown in almost all the states in the country under varied-agro climatic and soil conditions in plains as well as hilly regions. At present, India produces about 70 different varieties of leafy, fruity and starchy tuber varieties of vegetables. The major vegetables grown in India are onion, potato, tomato, cucurbits, cole crops and leafy vegetables. India is the world's largest producer of cauliflower, second largest producer of onions and among the first 10 producers of cabbage, green peas, potatoes and tomatoes (Deepthi, 2013).

Karnataka occupies a prominent place in the Horticulture map of the country. Vegetable crops occupy an area of 445.6 ('000ha) with a production 8250.3 ('000 MT). The total income generated from the horticulture sector accounts for over 40 per cent of the total income derived from the combined agriculture sector (Horticultural Crop Statistics of Karnataka at a Glance, 2013-14).

The major vegetables grown in the state are tomato, cabbage, chilli, capsicum, beans, cauliflower, brinjal, carrot, radish, pumpkin, ridge guard *etc.* To satisfy the continuous demand for vegetable seeds by the farmers, several seed companies in the corporate sector are supplying seeds in the state. Some of the important companies which supply seeds for this region include Rasi seeds Pvt Ltd, Syngenta Pvt Ltd, Mahyco seeds Pvt. Ltd., Seminis seeds Pvt. Ltd, East-West seeds Pvt. Ltd., Clause seeds Pvt Ltd, Sungro seeds, Tanindo seeds Pvt. Ltd, Indo America Hybrid seeds and Bejo sheethal Pvt. Ltd. These seed companies supply seeds first to the distributors, who in turn employ the dealers through whom seeds reach the ultimate users *i.e.*, the farmers. These dealers operate at the taluka level and who are in direct contact with farmers. Their attitudes largely determine the type and quality of services rendered to farmers, like technical information, credit facilities, timely supply of seeds and discretionary sale at lower prices keeping their profit margin low. Dealers' attitude however could in turn depend on the concentration of their business in seed market. Thus, an attempt to analyze the distribution network of seed market in important vegetable growing districts like Havri, Belagavi, Hassan and Kolar would be valuable for understanding perception and preferences of different participants in seed market. Also, efforts to examine the sales promotion measures undertaken by the seed companies would throw light on the impact of such promotional measures on seed uptake by farmers. This kind of study will help vegetable seeds companies to know the market concentration, farmer's preferences in different districts on different vegetables so that they can go for production of similar seeds. Study of market conduct and performance will help companies to know the strength and weakness among the close competitors.

1.1 Market structure, conduct and performance paradigm

Structure, Conduct and Performance paradigm (SCP) is used as an analytical framework, to make relations amongst market structure, market conduct and market performance. It was developed in 1959 by *Joe S. Bain Jr.*, who described it in his book "Industrial Organization". The SCP paradigm is considered as a pillar of industrial organization theory, and it has been since its conception a starting point when analysing markets and industries, not only in Economics, but also in the fields of business management and controlling. For instance, the mainline of Michael E. Porter's works on competition are based on premises derived from this paradigm.

Following its reasoning, an industry performance (which could be considered as the potential benefits to consumers and society as a whole) are determined by the conduct of the firms within the boundaries of the industry, which in turn depend on the structure of the market.

1.1.1 Elements of the Paradigm

1.1.1.1 Structure: Those set of variables that are relatively stable over time and affect the behaviour of sellers and/or buyers. The way in which markets fail to follow perfect competition conditions, depends basically in the degree of supply concentration, demand concentration, product differentiation and market entrance barriers. Also, the structure of the market will always be determined by the nature of the product and the technology available.

1.1.1.2 Conduct: It shows the advertising levels to reach the farmers, dealers, nurserymen and distributors in the root level.

1.1.1.3 Performance: It is measured by comparing the results of firms along the industry in efficiency terms, and different ratios are used to assess different performance levels. The variables considered at this level are quantity, product quality, resource allocation, *etc.*

The dynamic behavior of buyers and sellers has an effect on the markets, making it harder to predict and establish fixed market structures. Difficulties arise when trying to explain the paradigm and this is due to data shortage, and the multiple definitions and extension of markets. Actually, the main problem when using this methodology to analyse a market or an industry is the difficulty of defining the limits or boundaries of a given industry.

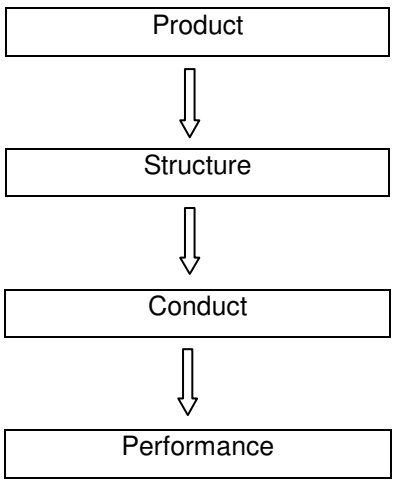

Fig. 1.1 Elements of the Paradigm

As implications of all this, the study recognizes market power as being monopoly and establishes a strong relation between companies with the distributors, dealers, nurserymen and the effects on farmer's seed buying behavior. The specific objectives of the study are:

1.2 Objectives

1. To study the growth in area, production and productivity of vegetables and estimate the vegetable seed requirement.
2. To study the structure of vegetable seed market in Karnataka.
3. To study the conduct and performance of the vegetable seed market in Karnataka.
4. To examine the factors influencing farmers purchasing behavior with respect to vegetable seeds.
5. To elicit the problems in vegetable seed marketing as perceived by distributor, dealers and nurseries.

1.3 Hypothesis

1. Area, production and productivity of vegetables are having positive growth.
2. Vegetable seeds market in Karnataka is not concentrated .
3. Different types of promotional activities have been conducted by different seed companies and performing differently.
4. Price and quality of the product are the only two factors which influence the purchasing behaviors.
5. Vegetable seeds market has more number of market intermediaries which creates competition and which leads to less margin to dealers/nurserymen

1.4 Limitations of the study

1. Time and cost factors limited extensive sampling for research.
2. The dealers are pre-occupied with business and could spare very little time for a survey and hence there is a possibility of bias although sufficient care was taken to minimize such errors.

2. REVIEW OF LITERATURE

This chapter deals with a brief review of the research work done in the past and are presented under the following headings based on the objectives of the study.

2.1 Area, production and productivity of vegetables and seed requirement

2.2 Market structure of vegetable seeds

2.3 Market conduct and performance of the vegetable seeds

2.4 Factors influencing farmers purchasing behavior of vegetable seeds

2.5 Constraints in vegetable seed market

2.1 Area, production and productivity of vegetables and seed demand estimation

Singh *et al.* (1984) attempted to estimate demand for nitrogenous fertilizers in India. They used the programming technique in their analysis. They parameterized the price elasticities for inputs. The results indicated two important implications: (1) Change in fertilizer price policy would have different impact on demand pattern and (2) Evidence of responsiveness of fertilizer to modern technology of crop production. Hence, there was a great scope to exploit the full potential of HYV's by applying right doses of fertilizers. They opined that there was an urgent need to increase the production of nitrogenous fertilizers to meet the increasing demand.

Quasem (1986) examined the availability of two major inputs, fertilizers and pesticides in Bangladesh. It was found that wholesaler operated only in less than 40 per cent of markets surveyed. Retailers however, were present in all markets. Pesticides dealers operated only in 40 per cent of market surveyed. The study concluded that 40 per cent shortage of pesticides and the prices of some of the pesticides were high.

Uma *et al.* (1990) used adjustment model, a version of dynamic model to study the fertilizer demand in India. This approach captured some of the dynamic elements in fertilizer demand better than simple static models without merely resorting to time trends. The results indicated that an increase in fertilizer demand to raise productivity of land would require a fall in relative price. Though the farmers stand to gain directly from the provision of subsidies, the economy as a whole suffers in the long run. Hence, they suggested that education was to be imparted to farmers on balanced use of fertilizers and use of micronutrients wherever necessary.

Dholakia and Jagdip (1995) estimated price elasticity of fertilizer demand at macro level in India using both static and dynamic models with annual data for 1966-67 to 1991-92. The results indicated that fertilizer demand was price inelastic in both the short and long runs.

Singhal (1997) reported that the trend line of spending on agro chemical business expected to increase an exponential growth. The compound average growth has around 15 per cent since 1988. This trend was likely to continue for some year. The pesticide market in India was essentially driven by more than adequate indigenous manufacturing capacity.

Bal and Bal (1999) studied fertilizer demand for wheat crop in Punjab. The study revealed that if the farmers were motivated to use the optimum dose of fertilizer, the demand for N would be 3,499.82 thousand quintals as against the estimated consumption of 1,882.82 thousand quintals for wheat crop during 1971-72. The consumption of P for this crop was 528.31 thousand quintals against the optimum demand of 1,454.23 thousand quintals dusring the same period.

Parker (1999) estimated that the world market for agro - chemicals at end-user level was worth around US $ 45 billion and growing at 1 to 2 per cent per year, more slowly than during the previous two decades. Agro-chemicals still took lion's share of total crop protection market although diseases and insect resistant, herbicide – tolerant seed varieties and biological pesticides were gradually increasing their shares.

Sharma and Sharma (1999) estimated that production of pesticides in India increased from 56,090 tones during treiennum ending 1983-84 to 90,229 metric tones in triannium ending 1995-1996.The production of herbicides registered the highest compound growth rate (15.97 %) followed fungicides (5.55 %) and lowest in case of insecticides (3.77 %) during the period (1981-95). Cotton alone accounted for about 40 per cent of total consumption of pesticides followed by rice (18.6 %) and vegetables (7.3 %).

Wagle (1999) estimated fertilizer demand and private investment function in India using time series data from 1962-63 to 1988-89. He observed that exclusion of the water variable represented a serious deficiency in the specification of the fertilizer demand function. The chow test for structural stability turned out to be significant at 5 per cent level of confidence in respect of the static model. But it was not so in the dynamic model.

Kayarkanni (2000) estimated the fertilizer demand function for Tamil Nadu state. The analysis was based on the time series data 1967-68 to 1992-93. The results of the static model indicated that the relative price and land intensity were negatively related with fertilizer demand while per cent area under HYV, per cent area in irrigated and weather had a positive relationship with fertilizer demand. The study indicated that 12 per cent increase in area under HYV would lead to increase in fertilizer demand by 1.13 per cent, R 2 F value indicated that explanatory variables accounted over 96 per cent variation in fertilizer use in dynamic model. The short-run price elasticity for fertilizer demand was -0.3527 and adjustment co-efficient was 0.0891. The short-run fertilizer demand would decrease by 3.52 per cent in response to 10 per cent increase in relative price as per the model.

Chauhan *et al*. (2002) studied demand and supply of quality seeds in Haryana with respect to cotton. The demand projections were made by multiplying the seed rate with projected acreage and seed multiplication rate inflated at 5 per cent every year. The study revealed that the demand for cotton seed increased from 18,684 quintals in 1996-97 to 23,517 quintals in the year 2005-06, showing an increase of 25.87 per cent. The study also revealed that factors like non-availability of desired variety, higher price of the quality seed and fear of adulteration were the most hindering ones which negatively influenced the acceptance of quality seed in cotton.

Radha and Chowdry (2002) studied present status and policy perspectives of seed industry in Andhra Pradesh. There was a wide gap ranging from 80 to 90 per cent between the production and demand of certified seed of different crops in the state. Out of the total quantity of 27.49 lakh quintals of seed produced in the state, a quantity of 12.69 lakh quintals were exported, indicating the wider scope for expansion of area under seed production in the state.

Srilatha *et al.* (2003) studied seed production in India with special reference to Andhra Pradesh. The three major crops maize, sunflower and cotton selected for the study. The study estimated seed production gaps for maize, sunflower and cotton. In case of maize certified production and requirement gap in 2000-01 was -55.68 thousand quintals (Actual production was 23.48 thousand quintals and requirement was 79.16 thousand quintals). In case of sunflower; the gap was -17.14 thousand quintals (Actual production was 2.59 thousand quintals and requirement was 19.73 thousand quintals). In case of cotton gap was -35.45 thousand quintals (Actual production was 15.63 thousand quintals and requirement was 51.08 thousand quintals).

Anonymous (2006) reported in 2005 that according to an estimate there was a demand for 150 quintals of DCH-32 cotton seed in Dharwad district. But Official Agriculture Department reported that 35 quintals were available. Hence a gap of 115 quintals of DCH-32 cotton seeds was noticed. Further, there was a shortage of seeds for some varieties of groundnut (JL-24), paddy (intan) and cotton (DCH-32, DHB-105 and DHH-11). It was reported that in Dharwad district likely shortage of 10,000 quintals of seeds. For the kharif season, there was heavy demand for green gram seed in Dharwad and Gadag districts, where there was likely to a shortage of 1,000 quintals and also in case of groundnut seeds.

Dudhat and Khunt (2006) reported that according to a projected demand for quality seeds of major crops of Gujarat state, requirement of quality seed of wheat, paddy, maize, bajra, sorghum and castor was expected to increase to 48,727.91, 20,756.78, 48,773.28, 4,068.51, 1,837.72 and 2,491.78 tonnes, respectively by 2014-15 on account of increase in crops acreage.

Suma (2007) in her study on demand for chemical fertilizers in Karnataka, examined the factors influencing the demand for fertilizer using multiple linear regression model. The multiple linear regression models gave a good fit to the sample data of Hassan taluka and the equation explained 80 per cent variation in the demand for fertilizer due to variation in the seven independent variables. The F ratio was significant which indicated good fit of the function. The regression coefficients of total land holding (127.73) and proportion of area under potato (1.84) were significant at one per cent level. The regression coefficients of proportion of area under irrigation (1.12), proportion of area under paddy (4.21), proportion of area under maize (1.55) and quality of FYM applied (7.40) were positively significant at five per cent probability level. The regression coefficient of fertilizer price/unit (-3.51) was negative but non-significant.

Timmanna (2007) conducted a study on marketing of cotton seeds – a market strategy analysis and projected gap between demand and supply of cotton seeds in Karnataka for the years 2007 to 2011. The projected demand for DCH-32 was expected to be decrease from 1,525.95 quintals in 2007-08 to 1,270.39 quintals in 2011-12. The projected supply is also expected to be

decrease from 1,108.41 quintals during 2007-08 to 621.58 quintals by 2011-12.The projected demand for NHH-44 was expected to be decrease from 220.46 quintals in 2007-08 to 136.56 quintals in 2011-12. Similarly the projected supply was also expected to decrease from 134.53 quintals in 2007 to 81.58 quintals in 2011. For Varalaxmi, cotton seed the projected demand is expected to decreases from 39.73 quintals in 2007 to 18.02 quintals in 2011. Similar to the projected demand, projected supply was also expected to be decrease from 43.87 quintals in 2007 to 19.89 quintals in 2011. For other hybrid cotton seeds in the state, the projected demand was expected to decrease from 2,696.75 quintals in 2007 to 1,768.64 quintals in 2011. The similar results were expected for supply also that it was expected to be decrease from 1,220.06 quintals in 2007-08 to 736.91 quintals in 2011. For LRA-5166 cotton variety the projected demand was expected to increase from 1,394.76 quintals in 2007 to 2,336.15 quintals in 2011. In case of supply of cotton seeds also it was expected to decrease from 730.28 quintals in 2007-08 to 627.33 quintals in 2011.

Reddy and Samaya (2012) studied the growth in area, production, productivity and export of India coffee for the period of 1990-91 to 2009-10. The study revealed that the growth in area and production were growing at 2.92 and 2.81 per cent per annum respectively. The quantity exported from India was at compound annual growth rate of 3.80 per annum whereas the total value of export was grown at the rate of 8.41 per cent per annum.

Umadevi (2013) conducted a study on production and marketing management of organic inputs in Dharwad district and analysed the demand for the different organic inputs in Dharwad district. The demand for farm yard manure was 835 tons during the year 2011. It is expected that the demand for the farm yard manure in the district would be around 861, 888 and 915 tons during the years 2012, 2013 and 2014 respectively. Vermi compost was demanded to the tune 985 tons during the year 2011. It is expected that the demand for vermi compost in the district would be about 1,004, 1,023 and 1,042 tons by the year 2012, 2013 and 2014 respectively. The demand for organic imputes that is sheep manure, goat manure, poultry manure and oil cake manure was of the order of 600, 882, 500 and 800 metric tons respectively during the year 2000. The forecast analysis of the demand of these organic inputs suggests that the demand would be around 795, 1,014, 607 and 911 metric tons respectively during the year 2014. The demand for Jeevamrutha was 728 litres during the year 2011; the expected demand is to be 735, 743 and 750 litres in the years 2012, 2013 and 2014 respectively. While the demand for Beejamruta was 928 litres by 2011, the expected demand is to be 936, 945 and 953 litres in the years 2012, 2013 and 2014 respectively.

Mangala (2014) conducted a study on estimation of demand for partial mechanization in agricultural operations in North Karnataka. It was observed that huge demand for power tillers, plant setters, weeding machines, sprayers and harvesters existed in Belgaum district with respect to sugarcane cultivation. Demand for power tillers, weeding machines and sprayers existed in Haveri district with respect to cotton cultivation and demand for paddy transplanters, weeding machines and harvesters existed in Raichur district with respect to paddy cultivation. The results thus confirming the existence of gap in use of machineries and huge scope for investment in agriculture implement sector.

2.2 Market structure of vegetable seeds

Mundinamani and Mahajanshetti (2001) attempted to assess the impact of market intervention operation by Karnataka Cooperative Oilseeds Consumer's Federation (KOF) on market structure and pricing of groundnut. For the purpose seven regulated markets in Karnataka were covered in the KOF's project area during 1994-95. Bain's market classification criterion was used to identify market structure. Market power concentration was analyzed with Lorenz coefficient of inequality. Seasonal indices were also computed. The analyses revealed high concentration of trade in one of the markets studied, moderate concentration in three markets, and low concentration in two markets. One market turned out to be atomistically competitive. Thus, the role of the KOF in reducing market concentration has been limited. The results of the study highlighted the importance of KOF's existence and its market intervention operation in the state. Efforts are needed to strengthen the working capital base of the KOF to enable them to work in more efficient manner.

Huballi (2002) analyzed the market structure for wholesale market of tamarind in Bellary, Gulbarga and Raichur markets of Karnataka. Lorenz curve and Gini coefficient were used to analyze the market power concentration among the different traders in selected markets. The computed value of Gini coefficient for tamarind was found to be 0.32, 0.30 and 0.34 in Bellary, Gulbarga and Raichur markets respectively in 2000-2001. This showed that there was a greater degree of competitiveness in these markets.

Ananda (2003) studied the structure, conduct and performance of Bangalore silk exchange and found that, with the Gini-coefficient ratio of 0.44 in the case of price and o.44 in quality handled, Bangalore silk exchange was relatively competitive. However, there was relatively more competition in quality handled than the prices.

Kiran (2003) analyzed market concentration for coconut market in Arsikere and Tiptur markets of Hassan district, Karnataka. The Gini coefficient for commission agents and traders in Arsikere market was found to be 0.05 and 0.16, indicating there was greater degree of competitiveness of commission agent and traders. The Gini coefficient for both commission agents and traders was 0.01 in Tiptur market, indicating greater competitiveness.

Meena *et al.* (2006) studied the impact of dairy cooperatives on the rural household economy in Alwar District of Rajasthan. The study covered 75 members milk producers and 75 non-member milk producers from six milk procurement societies existing in the selected villages which were post-stratified into small, medium and large herd size categories. This clearly indicated that income of the member group was more equitably distributed as compared to non-member group. In order to quantify the difference between member and non-member group, the Gini-concentration ratio was computed. The Gini-concentration ratio for member group was observed to be lower (0.4841) as compared to the non-member group (0.7532), indicating the income from dairying to be more equitably distributed in member group which could be attributed to the member of dairy cooperative societies being motivated to produce more milk with the facilities extended to them together with realising remunerative price of milk.

Honnanasi (2007) studied bio-pesticide marketing in north Karnataka. Lorenz curve technique was used to analyse the concentration of bio-pesticide dealers in Belgaum district. The values of Lorenz curve for Belgaum taluk (0.339), Bailahongal taluk (0.335) and Hukkeri taluk (0.36) indicated the existence of competition among the bio-pesticide dealers in Belgaum district.

Timmanna (2007) studied market structure in marketing of cotton seeds in Karnataka. The extent of market concentration was computed with the help of Gini ratio analysis. Gini coefficient was observed to be 0.95, which indicated that less was the inequality in marketing of BT cotton seeds in the study area. This means that the BT cotton trade was well distributed among various dealers or evenly distributed among different agencies in BT cotton seed trade. In the case of non-BT cotton, the coefficient was observed to be 0.947 which was quite similar indicating less inequality and thus even distribution of cotton trade between different agencies involved in cotton trade.

Kanyenga and Mangisoni (2008) assessed market concentration in the tobacco industry of Malwai. Firm level data on annual sales (1996-2006) were collected to compute comparable measures of market concentration to determine the size distribution of buying firms and measure the level of firm concentration in the tobacco industry. The industrial concentration ratios used in measuring market concentration showed high concentration and high inequality in market share distribution among firms. The 4- firm concentration ratio (98 %), Herfindahl – Hirschman Index (3,119) and Gini coefficient (0.57) were all above the cut-off levels. To enhance competition in the tobacco industry, the competition policy needed to be restructured to attract other potential buyers to enter the market. In medium term the tobacco control commission should devise ways of prohibiting mergers that facilitate or strengthen high market concentration.

Reuben and Mshelia (2008) conducted the structural analysis of yam markets in southern part of Taraba state of Nigeria. They specifically identified the degree of product differentiation, market information dissemination and determined the concentration of yam sellers in the markets. A total of 205 respondents compromising of 95 retailers and 110 wholesalers were randomly selected in 2007/2008 cropping season. Gini coefficient and Lorenz curve were the analytical tools used. The Gini coefficient of 0.56 and 0.52 were obtained for wholesaling and retailing respectively. The markets therefore exhibit features of imperfect markets of monopolistic competition. To reduce high concentration and income inequality among the sellers especially in wholesale business, funds, security and physical market facilities should be provided to yam markets in the area.

Gould (2010) conducted a study on consolidation and concentration in the U.S. dairy industry, using the HHI formula and he examined the distribution of only milk marketed by cooperatives, in contrast to the concentration ratio values which were evaluated with respect to all farm milk produced in the United States. The HHI value is much less than 1,000 but shows a similar trend of becoming increasingly concentrated. In 1995, the top 100 processors generated an HHI index of 238. This increased to 382 by 2008, well below the critical level of 1,000. The U.S. Department of Justice (DOJ) uses the HHI in guidelines for evaluating mergers. An HHI of less than 1,000 represents a relatively unconcentrated industry/market.

Boland (2010) conducted a study on increasing coordination in the plant and plant product processing and handling sector using the Herfindahl-Hirschman Index (HHI) in U.S. The HHI takes into account the relative size and distribution of the firms in a market and approaches zero when a market consists of a large number of firms of relatively equal size. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases. The U.S. Department of Justice defines an industry as being moderately concentrated with an HHI between 1,000 and 1,800 and horizontal mergers above an HHI of 1,800 must be reviewed.

Singh (2012) conducted a study on economic reforms and industrial concentration in Indian manufacturing sector - an inter-temporal analysis, using Annual Survey of Industries (ASI) data over the period 1979-80 to 2006-07. The concentration levels have been worked out using Lorenz curve based Gini coefficients and Herschman-Herfindal index of concentration for each year. The analysis used six alternative variables namely, i) No of factories; ii) Fixed capital; iii) Total persons engaged; iv) Fuel consumed; v) Material consumed; and vi) Gross output, for computing concentration levels among different states. The analysis had been performed using aforementioned two indices.

Deepthi (2013) studied the market concentration of tomato, cabbage and pepper based on farmers' purchasing behaviour of tomato seeds from different vegetable seed companies in Hassan district of Karnataka. As around 16.66 per cent of the farmers opined that they purchase vegetable seeds from Syngenta seed company for tomato seeds. Mahyco seeds, Sungro seeds and Indo-American hybrid seeds were purchased by 13.33 per cent of farmers each for tomato seed purchase. The other companies were Namadari and Nunhemphs with a market share of 10 per cent each. Harfindal Index was 1,155.51, which indicted that no market concentration in tomato seed market. In the case of cabbage around 20 per cent of the farmers opined that they purchase vegetable seeds from Mahyco seeds company for cabbage seeds. Sungro seeds and Syngenta hybrid seeds were purchased by 15.33 per cent of farmers. Mahyco seeds topped with 20 per cent market share followed by Sungro seeds (16.66 %) and Syngenta (13.33 %), Indo-American (10 %) and Namadari (10 %). Harfindal Index was 1,244.41 reflecting no market concentration in cabbage seeds market. Similarly in the case of capsicum seed market around 26 per cent of the farmers opined that they purchase vegetable seeds from Sungro seeds company for capsicum seeds. Mahyco seeds and Syngenta hybrid seeds were purchased by 15.33 per cent of farmers. Sungro seeds topped the list with 26 per cent market share followed by Mahyco seeds (16.66 %) and Syngenta (13.33 %), Indo-American (10 %) and Namadri (10 %). Harfindal Index was 1,488.56 which indicted no market concentration in the cabbage market.

Jaime *et al.* (2015) reported that between 2005 and 2012, in sales concentration (measured by the HHI approach) of the banana sector, the EU moved from moderate (1.190) to low (533) and for the US from 'high (2.716) to moderate (1.484). The number of exporting companies increased by 202 per cent, 278 per cent for the EU, but only 175 per cent in the US. As far as importers of Ecuadorian bananas are concerned, market concentration moved down from 2010 to 2012 to low (759) in the EU case but still high (2.753) in the US.

Zainalabidin *et al.* (2015) investigated the level of concentration and industry performance of selected meat and meat preparation manufacturing sub-sectors in Malaysia and to examine the relationship between market structure, conduct and performance of the industry. Secondary data were collected from selected meat manufacturing firms registered under the Companies Commission of Malaysia (CCM). Results indicated that the meat processing industry tended to have a moderate concentration with monopolistic market structure prevailing throughout the study period, where more than 60 per cent of the industry market share is being controlled by four firms.

2.3 Market conduct and performance of the vegetable seeds

2.3.1 Market conduct

Since the studies on promotional measures taken to promote the sale of vegetable seeds are limited, an effort was made to collect and present the reviews that are parallel to the present work.

Dave (1988) studied on dairy products in United States and revealed that advertising and promotion helped to boost consumption of dairy products for both the farmers and the consumers. It has been suggested that the increase in the funds for promotion of sales, only was the evidence of increase in sale due to these measures.

Rane (1996) studied the promotional· strategies of DFPCL (Deepak fertilizer and petrochemicals corporation Ltd.) and found that the sales programmes were carried out through agricultural graduates by distributing the company products personally to the farmers. This programme created good image for company's product. In addition, the spot demonstrations carried out on farmer fields helped to compare the efficiency of products. Apart from these things DEPCL also conducted farmers and dealers training programme to impart knowledge about the use of P, K and micronutrients.

Bhattacharyya and Paliwal (1998) conducted a study on promotional measures adopted for bio-fertilizer marketing. They stressed the need for availability of credit to farmers, technical knowledge to farmers and availability of bio-fertilizers at district and taluk levels and also to make the people aware of importance of bio-fertilizer for soil and crop growth. The study suggested promotional measures such as radio, T.V., press advertisement, wall paints, road side boards, cinema sliders, film show, street dramas *etc.*

Chang (2009) reported that co-branding was a marketing arrangement to utilize multiple brand names on a single product or service and the study was taken in U.S. Basically, the constituent brands can assist each other to achieve their objectives. Co-branding was an increasingly popular technique for transferring the positive associations of one company's product or brand to another. In the absence of a clearly defined strategy, co-brand mergers were frequently driven by short-term goals to mistrust and failure.

Deepthi (2013) studied the promotional measures adopted by most preferred vegetable seed companies for respective vegetables, *i.e.*, Syngenta seed company for tomato, Mahyco seeds company for cabbage and Sungro seeds seed company for capsicum in Hassan district of Karnataka. The promotional strategies were listed under ten major categories. Sungro seeds company for

capsicum had conducted 10 field days in a year for the promotion of vegetable seeds in the study area, whereas Mahyco seeds and Syngenta seed companies conducted 8 and 6 field days respectively. In the case of field demonstration, Mahyco seeds and Sungro seeds companies conducted 5 and 4 respectively, while Syngenta managed with three field days. Jeep campaign was also undertaken by all the companies with Syngenta in the lead (12) followed by Mahyco seeds (10) and Sungro seeds (8). All the other campaigns were not taken up by all the companies. Mahyco seeds company, as a promotional measure for the effective sale of vegetable seeds, prepared 2,000 posters, 10 wall paintings, and distributed 1,000 calendars. While the Syngenta seed company as promotional measures for sale of their seeds conducted farmers meetings (6), live telecast (1) and banners (200). Whereas, Sungro seeds company conducted slide show presentations (3), farmers meetings (4) and posters (200). While choosing various promotional measures, time, cost and effectiveness were the most important factors considered by vegetable seed companies.

2.3.2 Market Performance

The studies on the distribution network of different vegetable seeds are few in the literature. Thus, an efforts were made to review the related studies *viz*., studies on distribution network of different of agricultural commodities in general and studies on related aspects of vegetables.

Idachiba (1984) studied the role of private sector in farm input distribution in Nepal. He analyzed the constraints of farming in farm input distribution and found inefficiencies in fertilizer distribution. Hence, he suggested that the private sector should form the enterprise of a national farm input distribution strategy, that the existing governmental parastatals should be gradually phased out and replaced with private sector and all barriers to market entry be removed.

Sujatha *et al.* (1989) analysed the performance of market intermediaries in Bangalore regulated market in Karnataka. They employed the Gini concentration ratio technique to explain the extent of inequality in the distribution of volume of business among the traders. The Gini coefficient was found to be 0.33 and 0.45 for onion and potato and 0.17 and 0.21 for rice and ragi, respectively, which indicated the existence of perfect competition in the market for food grains compared to onion and potato crops.

Mundinamani (1993) using Bain's classification of markets and the Lorenz coefficient of inequality technique analysed groundnut market in Karnataka. High and moderately concentrated oligosponic nature of competition was observed with regards to buyers and slightly concentrated on competing type of markets with regard to sellers. A few big firms performing multiple functions were controlling the major portion of the groundnut trade.

Jairath (1997) in his study on operational efficiency in fruits and vegetable market in Jaipur examined the effect of operational efficiency on marketing efficiency. The study revealed that the systems of sale were by open auction, yet a very small portion of produce was sold by this method. This was mainly because of non-participation of sufficient number of traders in the auction and lack of adequate space for display and handling of produce.

Nagaraja (1998) studied market structure, market share and market potential for sunflower seeds in Raichur district of Karnataka state. Theil's entropy index of 0.4638 suggested that sunflower seed market was moderately concentrated with a few suppliers dominating the trade. The market share of individual brands and their switching pattern indicated that local unbranded seeds had the major share. A very high degree of brand switching was noticed among the different varieties of seeds.

Mandanna *et al*. (1998) carried out market-structure analysis to know the extent of market competition or concentration for two representative tobacco auction markets in Karnataka namely, Hunsur and Ramanathapura and found to have increased market concentration. Further, the same study on structural change in India's tobacco exports for the period 1980-81 to 1994-95 using markov chain analysis revealed USSR was the largest market for Indian unmanufactured tobacco.

Handiganur and Kunnal (1999) in their analysis of market power concentration by the intermediaries revealed that the top four sellers and buyers during lean period controlled more than 50 per cent of the quantity of chickpea transacted in all the markets with exception of Bhalki market, Bidar district of Kanataka state. The high Lorenz value noticed in some of the markets was the result of a few large sized firms sharing the major quantity of produce transacted and turnover made by them. The low value of Lorenz coefficient in some markets inferred that marketing system of chickpea was most competitive which is evident from the fact that arrivals in the market was distributed among more number of intermediaries.

Lipper *et al*. (2005) reported that formal system was concerned with the development and distribution of seeds of modern or improved varieties, while local cultivars or landrace varieties were handled by the informal system. In addition, in Ethiopia there have been attempts made by the government and NGOs to promote quality seed production and distribution through market channels for landrace varieties.

Kugbei and Shahab (2007) conducted a study on seed demand and reported that 48.8 per cent of the seed used by the farmers came from their saved seeds although almost half of the farmers considered the quality of their own seed as “poor”. Similarly, 39.4 per cent of the seed they used was bought against cash in the local markets with 44 per cent of the farmers also considering the quality of such seed as “poor”. The same “poor” quality was true of the 4.3 per cent seed that they got from other farmers. The farmers also bought part of their seed from the Improved Seed Enterprise (ISE), Non Governmental Organizations (NGOs) and others (6 %) and got seed from relief agencies, either free of charge or against credit (1.3 %).

Augustine and Langyintuol (2009) analyzed liberalization and restructuring of the seed sector in eastern and southern Africa. They suggested that maize seed industry could be promoted through a coordinated intervention effort by both public and private sector players to address the various bottlenecks. The collection, processing, dissemination and management of information on varietal release and adaptation remain vital in ensuring success of the coordinated effort.

Cameron (2009) studied the market potential of 4 major crops for the Bhopal district, in which one of the largest seed producer companies in the state of Madhya Pradesh - the Samarth Kisan Producer Company (SKPC) – is centred. The 4 crops investigated were soybean, gram (chennay), wheat (gehoo) and coriander (dhaneya).

Singh and Gautam (2010) appraised distribution network of different vegetable seed companies for tomato seed and benchmark the best distribution network in Udham Singh Nagar of Uttarakhand. Six major players dealing in tomato seed business were selected for the purpose. Twenty three parameters were devised during the study, *i.e.*- number of distributors, distribution density, average distance, percentage overlap, sales volume, distributor width, distributor depth, retailer width, retailer depth, push-pull index, product display, problem solving nature of distributor, distributor's shop location, transport facility with distributors, work force at distributor's shop, age of the firm, payment habit of distributor, types of companies dealt by distributor, time period of dealing with a company, promptness in delivery, appropriating schemes, account settlement, and cordial nature of distributors. Each company was ranked on 1 to 5 scales. Statistical tool like weighted mean was used for analyzing the data. A comparison on individual parameter was done and the overall performance of each of the company was calculated with help of a grid. It was evident from the study that the distribution width of Macho was foremost followed by Nansee. Hence, the Macho was having a better reach to its distributors in comparison to its close competitors. The rest four players demonstrated the same distribution width. However, for retail width, Nansee was the leader followed by Synergy, Macho and Adhari. The study showed that both distribution and retail depth was highest for Nansee followed by Synergy, however, the lowest distribution and retail depth was measured for Macho. It was evident from the study that Nancee was having maximum pull whereas the products of Gemini were having maximum push by distributors. The distributors of Gemini have shown more loyalty towards the company. The overall performance of Nancee was foremost for tomato seed in the study area emerging as benchmark on overall score, followed by Macho, Synergy, Adhari, Grow and Gemini.

Kumar *et al*. (2011) conducted a study in the Samastipur district based on surveys of seed producers, farmers, seed distributors, private seed companies and public research institutions as to understand the delivery system of maize seed in a value chain perspective. It had mapped the value chain of public and private seed systems and had brought out the need for a greater emphasis on integration of different stakeholders involved in the chain. Appropriate backward and forward linkages of maize growers with seed companies are likely to generate better returns from maize. The enabling environment from the government policies to support services needs to be reoriented towards enhancing efficiency in seed delivery in the Bihar state.

Deepthi (2013) studied performance of different vegetable seed companies in Kassan district of Karnataka for tomato seed market using various indicators like dealers depth, dealers width, distribution depth and sales volume, dealers assessments, age of the firm and push-pull index. It was observed that dealer's width of Sungro seeds was foremost followed by Indo-American hybrid seeds. Hence, the Sungro seeds Company was having a better reach to its dealers in comparison to its close

competitors. The rest three in succession according to dealer's width criterion were Syngenta, East-West seeds and Mahyco seeds. Distribution depth was highest for Syngenta followed by East-West seeds however; the lowest distribution was measured for Indo-American Hybrid seeds. In the case of sales volume, among the five companies considered, Syngenta was in the lead, followed by East-West seeds, Mahyco seeds, Sungro seeds and Indo-American Hybrids. It was evident from the study that Syngenta was having maximum push whereas the products of Sungro seeds were having maximum pull by distributors. The overall performance of Syngenta with the highest overall score is ranked first, followed by East-West seeds, Mahyco seeds, Sungro seeds and Indo-American Hybrid seeds.

2.4 Factors influencing farmers purchasing behavior of vegetable seeds

Venkateswaralu *et al.* (1984) attempted to examine the reasons for being brand loyal of biscuits. It was found that 50 per cent of the consumer respondents preferred a particular brand because they were convinced that its quality was better than that of other brands. Anoth6er 38 per cent of the sample consumers felt it was the taste, which made them go in for a particular brand, while very few consumers in the sample stated low price and easy availability as the main reasons for selecting a brand.

Ramaswamy and Chandrashekaran (1990) examined factors influencing cotton seed buying behaviour of farmers in Kamaraj district of Tamil Nadu, India. Sixty cotton growers were selected from four villages for agricultural year 1987-88. Factors influencing farmers' purchase of cotton seeds were source of purchase, varietal preference, seed quality, source of information about the supply· of cotton by different agencies and brand preference. Dealers with credit sale facility, availability of seeds at lower prices and premises located close to the farmers' locality attracted farmers.

Ali (1992) studied the factors influencing purchase decision for processed products in Kolar district of Karnataka. It revealed that factors such as taste, family preference, price, good keeping quality, well known brand, colour and consistency were important in the buying decisions of the consumers in that order.

Mohanaram *et al.* (1996) studied the preference for organic vegetables. It was suggested that high middle income group families should be targeted for organic produce; vegetable consumption was more than 50 gm per family. Among prominent vegetables consumed, bhendi and brinjal were rated as being first and second in preference. Nearly, 71 per cent of the consumers perceived the vegetables grown without using chemical fertilizers and pesticides to be tastier and good for health.

Sidhu (1996) studied the seed use practices of farmers in Punjab. The results of the study indicated that the farmers judged the purity and quality of seeds purchased from public seed agencies, research organizations, government departments, private seed companies/dealers *etc.*, by their past experience and reputation of agencies. The results also indicated that among the institutions/agencies, Punjab Agricultural University had the highest reputation among the selected farmers in Punjab.

Singh (1998) conducted study in Bihar and concluded that seeds were purchased from private traders and fellow farmers mostly on cash basis. The reasons for preferring these sources were seeds quality, availability and accessibility. This implied that the marketing bodies and seed businesses units did not carry out their functions in a manner as to create time place and form utility. Further, farmers purchased seeds only at the time of requirement *i.e.,* a few days before use, which was very rational given that seed is a perishable and costly input.

Ashalatha (1998) studied the factors influencing the performance of Bangalore urban, Rural and Ramnagara district co-operative milk products societies union ltd (BAMUL) milk for a sample of 100 respondents. The study revealed that the factors such as door delivery, clean packing quality, hygienic preparation, time saving, reliability, good value for money freshness and desired flavour were important in that order in influencing the decision of buyers for BAMUL milk.

Reddy and Raju (1999) studied the barter system of seeds among farmers. The results of the survey revealed that the highest number of farmers used seeds either borrowed or purchased from other farmers. The next major source was the own seeds.

Ayieko *et al.* (2005) studied on fresh fruit and vegetable consumption patterns and supply chain systems in urban Kenya reported that while there were households consuming fresh produce at levels below WHO/FAO recommended levels across all income groups, the poorest people in urban areas were the lowest consumers of fruit and vegetables. Also, as income increased, the level of fruit and vegetable consumption increased and approached the WHO/FAO standards. The study further showed that fresh produce consumption was influenced by education level, age and the gender of household head. The fresh produce consumers tend to be highly specialized in terms of their shopping patterns as compared to other food groups, often dominating the open-air markets and kiosks.

Milind *et al.* (2007) reported that the private sector has become an important supplier of varietal technology in agriculture giving rise to concerns about competition in the seed market. Study examined the evolution in the structure of India's cotton seed market and factors that underlie the changes. It found that the private sector had grown rapidly in the last decade. As the proprietary hybrid seed market had grown, more private players had come into the market, eating away at the share of market leaders. With BT cotton, the seed industry encompassed a seed market as well as a technology market. To some extent, biosafety laws had protected the monopoly of the incumbent, which had received a significant first mover advantage. However, the market structure was not frozen because of diffusion from illegal seeds, competition from alternative gene suppliers and changing regulatory practices.

Chalwe (2011) studied Zambian smallholder bean producers and the factors that influenced their choice of marketing channels. Results from the probit model indicated that the choice of marketing channel was directly influenced by the price of beans, scale of operation (as measured by the quantity of beans harvested, and quantity sold), distance to the market, farming mechanization used and livestock ownership implying that except distance which was negatively related to private trade channel selection, a positive change in the variables above increase the probability of farmers selling to private traders.

Oosthuizen (2011) examined the market perception and awareness of the brand regarding the company versus the competitive brands. Monsanto, as a company, deals in the market as Seminis seeds. The study concluded that in terms of top-of-mind awareness, Seminis seeds is in a very competitive position within the NAFTA market, but trails Nunhems seeds and Bejo in the EMEA market. While the individual Syngenta seed brands had low unaided brand awareness, Syngenta was frequently cited, on an unaided basis, as a brand of vegetable seed in both NAFTA and EMEA.

Feeney (2013) analyzed the buying behavior of farmers for expendable inputs in Argentina. They segmented seed buyers using cluster analysis. They identified four distinctive segments of farmers for seed purchasing: performance, price, balance, and convenience. Additionally, a multinomial logit model was used to predict segment membership for seed purchases based on farmers' observable and attitudinal variables.

2.5 Problems in vegetable seed market

Kameshwara Rao (2000) reported the problems in production of banana in Tungabhadra command area. The major problems faced 85 per cent of the farmers were non-availability of sufficient irrigation water, 73 per cent of the farmers opined that non-availability of quality planting materials. The other major problems were unavailability of labour, soil salinity and storms of heavy winds.

Guledgedda *et al.* (2002) studied constraints in coconut cultivation in Haveri districts of Karnataka and reported that the major production problems in coconut were lack of technical know-how, non-availability of labour, lack of adequate credit facility and non-availability of sufficient water.

Khunt *et al.* (2003) studied the constraints in production of pomegranate and indicated death in young plants, problems of mites inadequacy and poor quality of irrigation water and shortage of electricity were major problems faced by the farmers in Bhavnagar district in Gujarath.

Rane and Baghade (2006) reported major problems in banana production in Sindhurgh district of Maharashtra. They revealed that problems of bunchy top and aphid in production were the major ones.

Ajjan *et al.* (2008) studied the problems of cultivation and marketing of gloriosa in Tamil Nadu. They revealed that labour problem (30 %), high cost of cultivation (28 %), pest and disease (22 %) and weed (20 %) were the cultivation problems; fluctuations in price (74 %), no market information (20 %) were the identified marketing problems in gloriosa cultivation.

Dey (2011) conducted a study on an economic analysis of production and marketing of rubber in Tripura. Primary data were collected from 120 farmers from West and South Tripura districts. The noticed problems such as non availability of skilled tappers, higher initial investment, non availability and high cost of fertilizers, high fluctuations in product prices and high cost of transportation respectively were the major problems confronting cultivators.

Ramappa and Manjunatha (2013) conducted a study on arecanut in non-traditional region of Karnataka to assess the cost of cultivation of arecanut among different categories of farmers, to assess the problems of areca nut cultivators and make suitable policy recommendations. The study revealed that the 80 per cent of the farmers suffer from adequate finance, water scarcity, non-availability of labour and pest and disease problem.

Samsai *et al.* (2013) worked out the economic analysis of fresh mango value chain in Krishnagiri district of Tamil Nadu, to study the problems faced by the mango growers in marketing. The study revealed that 75 per cent of the farmers suffer from low price. Others major problems were processing and identification of markets.

Sreedhara *et al.* (2013) worked out the economics of capsicum production under protected condition in Northern Karnataka. They reported some of the problems faced by the capsicum farmers like, higher initial investments (89.50 %), high cost of pesticides (83.33 %), incidence of pests and diseases (83.33 %) and non-availability of high yielding and pest resistant varieties (82.50 %) were the major problems expressed by the most of the farmers.

Amrutha (2014) conducted study on an analysis of sapota fruit cultivation in Tuticorin district of Tamil Nadu. The problems faced by the sapota farmers were analysed through Garret's scoring technique. The study revealed that the heavy investments, pest and disease and climatic factors which were ranked as first, second and third major problems respectively. Long gestation period and inadequate credit facilities were ranked fourth and fifth problems.

Mukherjee (2015) studied the problems of farmers in integrated farming. Based on the responses of farmers the extent of damage was calculated by using Rank based quotient (RBQ). The study had identified that menace of '*Nilgai*' (antilope) was the biggest problem affecting the farmers of Rampur village fallowed by the inadequate availability of irrigation water, unavailability of labourers at crucial time, stem borer in rice, brown plant hopper in rice, tick infestation in animals, reproductive problems in cattle, mastitis in cattle and wilting and fruit cracking in orchard.

3. METHODOLOGY

In order to achieve the objectives of the study, it is very essential to follow a systematic and scientific approach in sample survey and data analysis. This chapter on methodology consists of the details of the description of the study area, the sampling procedure, the nature and sources of data and analytical techniques employed. The methodology chapter is discussed under the following sub-heads:

3.1 Description of the study area and sampling procedure

3.2 Nature and source of data

3.3 Analytical techniques employed

3.1 Description of the study area and sampling procedure

Karnataka is the 8th largest state in India with a geographical area of 190.50 lakh hectares. The state is surrounded by Arabian sea in the West, the states of Goa Maharashtra in the north, Andhra Pradesh and Tamil Nadu in the East and Kerala in the South. It is situated between 11^{0}05 and 18^{0}50 North latitude and 74^0 and 78^{0}30 East longitude in the southern plateau. According to the 2011 census, Karnataka has a total population of 611.30 lakhs with the density of 319 people per sq km. There is a decadal increase in population of 17.3 per cent. Out of the total geographical area, 30.62 lakh hectare is under forest cover, 10.17 lakh hectares under permanent pasture, 3.17 hectares under trees and groves. Karnataka receives an average annual rainfall of about 941 mm both from South West and North East monsoons.

3.1.1 Location and the study area

Four districts were purposively chosen for the study, *viz.,* Haveri, Belagavi, Hassan and Kolar district. The districts were selected as vegetables are extensively cultivated in these districts.

3.1.1.1 Haveri district

Identified as one of the nodes on the Bengaluru – Mumbai economic corridor from Karnataka, Haveri is of growing importance with potential growth. The district comprises of world famous chilly market at Byadagi and is a major export hub for Byadagi chilly. A 120 acre spice park is proposed to further spice up the affairs in the district. The district is located right in the center of Karnataka equidistance from Bidar in North and Kollegal in South region. It has two sub-divisions namely Haveri and Savanur with seven taluks namely Hanagal, Shiggaon, Savanur, Haveri, Byadagi, Hirekerur, & Ranebennur. The district has a literacy rate of 77.60 per cent.

3.1.1.1.1 Economic

Haveri's total GDP stands at INR 44.52 billion, contributing 1.5 per cent to state GSDP. It's per capita annual income in the district being Rs.45, 581. However, the GDDP trend has been growing at 3.6 per cent CAGR from 2007-08 to 2012-13; with the agriculture and allied industries reigning with a total contribution of 13.24 billion amounting to 3.15 per cent of the state's agriculture sector.

3.1.1.1.2 Agriculture in focus

Agriculture is the mainstay of Haveri with 69.51 per cent of its net area under cultivation and of this a major portion of land about 61.51 per cent of the net sown area is focused on growing cereals alone. maize, paddy, hybrid cotton, ground nut, chilli, tomato, brinjal, cabbage, gagi, pulses are the major crops in the district. The district is rich in spice cultivation. The major spice industry here is the chilly powder mills. There is also a chilly processing facility in the district.

3.1.1.2 Belagavi District

The fourth largest city, Belagavi houses India's first notified aerospace precision engineering and manufacturing Special economic zone center. Rich deposits of bauxite and 200 foundries producing over 70,000 tons of automotive and industrial casting of ferrous base has made it an important center for manufacture of heavy machine tools and high pressure oil hydraulics. The locational advantage of being right in the middle of Bengaluru - Mumbai region is a major advantage in developing the region as a support base for Automobile and Aerospace industries here. Belagavi spread across 13,433 sq. km comprises of 10 taluks namely Athani, Ballhongal, Belagavi, Chikkodi, Gokak, Hukkeri, Khanapur, Ramdurg, Raybag and Saundatti.

3.1.1.2.1 Economic

Belagavi is the second largest exporter of the state. Belagavi's total GDP is a whopping INR 159.65 billion contributing 5.3 per cent to state GSDP with the per capita annual income in the district being INR.52, 250. However, the GDDP trend is 4.3 per cent CAGR from 2007-8 to 2012-13; with the agriculture and allied industries at the top with 8.1 per cent contributions.

3.1.1.2.2 Agriculture in focus

Belagavi devotes 48 per cent of its land for cultivation; amongst this cereals and pulses occupying 42 per cent and 6 per cent of the land respectively. It is best known for its fruits & vegetable cultivation next only to Hassan and Kolar districts; onion, tomato, potato, chilli, capsicum, cabbage, carrot, mango, sapota, banana, grapes & papaya are the other major horticultural crops in the region.

3.1.1.3 Hassan district

Anchoring the master control facilities of Indian Space Research Organisation (ISRO). Hassan is acknowledged as an industrial growth center along with 6 developed industrial areas and 4 special economic zones. Add to this nearly 70 per cent of the population that is engaged in agriculture occupation with a 265 acres food processing special economic zone for export oriented units here; Hassan is a double edged advantage to explore. Hassan is spread across 6814 sq.km consisting of 8 talukas – Alur, Arkalgud, Arsikere, Belur, Channarayapatna, Hassan, H.N. Pura and Sakleshpur in the south eastern part of Karnataka. The district has a literacy rate of 75.89 per cent.

3.1.1.3.1 Economic

Hassan’s total GDP stands at INR 66.12 billion, contributing 2.2 per cent to state GSDP and it’s per capita annual income in the district being INR. 53,000. However, the GDDP trend has been growing at 6.3 per cent CAGR from 2007-08 to 2012-13; with the Agriculture & Allied sector bringing in the highest contributions at 4.3 per cent for 2012-13.

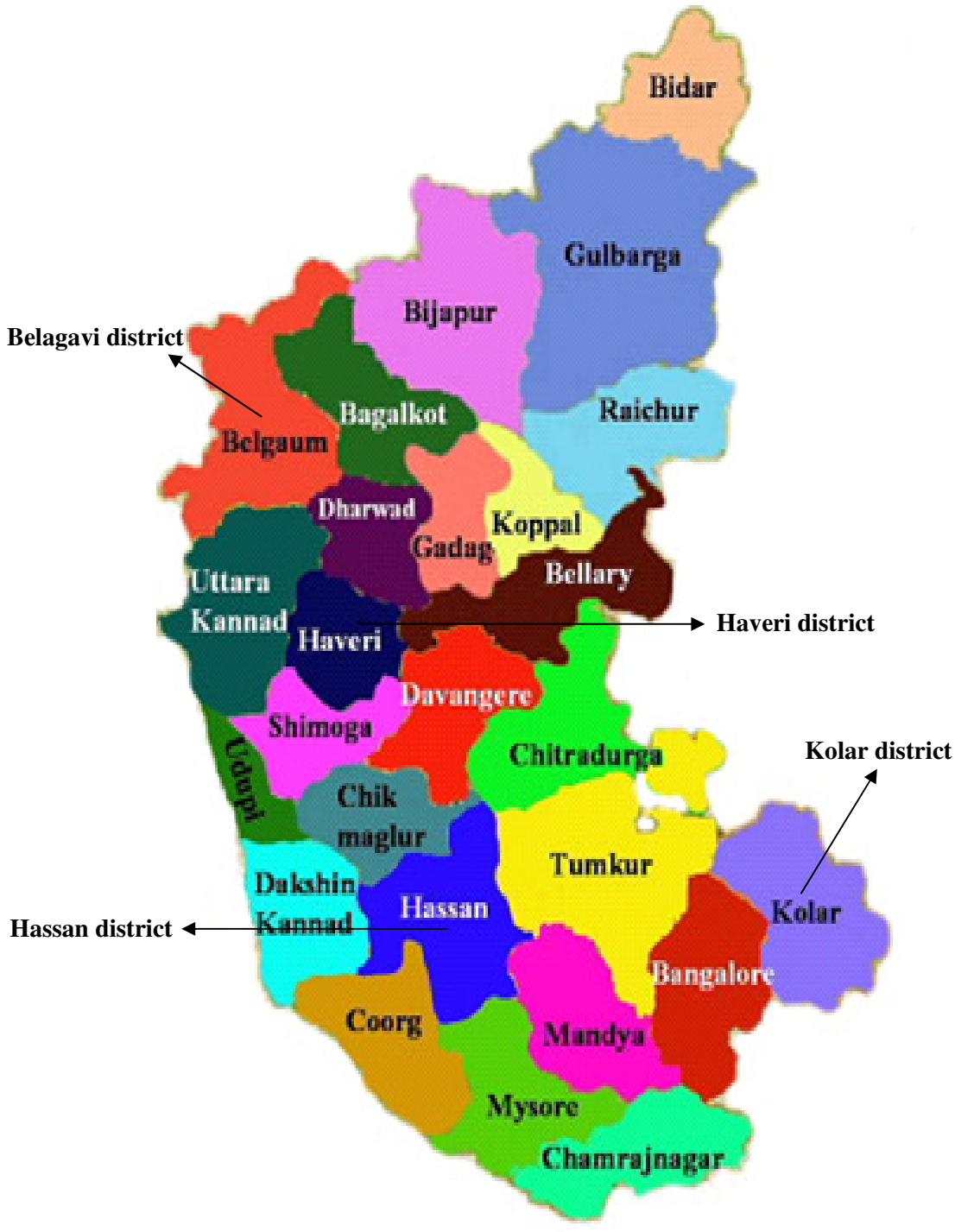

Fig. 3.1. Map showing study area

Table 3.1: Distribution of sample respondents

Sl. No.	Particulars	District				Total
		Haveri	Belgavi	Hassan	Kolar	
1	Farmers	40	40	40	40	160
2	Dealers	15	15	15	15	60
3	Nurseries	15	15	15	15	60
4	Distributors	16	16	16	16	64

3.1.1.3.2 Agriculture in focus

Hassan has a growing focus on the agriculture sector with the net sown area of 46.49 per cent. The dual agro climatic zone and bi modal rainfall allows for adopting multiple cropping patterns in the district. It allots 64.15 per cent of net sown land to cereals and pulses rank a low second with only 16.22 per cent allotted to it. It also cultivates oilseeds like sunflower, groundnut, sesamum, castor, mustard, soya bean and other commercial crops-cotton, sugarcane and tobacco. Hassan has plantation crops like coconut, arecanut, cocoa, coffee and oil palm along with spices like lack pepper, ginger, cardamom and vanilla. It also has horticulture produce like tomato, chilli, potato, brinjal, banana, mango, lemon, sapota. Some flowers like jasmine, chrysanthemum, marigold and rose. It also grows medicinal plants like patchouli and amla.

3.1.1.4 Kolar District

The golden land Kolar (known for the presence of the Kolar gold fields) today is emerging hub for agro and food processing industries base in the state. It ranks No 1 for productivity and yield of horticulture crops and has the biggest solar power unit in India. Kolar is spread across 3,979 sq. km consisting of 5 taluks–Kolar, Bangarpet, Srinivaspura, Malur and Mulbagal in the south eastern part of the state. The district has a literacy rate of 74.33 per cent.

3.1.1.4.1 Economic

Kolar's total GDP stands at INR 61.82 billion, contributing 2 per cent to state GSDP and it's per capita annual income in the district being INR. 59,614. However, the GDDP trend has been growing at 7 per cent CAGR from 2007-08 to 2012-13; with the agriculture and allied industries as the highest contributors at 4.8 per cent for 2012-13.

3.1.1.4.2 Agriculture in focus

Kolar with its top rank in productivity and yields of horticulture crop has 49.95 per cent of the net sown land under its cultivation. The district allots 33.34 per cent for cereals and 10.58 per cent for pulses. The horticulture crops in the region include potato, tomato, onion, beans, green chilies, khol crops, carrot, radish and beetroot, mango, banana, guava, sapota, grapes, marigold, jasmine, chrysanthemum and rose.

3.1.2 Sampling procedure

Pilot survey was done for selection of vegetables; tomato, cabbage, green chilli and brinjal. Where, companies get better margins in these vegetables seed business.

Multistage Sampling technique was adopted for this study. In the first stage, northern Karnataka and south Karnataka were purposively selected to cover major vegetable growing districts in Karnataka. In the second stage two districts were selected from each north Karnataka and south Karnataka based on the highest area under cultivation of selected vegetables. Accordingly, Haveri and Belagavi districts from northern Karnataka, Hassan and Kolar districts from south Karnataka were selected. In the third stage, 4 companies were selected purposively for each vegetable based on the highest sales volume. Four distributors (purposively), 10 farmers, 15 dealers and 15 nurseries were selected randomly for each crop.

3.2 Nature and sources of data

Both primary and secondary data were used in this study. Primary data were collected from the farmers related to the factors they considered important in their decisions regarding the purchase of seeds. The data pertaining to sales volumes, marketing aspects like, promotion measures adopted by the different vegetable seed firms, the importance they attached to different sales promotion measures adopted by different firms and the constraints faced in the vegetable seed business were collected from the distributors.

The data related to vegetable seed companies, product display, problem solving, transportation facility, work force, payment habits, time period of dealing, promptness in delivery, appropriating schemes, account settlement, cordial nature, product quality, push and pull volume of sales and constraints related to vegetable seed business were collected from the dealers and nurseries, for the period of 2015-16. The data were collected with the help of pretested structured schedules. Adequate care was taken at the time of data collection to elicit accurate information from the respondents.

Secondary data for the period of 2005-06 to 2015-16 were collected and analysed for better understanding of growth and estimate the demand for the vegetable seed requirement for tomato, cabbage, green chilli and brinjal crops in the selected districts.

3.3 Analytical tools and techniques employed

The data collected from primary and secondary sources were subjected to appropriate analytical techniques in order to arrive at meaningful conclusions. The different analytical techniques used in the study are as follows.

3.3.1 Growth rate analysis

In order to assess the growth in area, production and yield of tomato, cabbage, green chilli and brinjal in selected district, ten years data from 2005-06 to 2015-16 were used. The compound growth rates were computed by using the exponential function of the form.

$$Y_t = AB^t + U_t \quad \text{..... (1)}$$

Where,

Y_t = Area, production and productivity of chilli and cotton

t = Year 1,2.....n

U_t = Disturbance term in year “t”

“a” and “b” are the parameters to be estimated

The equation (1) was transformed into a log linear form and written as

$$\log Y = \log A + t \log B + \log U_t \quad \text{..... (2)}$$

Equation (2) was estimated by using ordinary least squares (OLS) technique.

Compound growth rate (g) was then estimated by using the relationship given in equation (3).

$$\hat{g} = (b-1) * 100 \quad \text{..... (3)}$$

Where,

$\hat{g}$ = Estimated compound growth rate % per annum

$\hat{b}$ = Antilog of B

The standard error of the growth rate was estimated and tested for its significance with 't' statistics.

3.3.2 Demand forecasting of the vegetable seeds in the districts

Forecasting of demand for selected vegetable seeds in each district, the demand data of vegetable seeds were required. And it was very difficult to get data on demand for the vegetable seeds in the previous years. Therefore under vegetable crop in each of the selected districts data were collected for the past 10 years (2005-06 to 2015-16). The area data was multiplied by seed rate to arrive at the total seed requirement (demand) in previous 10 years. This data were used to forecast the demand in each of the district for the next 5 years. Different models like, moving average, single exponential smoothing, double exponential smoothing, Halt Winters models, Artificial Neural Network (ANN) and Autoregressive Integrated Moving Average (ARIMA) models were tried and efficacy of each of the model were tested based on the mean absolute percentage error (MAPE) value. This model with a least MAPE was selected for further forecasting, Accordingly ARIMA model was chosen for forecasting the demand for the vegetables seeds in the selected district.

3.3.2.1 Autoregressive Integrated Moving Average (ARIMA) technique

The present study adopted Autoregressive Integrated Moving Average (ARIMA) method to forecast vegetable seeds requirement in selected districts with the help of SPSS software. The class of ARIMA models, also called Box-Jenkins models, is suitable for non-stationary time series data, as is the case for many economic time series, where one part of the series behaves much like any other series (Cooray, 2008). ARIMA models consist of two parts, an autoregressive (AR) part and a moving average (MA) part (Enders, 2010). If the series Y_t consists of characteristics of both AR and MA, it follows an ARMA *(p,q)* process where there are *p* autoregressive and *q* moving average terms (Gujaratii, *et al*., 2012). The term integrated (I) in ARIMA is included because of the differencing process (*d*) that can be reversed (meaning integration process) to obtain the original series during estimation process (Cooray, 2008). Thus, if a series Y_t has to be differenced *d* times to make it stationary and then apply ARMA (*p,q*) model to it, it is generally said that the original time series is ARIMA (*p,d,q*) model where *p, d*, and *q* are integers with values greater than or equal to zero and *d*, denotes the number of times the series has to be differenced before it becomes stationary and *p* and *q* are as defined earlier (Gujarati, *et al*., 2012: 824).

The mathematical representation of AR, MA and ARIMA processes is provided in detail in literature (*i.e.* Cooray, 2008; Enders, 2010; Gujaratii, *et al*., 2012). For non-seasonal time series, the simplified general form of these processes is given in Nochai and Nochai (2006) as;

(a) The p^{th}-order autoregressive model, AR (*p*) has the general form as;

$$Y_t = \phi_0 + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \ldots\ldots + \phi_p Y_{t-p} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where:

Y_t = the dependent variable (*i.e.* maize price) at time *t*.

Y_{t-1}, Y_{t-2} ----- Y_{t-p} = dependent variable at time lags *t-1, t-2* and *t-p,* respectively.

ϕ_0, ϕ_1, ϕ_2 --------ϕ_p = coefficients to be estimated

ε_t = error term at time *t*

(b) The autoregressive moving average, MA (q) which has the general form as;

$$Y_t = \mu + \varepsilon_t - \theta_1\varepsilon_{t-1} - \theta_2\varepsilon_{t-2} - \in - \theta_q\varepsilon_{t-p} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where:

Y_t = dependent variable at time t

μ = constant mean of the process

ε_t = error term at time *t*

$\theta_1, \theta_2, \ldots\ldots \theta_q$ = coefficients to be estimated

ε_{t-1}, ε_{t-2},… ε_{t-q} = errors in the previous time periods that are incorporated in the dependent variable Y_t.

(c) Autoregressive Moving Average model: ARIMA (*p,q*) which is a combination of AR (*p*) and MA (*q*) processes and has the general form as;

$$Y_t = \phi_0 + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \ldots. + \phi_p Y_{t-p} + \varepsilon_t - \theta_1\varepsilon_{t-1} - \theta_2\varepsilon_{t-2} - \in - \theta_q\varepsilon_{t-q} \ldots\ldots\ldots\ldots\ldots\ldots$$

The Box-Jenkins (BJ) methodology

ARIMA technique is also popularly known as Box-Jenkins method. This method consists of four steps which are well explained in many econometrics as well as time series analysis literature (Cooray, 2008). In this study the description of the four steps for model building as adopted from Gujarati, *et al.* (2012: p. 824) namely; (a) Identification of model, (b) Estimation of parameters, (c) Diagnostic checking and (d) Forecasting, are described in detail below.

(a) Identification of model

This step refers to the process of finding out the appropriate values of *p, d* and *q*. The main statistical tools used for identification of model are the Auto-Correlation Function (ACF), the Partial Auto-Correlation Function (PACF) and the resulting correlograms, which are simply the plots of ACF and PACFs against the lag length (Cooray, 2008). Gujaratii, *et al.* (2012) have provided some theoretical hints to consider while examining the ACF and PACF correlogram in order to identify appropriate model, AR (*p*) or MA (*q*) or ARMA (*p,q*).

First, the ACF and PACF enable the determination of whether the series is stationary or not (Nochai and Nochai, 2006). Second, different patterns of ACF and PACF and the associated correlograms will yield several ARMA processes, such as AR (*1*), AR (*2*), MA (*1*), MA (*2*), ARMA (*1,1*), ARMA (*1,2*) and so on. Since each of these stochastic processes exhibits typical pattern of ACF and PACF, if the time series under study fits one of these patterns, one can identify the time series with that process. However, one has to apply diagnostic tests to find out if the chosen ARIMA model is reasonably accurate (Cooray, 2008).

(b) Estimation

Once the appropriate values of *p* and *q* have been identified, the next step is to estimate the parameters of the autoregressive and moving average terms included in the model. Sometimes this calculation can be done by simple least squares, but sometimes one will have to resort to non linear (in parameter) estimation methods.

(c) Diagnostic checking

Once the parameters have been estimated, the chosen model is checked if it fits the data reasonably well, because ARIMA models can yield several values of p and q and it is possible that another ARIMA model may yield better estimate of parameters. One easy test of the identified model is to examine if the residuals estimated from these models have white noise; if they have, one can accept the particular fit; otherwise the process has to be done all over again (Gujarati, *et al.*, 2012). An overall check of model adequacy is provided by the Ljung-Box Q statistic (Nochai and Nochai, 2006).

(d) Forecasting

Gujarati, *et al.* (2012) stated emphatically that one of the reasons for the popularity of the ARIMA modeling is its success in forecasting, particularly, short-term forecasts. The estimated tentative model can be used to forecast for one period or several periods into the future. Equally important are the assumptions on which the forecasts are based

3.3.3 Herfindahal-Hirschman Index

The Herfindahl index is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them. It is named after economists Orris C. Herfindahl and Albert O. Hirschman. It is also known as Herfindahl–Hirschman Index, or HHI. An increase in the HHI generally indicates a decrease in competition and an increase of market power, whereas decreases indicate the opposite. The major benefit of the HHI index is to measure the concentration ratio.

Computation:

The HHI is calculated from the following formula:

$$H = \sum_{i=1}^{N} s_i^2$$

Where s_i is the market share of firm *i* in the market and *N* is the number of firms.

The Herfindahl–Hirschman Index (*H*) ranges from zero to one, where *N* is the number of firms in the market. Equivalently, if per cent is used as whole numbers, *viz.*, 75 instead of 0.75, the index can range up to 100^2, or 10,000.

Interpretation of values:

i. HHI index below 0.01 (or 100) indicates a highly competitive index.

ii. HHI index below 0.01 (or 100) to 0.15 (or 1,500) indicates a concentrated index.

iii. HHI index between 0.15 to 0.25 (or 1,500 to 2,500) indicates moderate concentration.

iv. HHI index above 0.25 (above 2,500) indicates high degree of concentration.

A small index indicates a competitive industry with no dominant players. If all firms have an equal share the reciprocal of the index shows the number of firms in the industry. When firms have unequal shares, the reciprocal of the index indicates the "equivalent" number of firms in the industry.

3.3.4 Descriptive statistics

These are used to describe the basic features of the data gathered from various sources. The measures like averages, ratios and percentages were used in the study. Average and percentage analysis was adopted to examine sales promotion measures.

The distribution network of vegetable seed companies and benchmarking the existing distribution network, a convenient sampling method was used to identify the respondents including distributors, dealers, nurserymen and company representatives. Benchmarking of the distribution network of different seed companies was done on the basis of sixteen parameters. These parameters were; number of product display, problem solving, transportation facility, work force, payment habits, time period of dealing, promptness in delivery, appropriating schemes, account settlement, co-ordinal nature, product quality, push pull index, dealers width, dealers depth, distributors width and distributors depth. Weighted mean was calculated for parameters of the distribution system and was used for knowing the overall performance of each company with the help of a grid. The weights were assigned to different parameters after proper classification according to their importance and deep discussion with company personnel and dealers. Points awarded to each parameter were multiplied with the respective weightage and the sum was calculated for individual companies. The company with the highest total is termed as the benchmark and was considered to have the best distribution system.

$$\text{Dealers width} = \frac{\text{Number of dealers of a particular company}}{\text{Total number of dealers}}$$

$$\text{Dealers depth} = \frac{\text{Company's sales volume through dealers (in kg)}}{\text{Total sales volume of all dealers (in kg)}}$$

$$\text{Distribution depth} = \frac{\text{Companies sales volume through distributors (in kg)}}{\text{Total sales volume of all distributors (in kg)}}$$

$$\text{Distribution width} = \frac{\text{Number of distributors of a particular company}}{\text{Total number of distributors}}$$

$$\text{Push-pull index} = \frac{\text{Average push volume (in kg)}}{\text{Average pull volume (in kg)}}$$

3.3.5 Standardized index

This is used for ranking the factors influencing the purchase of vegetable seeds by farmers. For this purpose, ten factors were identified as important by the farmers in their vegetable seed purchase. These factors were identified in consultation with farmers and seed dealers and they included suitability of soil, productivity, suitability of climate, market price at the planting stage, companies promotion activities, germination percentage, neighbor's opinion, brand name, dealers guidance and availability of credit. For each crop, each of the 10 farmers selected were asked to rank the above ten factors. In this analysis, rank 1 meant most important factor and rank 10 meant least important factor. In the next stage, rank assigned to each factor by each individual was converted into a standardized index using the following formula,

SI = (Actual value - Minimum value) /Maximum value

3.3.6 Rank based quotient (RBQ)

The constraints based on the vegetable seed marketing obtained from the dealers, nurseries and distributors were ranked, the factors were nonavailability of preffered seeds in time, difficulty in convenience of farmers about the new seeds, poor credit recovery from farmers, low margins in seed business, nonavailability of skilled labours, delay in response of the companies in the case of crop failure, lack of storage facilities, computation from product development (PD), difficulty in credit recovery from dealers/nurseries, competition with other distributors, competition with dealers and competition with nurseries. These parameters were quantified and the rank based quotient (RBQ) was calculated using the following formula,

$$RBQ = \frac{\Sigma f_i (n + 1\text{-}i) * 100}{(N*n)}$$

Where,

fi = Frequency of farmers for the i^{th} rank of the attribute

N = No. of farmers contacted for factor identification

n = Maximum no. of ranks given for various factors.

i = Rank of the attributes

3.3.7 Definitions, terms and concepts used

3.3.7.1 Market concentration

It is a function of the number of firms and their respective shares of the total production (alternatively, total capacity or total reserves) in a market. Alternative terms are industry concentration and seller concentration.

3.3.7.2 Market structure

The nature and degree of competition in the market for goods and services.

3.3.7.3 Market conduct

Firm's pattern of behavior in executing its promotion strategy and its response to the realities of the market it serves.

3.3.7.4 Market performance

It relies on a set of measurable performance standards, a pointed focus on outcomes, and clear lines of accountability.

3.3.7.5 Product Development

Market dealer who get the products directly from company at the same price which distributors gets from companies. He/She is authorised to sell the product on counter itself but not authorised to distribute to dealers or nurserymen.

3.3.7.6 Field day

A large trade show for agricultural industry and equipment, especially for broadacre farming. In contrasts with an agricultural show in that a show focuses on livestock and judging, a field day focuses on equipment, demonstrations and processes.

3.3.7.7 Field demonstration

A long term educational activity conducted in a systematic manner in farmers' fields to show worth of a new practice/ technology.

3.3.7.8 Distribution depth

Distribution depth of a company indicates the sales volume of a particular company among distributors of other companies. More distribution depth signifies a market leader.

3.3.7.9 Distribution width

Distribution width of a company indicates the reach of a particular company among distributors. More distribution width signifies a better distribution network.

3.3.7.10 Dealer’s depth

Shows the penetration of a company among dealers and dealer’s width of a company indicates the reach of a particular company among dealers.

3.3.7.11 Dealers’ width

It signifies the number of dealers selling a company’s product out of the total products sold by the dealers.

4. RESULTS

Keeping in view of the objectives of the research, the data pertinent to the study were elicited from various sources and analyzed through appropriate statistical techniques. The results of the analysis were presented below:

4.1 Growth rates in vegetable crops

4.2 Projected demand for vegetable seeds

4.3 Market structure of vegetable seed business

4.4 Conduct and performance of vegetable seed business

4.5 Factors influencing farmers in vegetable seed purchase

4.6 Problems in vegetable seed marketing

4.1 Growth rates in vegetable crops

Vegetables are one of the most important crops grown in the Karnataka state. It is mainly cultivated under irrigated conditions. So, it is important to know the development of the vegetable crops under the study area. The results of the growth rates are presented district wise in the fallowing paragraphs.

4.1.1 Haveri district

The growth in area under vegetables in the Haveri district (Table 4.1) has recorded a mild annual increment in tomato (6.46 %), cabbage (8.91 %), green chilli (10.78 %) which were significant at 1 per cent and in brinjal growth rate in area was 6.39 per cent which was significant at 5 per cent. The Haveri district registered an increment with CGR of 10.09 per cent, 10.49 per cent, 13.07 per cent and 5.22 per cent growths in the production of tomato, cabbage, green chilli and brinjal, respectively. The growth in productivity under tomato (3.42 %), cabbage (1.45 %) and green chilli (2.07 %) were positive, meanwhile productivity growth of brinjal was negative (-1.10 %) during the study period. Thus, it can be said that the area and production of selected vegetables in Haveri district were growing at a faster rate compared to the productivity during the study period.

4.1.2 Belagavi district

The area under cabbage has witnessed an increment of CGR of 10.69 per cent (Table 4.2) in Belagavi district which was significant at 1 per cent during the study period. Similarly, in the case of production an increment of CGR of 12.26 per cent, but was significant at 10 per cent in case of and productivity, mild increment of CGR of 1.45 per cent was noticed with respect to the crop. The area and production of green chilli in the district have CGRs of -0.95 per cent and 0.44 per cents respectively but were statistically non significant, whereas productivity increment was at of 1.41 per cent CGR which was significant at 1 per cent. The rate of growth of the tomato crop area in the district has shown increase rate at CGR of 5.93 per cent with the production rate at CGR of 5.84 per cent, both were significant at 1 per cent level, where as in the case of productivity, growth rate was negative (-0.08 %) and statistically non significant.

Table 4.1: Compound growth rate of area, production and productivity of selected vegetable crops in Haveri district

(Period: 2005-06 to 2015-16)

Sl. No.	Crops	Area (%)	R^2	Production (%)	R^2	Productivity (%)	R^2
1	Tomato	6.46**	0.717	10.09**	0.611	3.42	0.330
2	Cabbage	8.91**	0.759	10.49**	0.874	1.45	0.305
3	Green chilli	10.78**	0.648	13.07**	0.603	2.07^{NS}	0.147
4	Brinjal	6.39*	0.484	5.22*	0.383	-1.10^{NS}	0.072

Note: **significant at 1 per cent level, *significant at 5 per cent and NS – Non-significant

4.1.3 Hassan district

The results in table 4.3 indicate that, the area under tomato crop in the Hassan district has a decreased growth rate of -3.88 per cent with significance at 5 per cent, production (12.23 %) and productivity (16.76 %) in the district witnessed an increment in CGR with 1 per cent significance. The growth rate of green chilli area observed a negative growth at CGR of -2.46 per cent, but production (1.95 %) and productivity (4.53 %) observed positive growth during the study period and all these were statistically non significant. Similarly in the case of brinjal crop, area (-9.20 %) and production (-2.93 %) had negative growth rate and statistically non significant, whereas productivity (6.91 %) had increased growth rate, but significant at with 10 per cent. In the case of cabbage production (7.27 %) and productivity (6.90 %), confirmed increment growth rate in the district. Where area (0.35 %) under cabbage was observed mild increment and was statistically non significant. Thus, it can be said that the area under vegetable in Hassan district was observed negative growth compared to the production and productivity of during the study period.

4.1.4 Kolar district

From table 4.4, the results of the CGR in Kolar district indicate that the growth rate of area in vegetable crops had shown a negative trend with the exception of cabbage. By and large, green chilli and brinjal crops have recorded a negative area growth rate of -3.40 and -3.75 per cent respectively, and it were statistically significant at 1 per cent level. However, tomato had a negative area growth rate of -0.33 per cent and was statistically non significant. The productivity of green chilli, tomato and brinjal have shown an increase growth rate of 7.04, 5.33 and 5.41 per cent, respectively. However, the productivity growth rate of cabbage registered a negative growth date (-1.82 %) during the study period. Tomato and green chilli production registered positive compound growth rates of 4.98 per cent, 3.39 per cents respectively, while the growth rates of production of cabbage and brinjal were positive but insignificant.

4.2 Projected demand for vegetable seeds in Karnataka

The demand for related vegetable seeds was projected for 5 years i.e from 2016-17 to 2020-21 for Haveri, Belagavi, Hassan and Kolar districts using ARIMA models. The result of projected demand are presented in the table 4.5, 4.6, 4.7 and 4.8. These results would be helpful for different vegetable seed companies to give a target of sales volume and have a distribution plan in the respective districts.

4.2.1 Haveri district

It was observed from table 4.5 that, in the year 2015-2016 the actual demand for vegetable seeds stands at 577.35, 559.41, 1,513.54 and 376.05 kg for tomato, cabbage, green chilli and brinjal, respectively. Whereas, the projected demand in year 2016-17 stands at 602.66, 580.32, 1616.54 and 382.59 kgs for the four vegetable seeds, respectively. However, the projected demand for vegetable seeds in year 2020-21 stands at 697.42, 663.95, 1,986.71 and 408.77 kg for tomato, cabbage, green chilli and brinjal, respectively. In addition, the demand for vegetable seeds will be growing at the rate of 3.72, 3.42, 5.35 and 1.66 per cents per annum during the projected period for the four vegetable seeds respectively.

Table 4.2: **Compound growth rates of area, production and productivity of selected vegetable crops in Belagavi district**

(Period: 2005-06 to 2015-16)

Sl. No.	Crops	Area (%)	R^2	Production (%)	R^2	Productivity (%)	R^2
1	Tomato	5.93**	0.774	5.84**	0.830	-0.08^{NS}	0.0008
2	Cabbage	10.69**	0.908	12.26	0.927	1.42**	0.662
3	Green chilli	-0.95^{NS}	0.092	0.44^{NS}	0.028	1.41**	0.68
4	Brinjal	2.51*	0.363	2.43*	0.359	-0.08^{NS}	0.002

Note: **significant at 1 per cent level, *significant at 5 per cent and NS – Non-significant

Table 4.3: **Compound growth rates of area, production and productivity of selected vegetable crops in Hassan district**

(Period: 2005-06 to 2015-16)

Sl. No.	Crops	Area (%)	R^2	Production (%)	R^2	Productivity (%)	R^2
1	Tomato	-3.88*	0.445	12.23**	0.505	16.76**	0.718
2	Cabbage	0.35^{NS}	0.003	7.27*	0.398	6.90*	0.355
3	Green Chilli	-2.46^{NS}	0.072	1.95^{NS}	0.020	4.53^{NS}	0.175
4	Brinjal	-9.20**	0.901	-2.93^{NS}	0.068	6.91	0.258

Note: **significant at 1 per cent level, *significant at 5 per cent and NS – Non-significant

Table 4.4: **Compound growth rates of area, production and productivity of selected vegetable crops in Kolar district**

(Period: 2005-06 to 2015-16)

Sl. No.	Crops	Area (%)	R^2	Production (%)	R^2	Productivity (%)	R^2
1	Tomato	-0.33^{NS}	0.003	4.98**	0.681	5.33**	0.793
2	Cabbage	2.29**	0.529	0.42^{NS}	0.015	-1.82**	0.518
3	Green chilli	-3.40**	0.762	3.39	0.311	7.04**	0.604
4	Brinjal	-3.75**	0.737	1.46^{NS}	0.064	5.41*	0.482

Note: **significant at 1 per cent level, *significant at 5 per cent and NS – Non-significant

4.2.2 Belagavi district

It was observed from the table 4.6 that, in the year 2015-16, the actual demand for vegetable seeds stands at 760.06, 930.36, 1,741.69 and 556.31kg for tomato, cabbage, green chilli and brinjal, respectively. Whereas, the projected demand in year 2016-17 stands at 790.28, 974.73, 1,713.51 and 561.78 kgs for tomato, cabbage, green chilli and brinjal, respectively. Moreover, the projected demand for vegetable seeds in year 2020-21 stands at 911.15, 1,152.18, 1,713.51 and 583.63 kg for tomato cabbage, green chilli and brinjal, respectively. By and large, the growth rate of vegetable seed was growing at the rate of 3.62, 4.12, 0.00 and 0.96 per cent for tomato, respectively in the district.

4.2.3 Hassan district

It was evident from the table 4.7 that, in the year 2015-16, the actual demand for vegetable seeds stands at 149.35, 355.13, 545.87 and 2,150.55 kg for tomato, cabbage, green chilli and brinjal, respectively. Whereas, the projected demand in year 2016-17 stands at 139.09, 417.98, 544.12 and 1,555.84 kgs for tomato, cabbage, green chilli and brinjal, respectively. Also, the projected demand for vegetable seeds in year 2020-21 stands at 98.06, 437.61, 544.13 and 822.98 kg for tomato cabbage, green chilli and brinjal, respectively. Moreover, the growth rate of vegetable seed was growing at the rate of -8.35, 1.17, 0.00 and 30.68 per cent for tomato, cabbage, green chilli and brinjal, respectively in the study period.

4.2.4 Kolar district

The results in Table 4.8 indicated that, in the year 2015-16, the actual demand for vegetable seeds stands at 1,169.21, 899.45, 338.32 and 272.88 kg for tomato, cabbage, green chilli and brinjal, respectively. Whereas, the projected demand in year 2016-17 stands at 1,205.63, 919.90, 324.07 and 258.99 kgs for tomato, cabbage, green chilli and brinjal, respectively. Meanwhile, the projected demand for vegetable seeds in year 2020-21 stands at 1,205.63, 1,001.73, 267.06 and 203.46 kg for tomato cabbage, green chilli and brinjal, respectively. Also, the growth rate of vegetable seed was growing at the rate of 0.00, 2.14, -4.72 and -5.85 per cent for tomato, cabbage, green chilli and brinjal, respectively in the district.

4.3 Market structure of vegetable seed business

The survey was conducted to know the number of seed companies operating and level of market concentration in the study area. Later a pre-tested schedule was prepared and different company employees and distributors were inquired about sales volume of vegetable seeds for four selected crops *viz*., tomato, cabbage, green chilli and brinjal. Based on that market share of different vegetable seeds companies in the districts were obtained and calculated by using Harfindal-Hirschman Index (HHI).

4.3.1 Market Structure

Economists evaluate the degree of “concentration” in analyzing market structure and assessing its impact on market conduct and performance. Market concentration is the major factor considered to know the structure of the market. Market concentration is a function of the number of firms and their respective shares of the total sales in a market. Alternative terms are industry concentration and seller concentration.

Table 4.5: Projected demand for selected vegetables seeds in Haveri district

Sl. No.	Crops	Demand (kg) 2015-16	Demand during the years (kg)					Average annual growth rate
			2016-17	2017-18	2018-19	2019-20	2020-21	
1	Tomato	577.35	602.66	626.35	650.04	673.73	697.42	3.72
2	Cabbage	559.41	580.32	601.23	622.14	643.05	663.95	3.42
3	Green chilli	1,513.54	1,616.54	1,709.08	1,801.63	1,894.17	1,986.71	5.35
4	Brinjal	376.05	382.59	389.14	395.68	402.23	408.77	1.66

Table 4.6: Projected demand for selected vegetables seeds in Belgavi district

Sl. No.	Crops	Demand (kg) 2015-16	Demand during the years (kg)					Average annual growth rate
			2016-17	2017-18	2018-19	2019-20	2020-21	
1	Tomato	760.06	790.28	820.49	850.71	880.93	911.15	3.62
2	Cabbage	930.36	974.73	1,019.09	1,063.45	1,107.82	1,152.18	4.12
3	Green chilli	1,741.69	1,713.51	1,713.51	1,713.51	1,713.51	1,713.51	0.00
4	Brinjal	556.31	561.78	567.24	572.70	578.17	583.63	0.96

Table 4.7: Projected demand for selected vegetables seeds in Hassan district

Sl. No.	Crops	Demand (kg) 2015-16	Demand during the years (kg)					Average annual growth rate
			2016-17	2017-18	2018-19	2019-20	2020-21	
1	Tomato	149.35	139.09	128.84	118.58	108.32	98.06	-8.35
2	Cabbage	355.13	417.98	437.61	437.61	437.61	437.61	1.17
3	Green chilli	545.87	544.12	544.13	544.13	544.13	544.13	0.00
4	Brinjal	2,150.55	1,555.84	9,61.14	366.43	228.27	822.98	30.68

Table 4.8: Projected demand for selected vegetables seeds in Kolar district

Sl. No.	Crops	Demand (kg) 2015-16	Demand during the years (kg)					Average annual growth rate
			2016-17	2017-18	2018-19	2019-20	2020-21	
1	Tomato	1,169.21	1,205.63	1,205.63	1,205.63	1,205.63	1,205.63	0.00
2	Cabbage	899.45	919.91	940.36	960.82	981.27	1,001.73	2.14
3	Green chilli	338.32	324.07	309.82	295.57	281.31	267.06	-4.72
4	Brinjal	272.88	258.99	245.11	231.23	217.35	203.46	-5.85

4.3.2 Market structure of vegetable seed business in Haveri district

4.3.2.1 Tomato

Based on the volume of sales, the per cent share of different seed companies (Table 4.9) indicates that around 61.30 per cent of the market share of tomato seed market was captured by the Rasi seeds company. US Agri seeds and Mahyco seeds companies had a share of 17.51 per cent each. Bio seeds accounted 3.50 per cent of the total sales volume. Harfindal Index was 4,383.13 which indicated high degree of market concentration in tomato seed market (Fig. 4.1). In other words, there was no stiff competition among companies to capture the market.

4.3.2.2 Cabbage

It was observed from the results in table 4.9 that Harfindal Index of cabbage seed market was 4,070.59 which depicted high degree of market concentration. Further about 61.30 per cent share of cabbage seed market was captured by Seminis seeds seed company, followed by Mahyco seeds (9.98 %), Ankur seeds (9.98 %) and Welcome seeds (7.66 %). Other different vegetable companies contributed around 3.83 per cent to the total cabbage seeds in the market in the Haveri district. The market confirms there was no stiff competition among companies to capture the market during the study period (Fig. 4.2).

4.3.2.2 Green chilli

The market concentration in green chilli seed market was very high (Table 4.9). Beejo Sheetal company had the majority of the market share (64.36 %), followed by Seminis seeds (16.26 %), Sungro seeds (11.92 %), Mahyco seeds (4.88 %) and Tandindo seeds (1.56 %). Herfindal Index was 4,575.11, which registered there was no stiff competition among companies to capture the market (Fig. 4.3).

4.3.2.4 Brinjal

The results in the Table 4.9 also reveals that, 73.53 per cent of the market share of brinjal seed market was captured by Rasi seeds company, whereas, Mahyco seeds, Beejo Sheetal and East-West seeds companies had 14.71, 5.88 and 5.88 per cents of the market share, respectively. Harfindal Index was 5,692.19 which indicated high degree of market concentration of brinjal seed market and difficult for new companies to enter in brinjal market in Haveri district (Fig. 4.4).

4.3.3 Market structure of vegetables seed business in Belagavi district

District vegetables sales volume per cent shares of different seed companies are presented in Table 4.10.

4.3.3.1 Tomato

It could be noted from results in Table 4.10 that Sungro seeds and US Agri seeds companies had the highest equal share in the market that is 25.48 per cent each, followed by Rasi seeds (12.74 %) and Syngenta (12.74 %). Other 7 companies contribute 23.75 per cent of market share each (Fig. 4.5). Furthermore, the Herfindal Index was 1,811.10 which illustrated a moderate concentration in the tomato market of the Belagavi during the study period.

Table 4.9: Market share of vegetable seed companies in Haveri District

Sl. No.	Crop	Seed companies and hybrid	Market (% share)	HHI	Market Concentration
1	Tomato	Rasi seeds (Shivam)	61.30	**4,383.13**	**High degree of concentration**
		US Agi seeds (US-800)	17.51		
		Mahyco seeds (Bio-90)	17.51		
		Bio seeds (303)	3.50		
		Others 8 companies	0.18		
2	Cabbage	Seminis seeds (Saint)	61.30	**4,070.59**	**High degree of concentration**
		Welcome seeds (Annaji)	7.66		
		Mahyco seeds (118)	9.98		
		Ankur seeds (Manasa)	9.98		
		Noble seeds seeds	7.09		
		Others 6 companies	3.83		
3	Green chilli	Beejo sheetal (BSS-414)	64.36	**4,575.11**	**High degree of concentration**
		Sungro seeds (S16)	11.92		
		Mahyco seeds (Teja-4)	4.88		
		Seminis seeds (Sitara)	16.26		
		Tanindo	1.56		
		Others 6 companies	1.02		
4	Brinjal	Mahyco seeds (Super 10)	14.71	**5,692.19**	**High degree of concentration**
		Rasi seeds (Dhruva)	73.53		
		Beejo sheetal (Darpan)	5.88		
		East-West (Lalith)	5.88		

HHI: Herfindahal-Hirschman Index

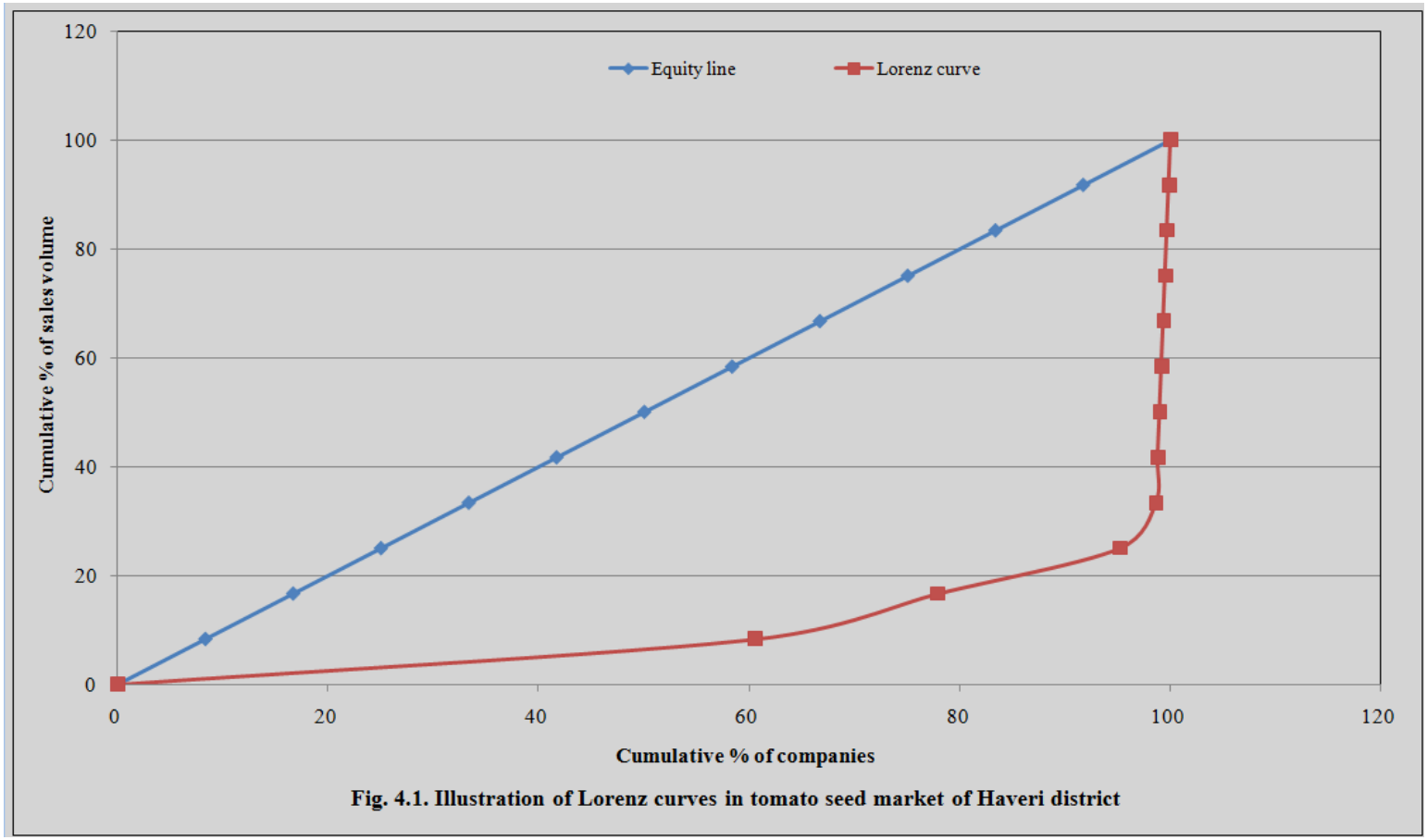

Fig. 4.1. Illustration of Lorenz curves in tomato seed market of Haveri district

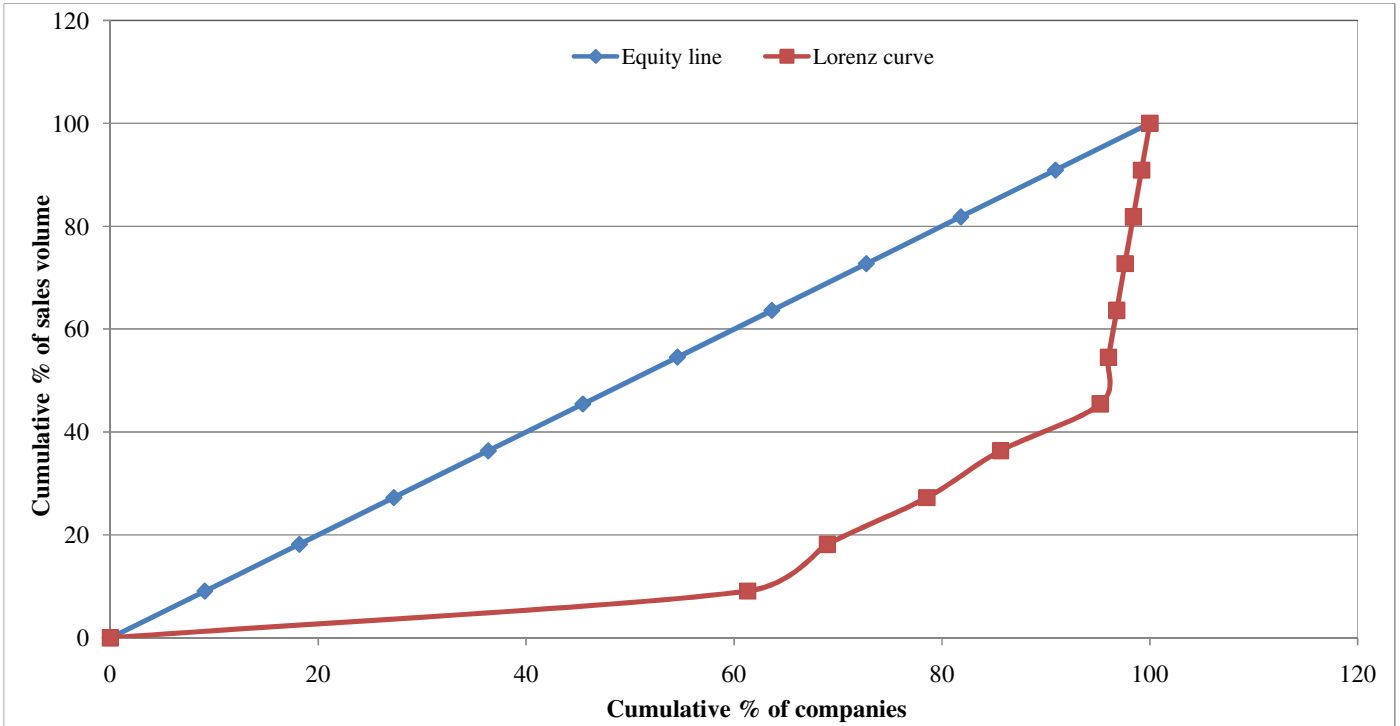

Fig. 4.2. Illustration of Lorenz curves in cabbage seed market of Haveri district

Fig. 4.2. Illustration of Lorenz curves in cabbage seed market of Haveri district

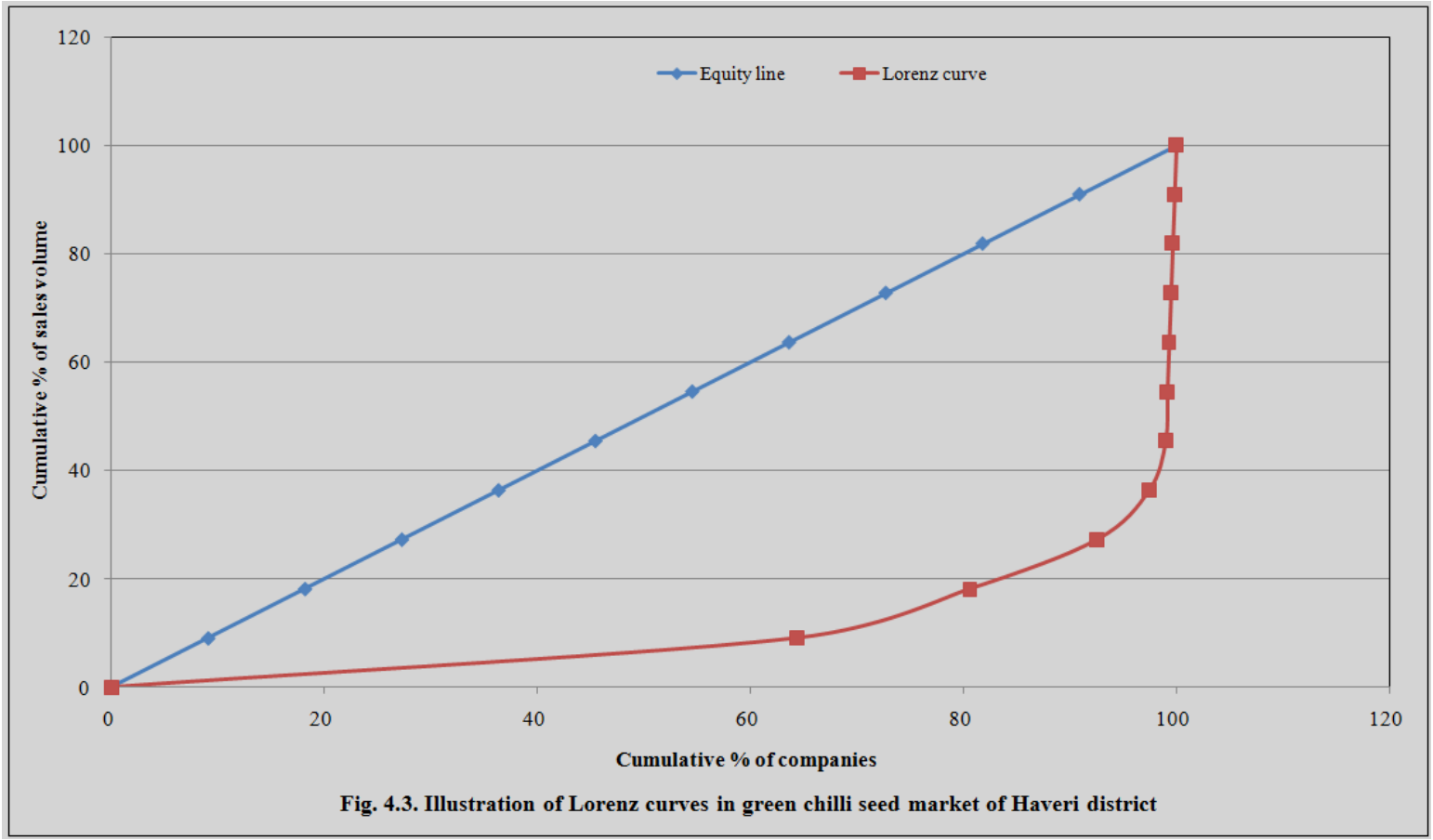

Fig. 4.3. Illustration of Lorenz curves in green chilli seed market of Haveri district

Fig. 4.3. Illustration of Lorenz curves in green chilli seed market of Haveri district

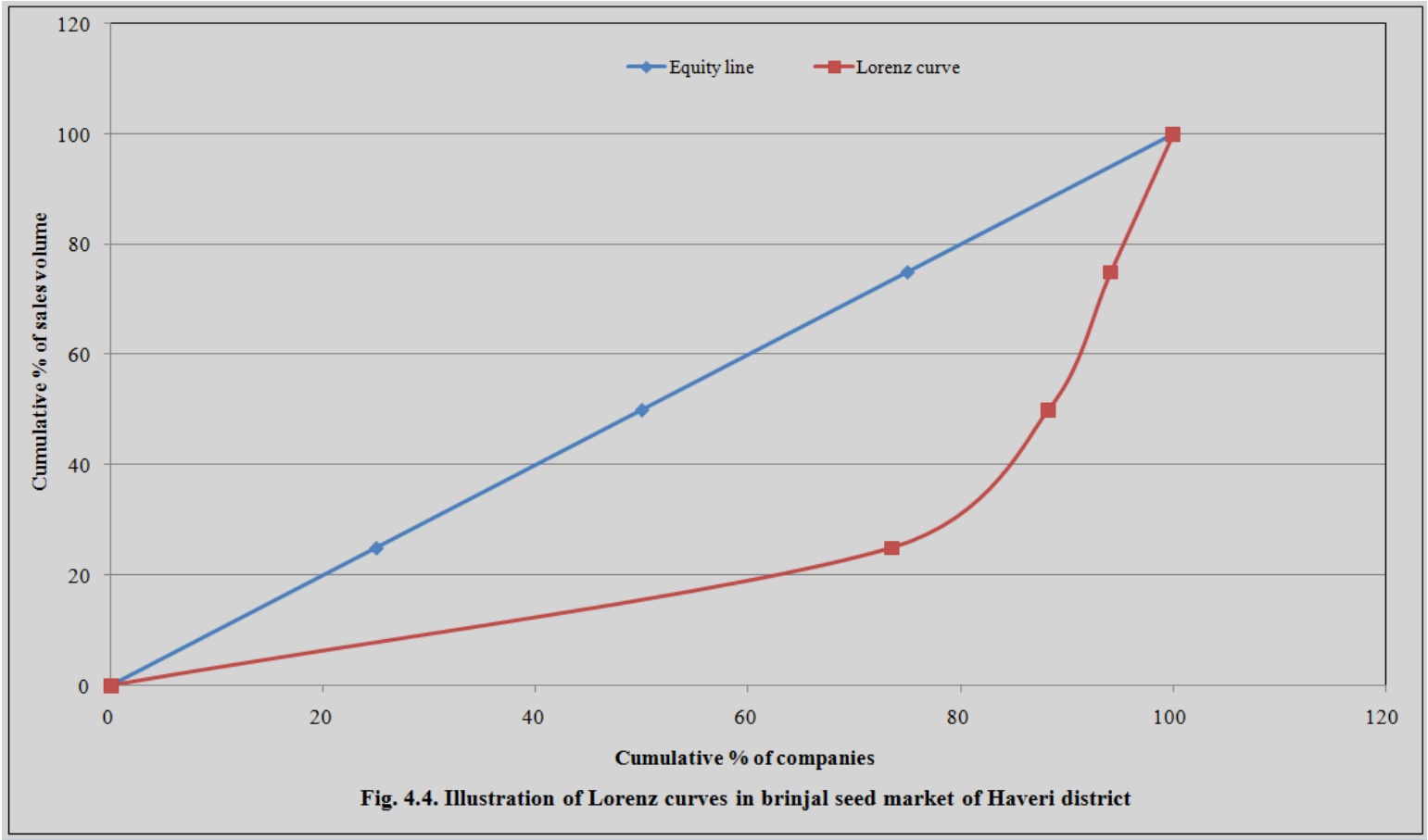

Fig. 4.4. Illustration of Lorenz curves in brinjal seed market of Haveri district

4.3.3.2 Cabbage

The results in the table also showed, that Seminis seeds company had the highest share of the cabbage seed market and it contributes of 76.92 per cent, while, Mahyco seeds, Tokita seeds and Welcome seeds contributed 6.41, 6.41 and 5.13 per cent each, respectively. Herfindal Index was 6,028.94 which indicated very high degree of concentration in the cabbage market; it shows that the cabbage market in the study area has no stiff competition (Fig. 4.6).

4.3.3.3 Green chilli

In Table 4.10 the results indicated that, in green chilli seed market, Tanindo seeds had the bulk market share of 57.69 per cent. This was followed by Nangwoo Bio seeds (12.82 %), Sngenta (7.69 %) and Seminis seeds (6.00 %). Harfindal Index was 3,635.79 which revealed high degree of market concentration in green chilli seed market in the study area (Fig. 4.7).

4.3.3.4 Brinjal

It could be observed from the results in Table 4.10 that Mahyco seeds company had the market share of 49.32 per, which is the uppermost, followed by, Seminis seeds (21.92 %), Rasi seeds (8.22 %) and East-West seeds (6.85 %). Herfindal Index was 3,121.28 which suggested presence of high degree of concentration in the brinjal market of Belgavi district (Fig. 4.8).

4.3.4 Market structure of vegetables seed business in Hassan district

Hassan district vegetables sales volume per cent shares of different seed companies are presented in table 4.11.

4.3.4.1 Tomato

Results in table 4.11 revealed that tomato seed market in Hassan district had high degree of concentration, as Clausa seeds company had the preponderance of market share that is 41.67 per cent, Syngenta had 16.67 per cent, Seminis seeds and Bio seeds captured equal market share that is 12.50 per cent each. Harfindal Index was 2,366.48 which indicate extended of moderate degree of market concentration in tomato seed market (Fig. 4.9).

4.3.4.2 Cabbage

It was observed from the results in table 4.11 that, Syngenta company had the highest market share of 40.85 per cent in the cabbage market, followed by Seminis seeds, Mahyco seeds and Nunhems seeds which represented 22.89, 26.40 and 5.28 per cent of the market share, respectively. Further, Herfindal Index was 2,899.72 which indicated high degree of concentration in the tomato market of the study area (Fig. 4.10).

4.3.4.3 Green chilli

East-West company has the market share of 55.12 per cent of green chilli market share, followed by Seminis seeds (22.44 %), Beejo Sheetal (11.22 %) and Kalsh (9.62 %), respectively (Table 4.11). The Herfindal Index was 3,762.75 which implied a high degree of concentration in the green chilli seed market of Hassan district (Fig. 4.11).

Table 4.10: Market share of vegetable seed companies in Belgavi district

Sl. No.	Crop	Seed companies	Market (% share)	HHI	Market Concentration
1	Tomato	Sungro (S-85)	25.48	**1,811.10**	**Moderate degree of concentration**
		US Agri seeds (US-800)	25.48		
		Rasi seeds (Ryna)	12.74		
		Syngenta (1057)	12.74		
		Others 7 companies share	23.75		
2	Cabbage	Seminis seeds (Saint)	76.92	**6,028.94**	**High degree of concentration**
		Mahyco seeds (118)	6.41		
		Tokita seeds (Green Rock)	6.41		
		Welcome seeds (Annaji)	5.13		
		Others 7 companies share	5.13		
3	Green chilli	Tanindo seeds (Siri)	57.69	**3,635.79**	**High degree of concentration**
		Nangwoo bio seeds (Tara)	12.82		
		Syngenta (1,900)	7.69		
		Seminis seeds (Sitara)	6.00		
		Other 5 companies	6.14		
4	Brinjal	East-West (Meghana)	6.85	**3,121.28**	**High degree of concentration**
		Mahyco seeds (Super-10)	49.32		
		Seminis seeds (Manjre)	21.92		
		Rasi seeds (Dhruva)	8.22		
		Other 2 companies	13.70		

HHI: Herfindahal-Hirschman Index

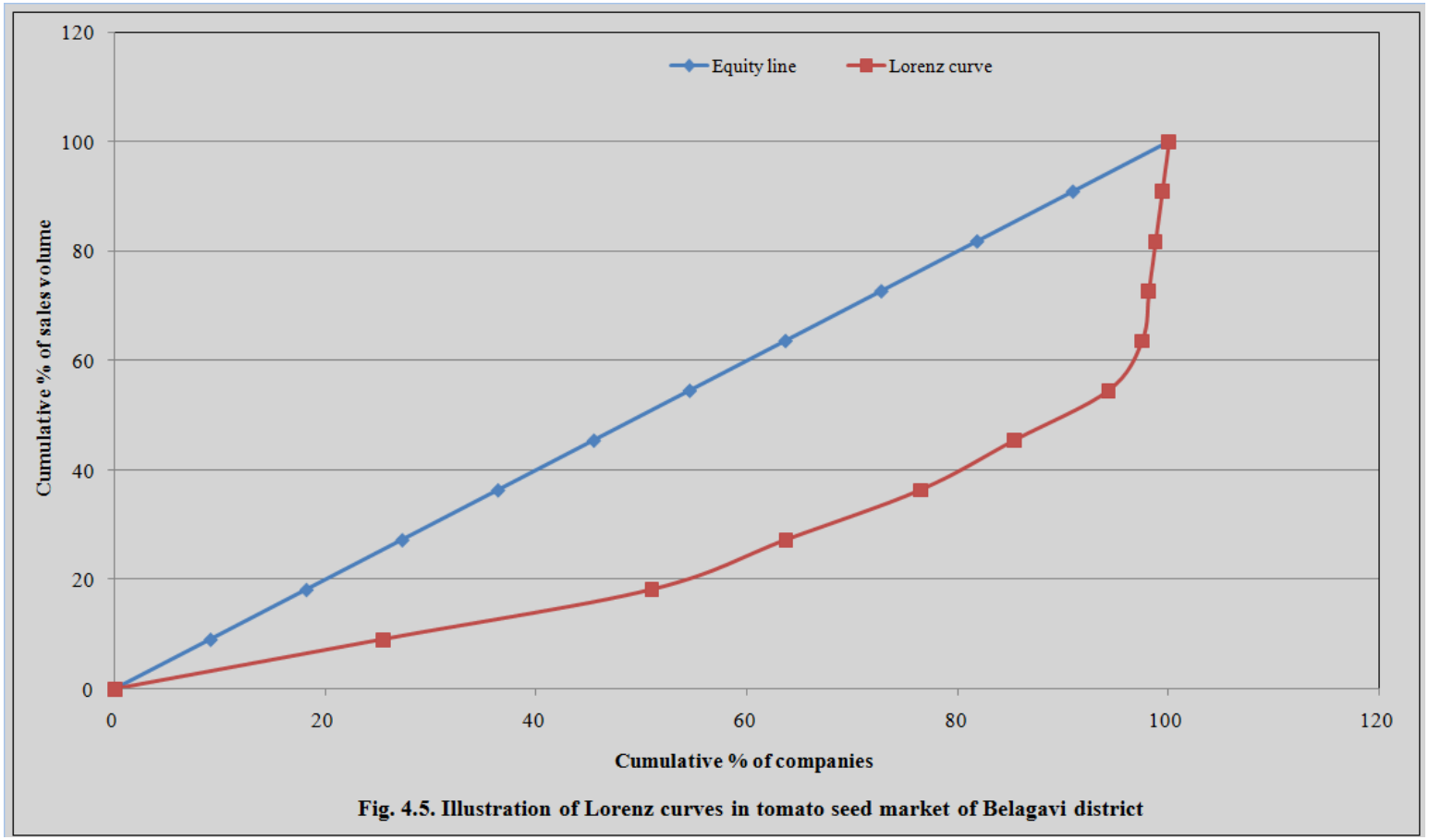

Fig. 4.5. Illustration of Lorenz curves in tomato seed market of Belagavi district

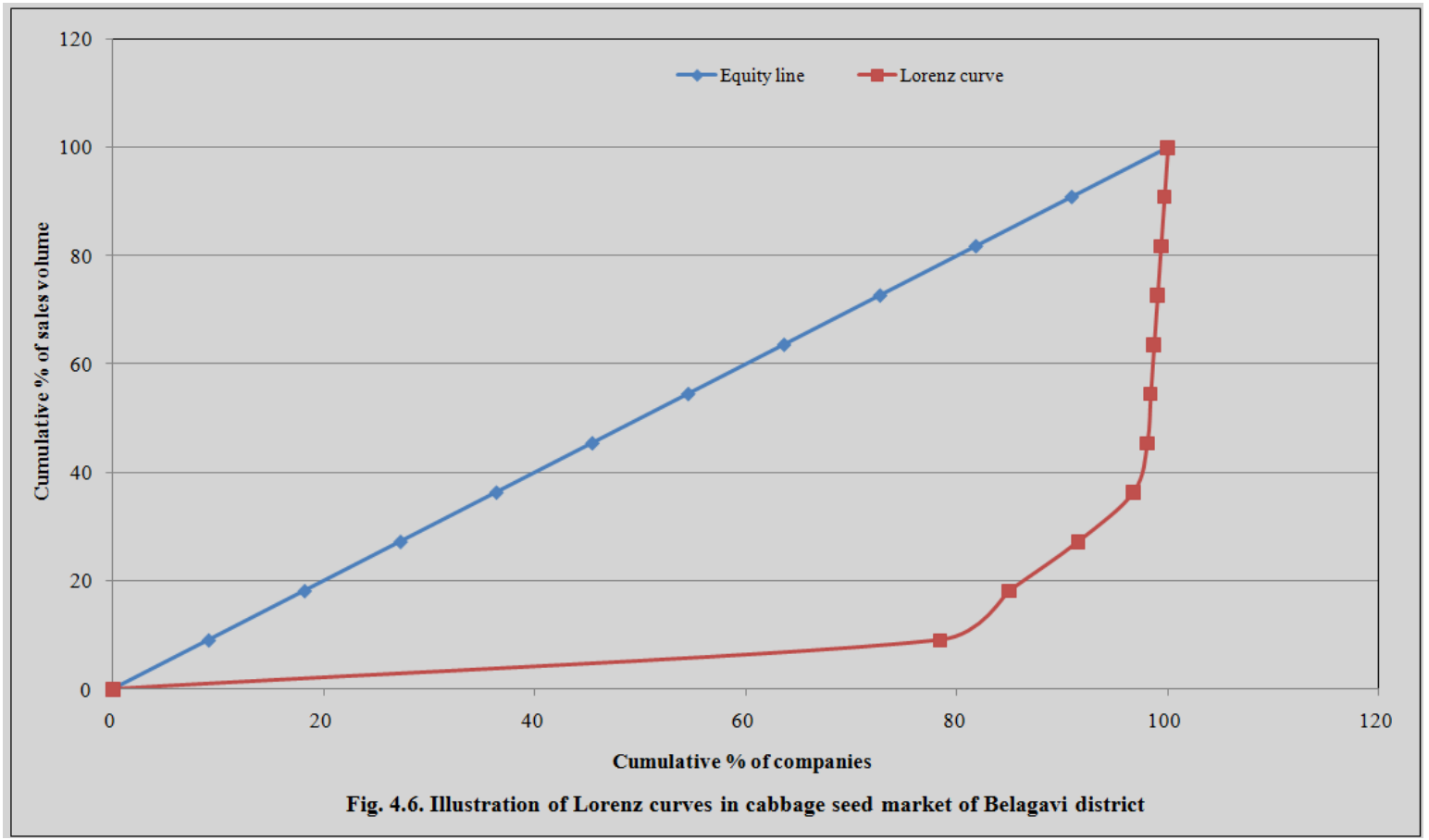

Fig. 4.6. Illustration of Lorenz curves in cabbage seed market of Belagavi district

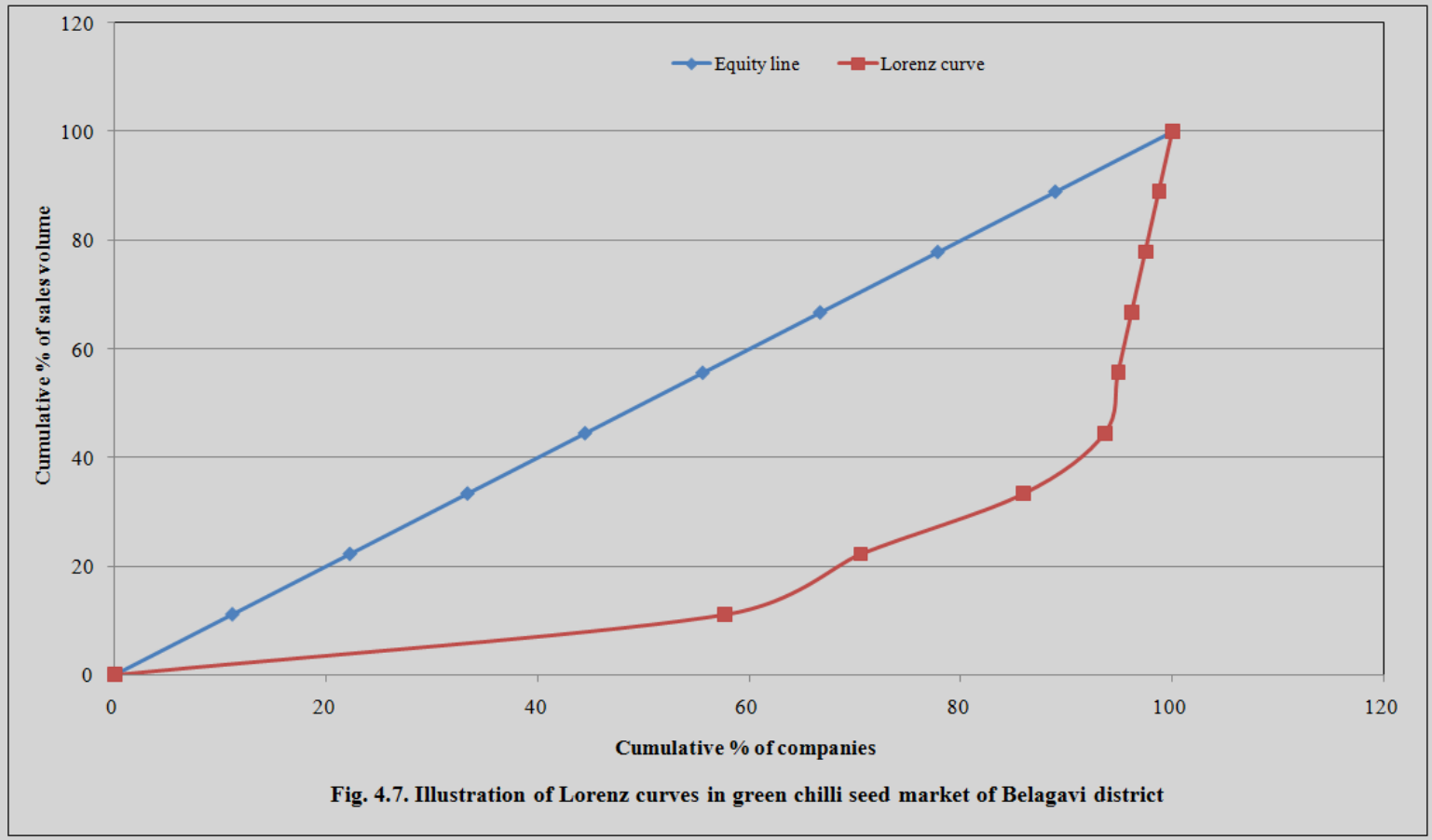

Fig. 4.7. Illustration of Lorenz curves in green chilli seed market of Belagavi district

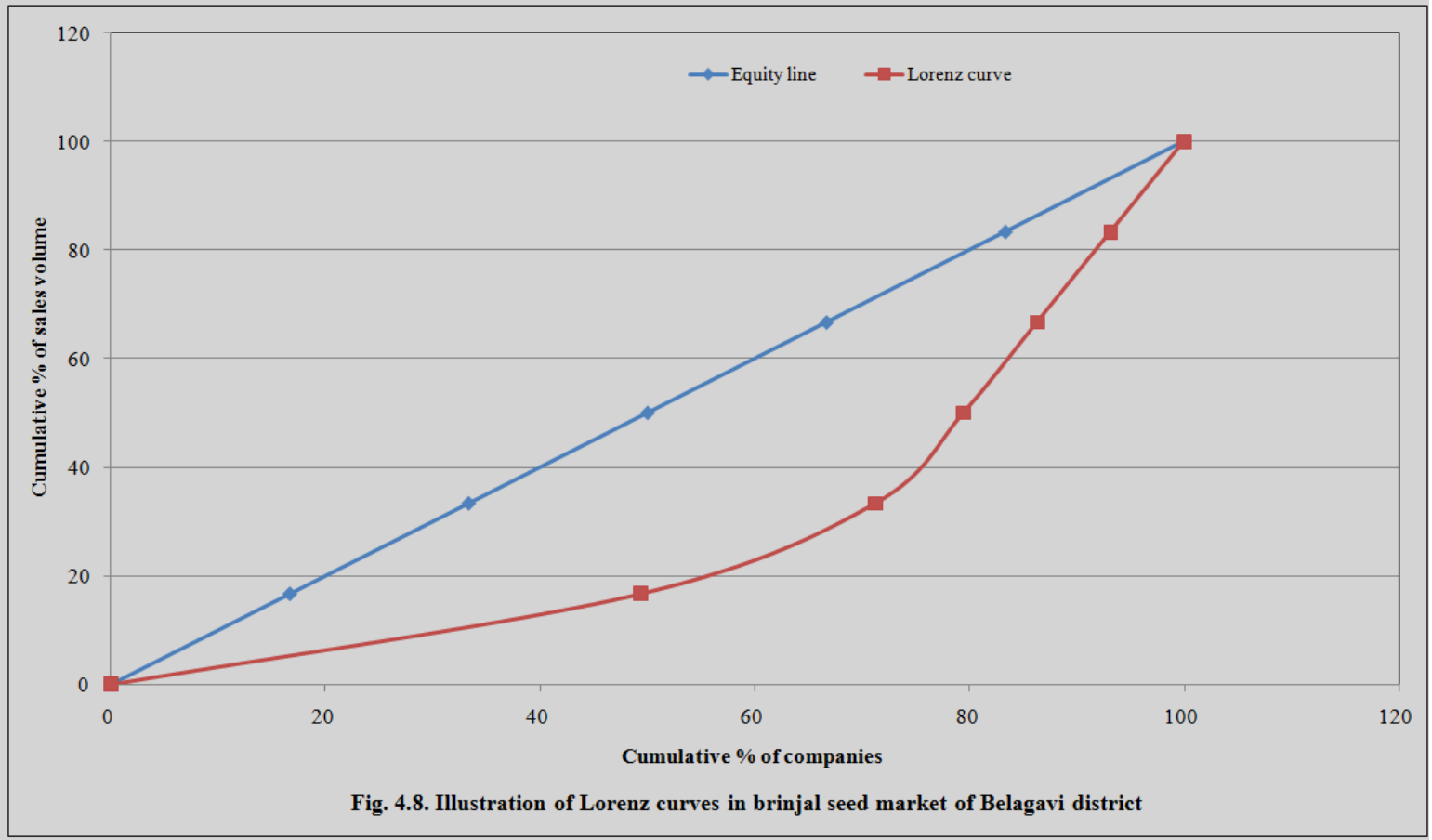

Fig. 4.8. Illustration of Lorenz curves in brinjal seed market of Belagavi district

Table 4.11: Market share of vegetable seed companies in Hassan district

SL. No	Crop	Seed companies	Market (% share)	HHI	Market Concentration
1	Tomato	Clausa seeds (Alankara)	41.67	**2,366.48**	**Moderate degree of concentration**
		Syngenta (1057)	16.67		
		Seminis seeds (Ayushman)	12.50		
		Bio seeds (Bio-90)	12.50		
		Other 7 companies	16.67		
2	Cabbage	Syngenta (Quisto)	40.85	**2,899.72**	**High degree of concentration**
		Seminis seeds (Saint)	22.89		
		Mahyco seeds (118)	26.40		
		Nunhems seeds (Harirani)	5.28		
		Other 5 companies	4.58		
3	Green chilli	East-West (Ulka)	55.12	**3,762.75**	**High degree of concentration**
		Seminis seeds (Sitar)	22.44		
		Beejo Sheetal (Priyanka)	11.22		
		Kalash seeds (Disha)	9.62		
		Other 3 companies	1.60		
4	Brinjal	Mahyco seeds (MH-9)	95.97	**9,217.65**	**High degree of concentration**
		Golden seeds (F-9)	1.92		
		Sungro (134)	1.92		
		Rasi seeds (Dhruva)	0.19		

HHI: Herfindahal-Hirschman Index

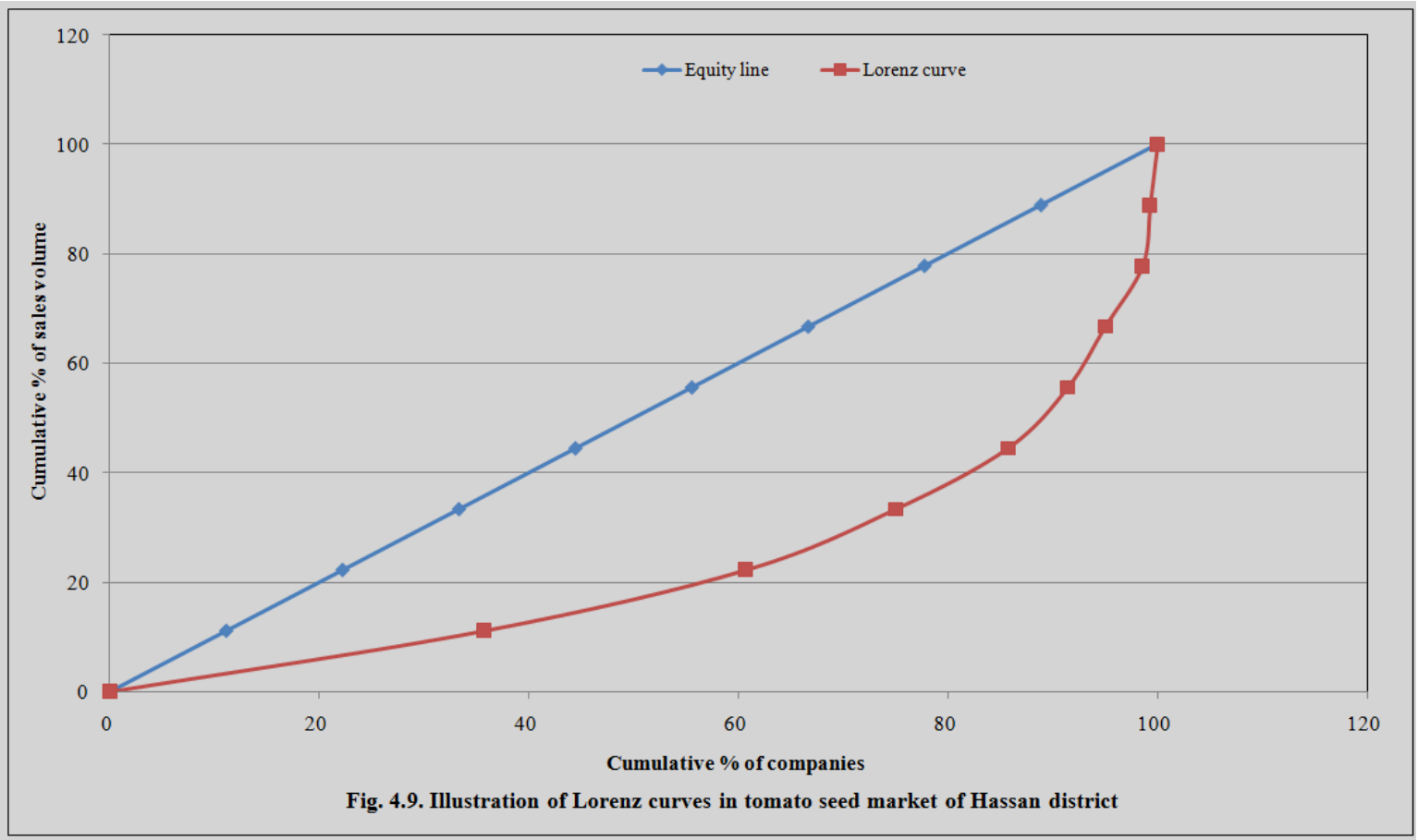

Fig. 4.9. Illustration of Lorenz curves in tomato seed market of Hassan district

Fig. 4.9. Illustration of Lorenz curves in tomato seed market of Hassan district

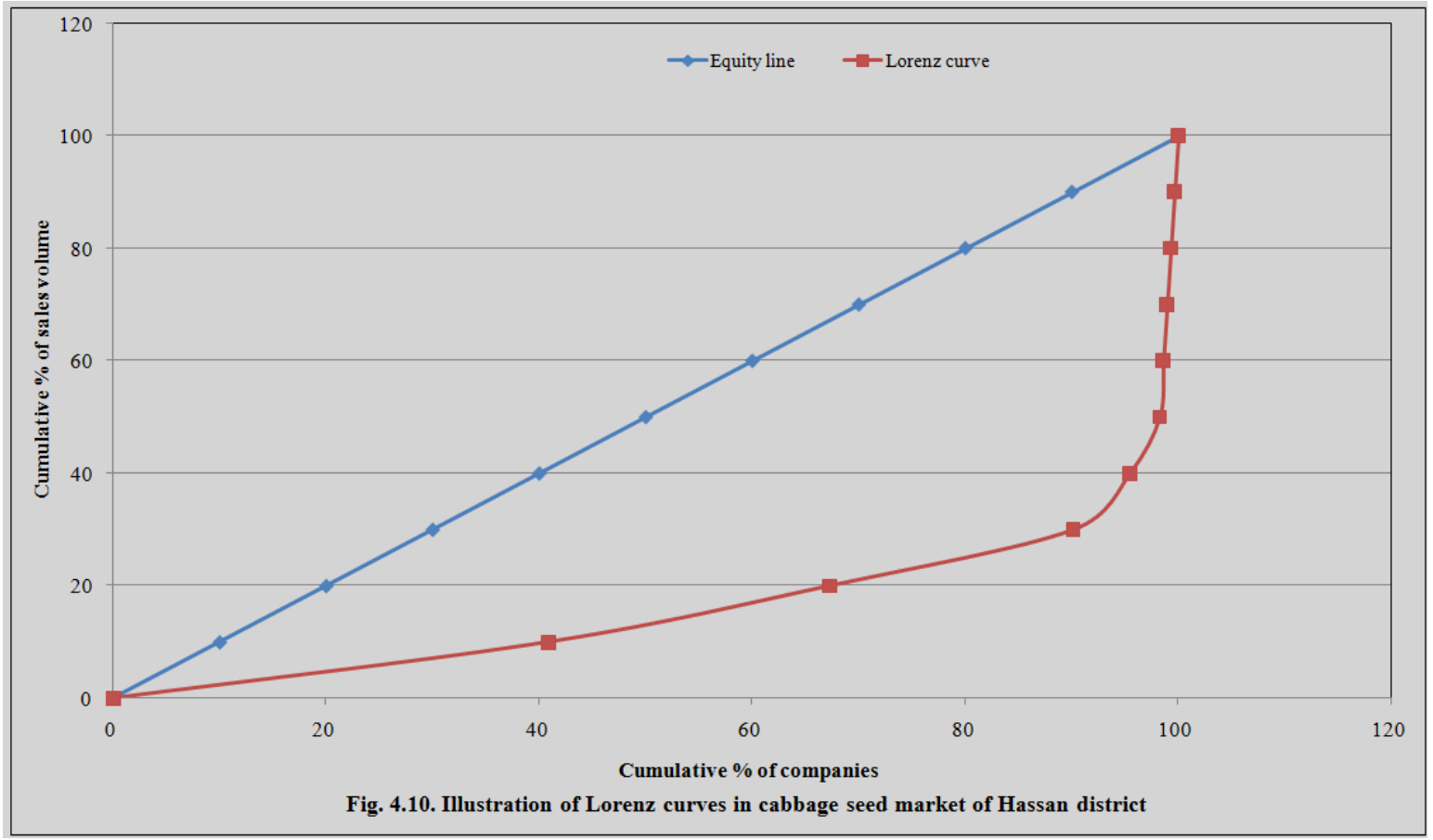

Fig. 4.10. Illustration of Lorenz curves in cabbage seed market of Hassan district

Fig. 4.10. Illustration of Lorenz curves in cabbage seed market of Hassan district

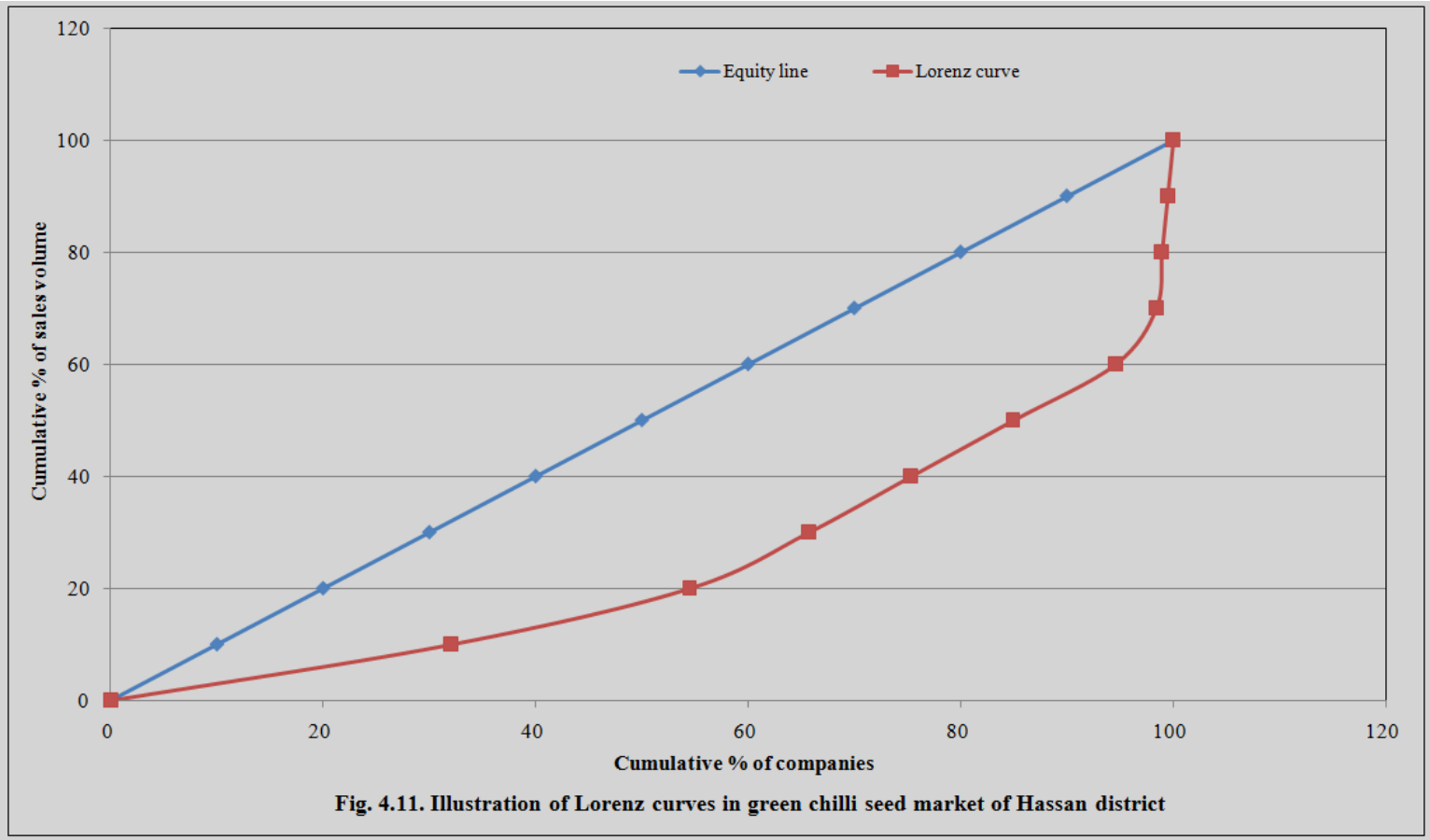

Fig. 4.11. Illustration of Lorenz curves in green chilli seed market of Hassan district

Fig. 4.11. Illustration of Lorenz curves in green chilli seed market of Hassan district

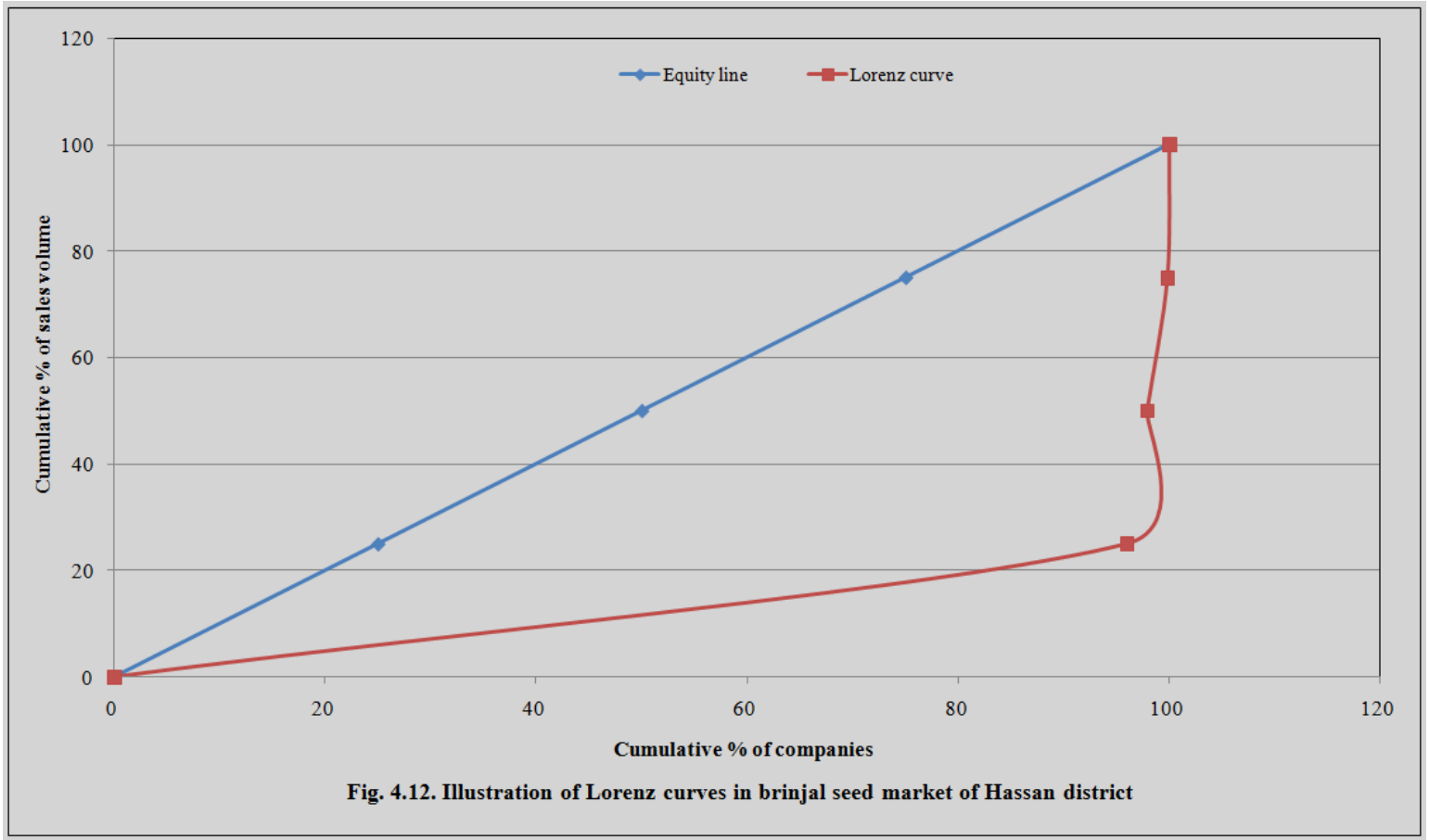

Fig. 4.12. Illustration of Lorenz curves in brinjal seed market of Hassan district

4.3.4.4 Brinjal

The results in the Table 4.11 indicated that, Mahyco seeds company enjoyed a lion's share of 95.97 per cent in the brinjal market. Both Golden seeds and Sungro seeds had captured a marker share of 1.92 per cent, while Rasi seeds 0.19 per cent, respectively and Herfindal Index was 9,217.65 which is the evidence of high degree of concentration of brinjal seed market in the study area (Fig. 4.12).

4.3.5 Market structure of vegetables seed business in Kolar district

Kolar district vegetables sales volume per cent share of different seed companies are given in Table 4.12.

4.3.5.1 Tomato

It was found that US Agri seeds had the largest market share of 61.22 per cent, followed by Syngenta, Indo-American seeds and Namdhari seeds which contributes 15.51, 15.51 and 6.53 per cent each, respectively as indicated in Table 4.15. Herfindal Index was 4,275.14 which pointed out high degree of concentration of tomato seed market in Kolar district (Fig. 4.13).

4.3.5.2 Cabbage

It is evident from the Table 4.12 that, cabbage seed market was dominated by Nunhems seeds which had controlled 86.31 per cent of market share. Next to Nunhems seeds, Rasi seeds (11.90 %), Seminis seeds (1.79 %) and Mahyco seeds (0.60 %). Herfindal Index was highest 7,491.38 which suggested presence of high degree of market concentration in the study period (Fig. 4.14).

4.3.5.3 Green chilli

It was revealed from results in Table 4.12 that, Namdhari seeds and US Agri seeds had major market shares of 38.60 and 35.09 per cent, respectively. East-West seeds and Kalash seeds controlled 17.54 and 8.77 per cent each of the green chilli market, respectively. Herfindal Index was 3,105.83 which demonstrated the high degree of concentration in the Kolar green chilli market (Fig. 4.15).

4.3.5.4 Brinjal

It was found that Mahyco seeds was having the foremost market share of 54.55 per cent, followed by, East-West seeds (27.27 %), Ankur seeds (9.09 %) and Rasi seeds (9.09 %) as indicated in Table 4.15. and Herfindal Index was 3,884.61 which illustrated the existence of high degree of concentration in the study period (Fig. 4.16).

4.4 Conduct and performance of vegetable seed companies

4.4.1 Market conduct

Before a communication and advertising plan is put in place the company determines where it is on the promotion pyramid. The promotion pyramid describes the market as it relates to the company. It is worth noticing that those who ignore the existence of company always make up the majority at the base of the pyramid. The number of people having knowledge of a company's existence, products and services narrows as this knowledge becomes more precise. Those who will ultimately buy a company's product are the smallest group on the tip of the pyramid.

Table 4.12: Market share of vegetable seed companies in Kolar District

Sl. No.	Crop	Seed companies	Market (% share)	HHI	Market Concentration
1	Tomato	US Agri seed (US-400)	61.22	**4,273.14**	**High degree of concentration**
		Syngenta (Abhinav)	15.51		
		Indo-American seeds	15.51		
		Namdhari (1601)	6.53		
		Seminis	1.22		
2	Cabbage	Nunhems (Unnati)	85.71	**7,491.38**	**High degree of concentration**
		Seminis (Saint)	1.79		
		Rasi seeds (Uttam)	11.90		
		Mahyco seeds (118)	0.60		
3	Green chilli	Namdhari (1101)	38.60	**3,105.83**	**High degree of concentration**
		US agri seeds (US-16)	35.09		
		East-West (Ulka)	17.54		
		Kalash (Disha)	8.77		
4	Brinjal	Mahyco seeds (MH-11)	54.55	**3,884.61**	**High degree of concentration**
		Ankur seeds (Ajay)	9.09		
		Rasi seeds (Druva)	9.09		
		East-West (Lalith)	27.27		

HHI: Herfindahal-Hirschman Index

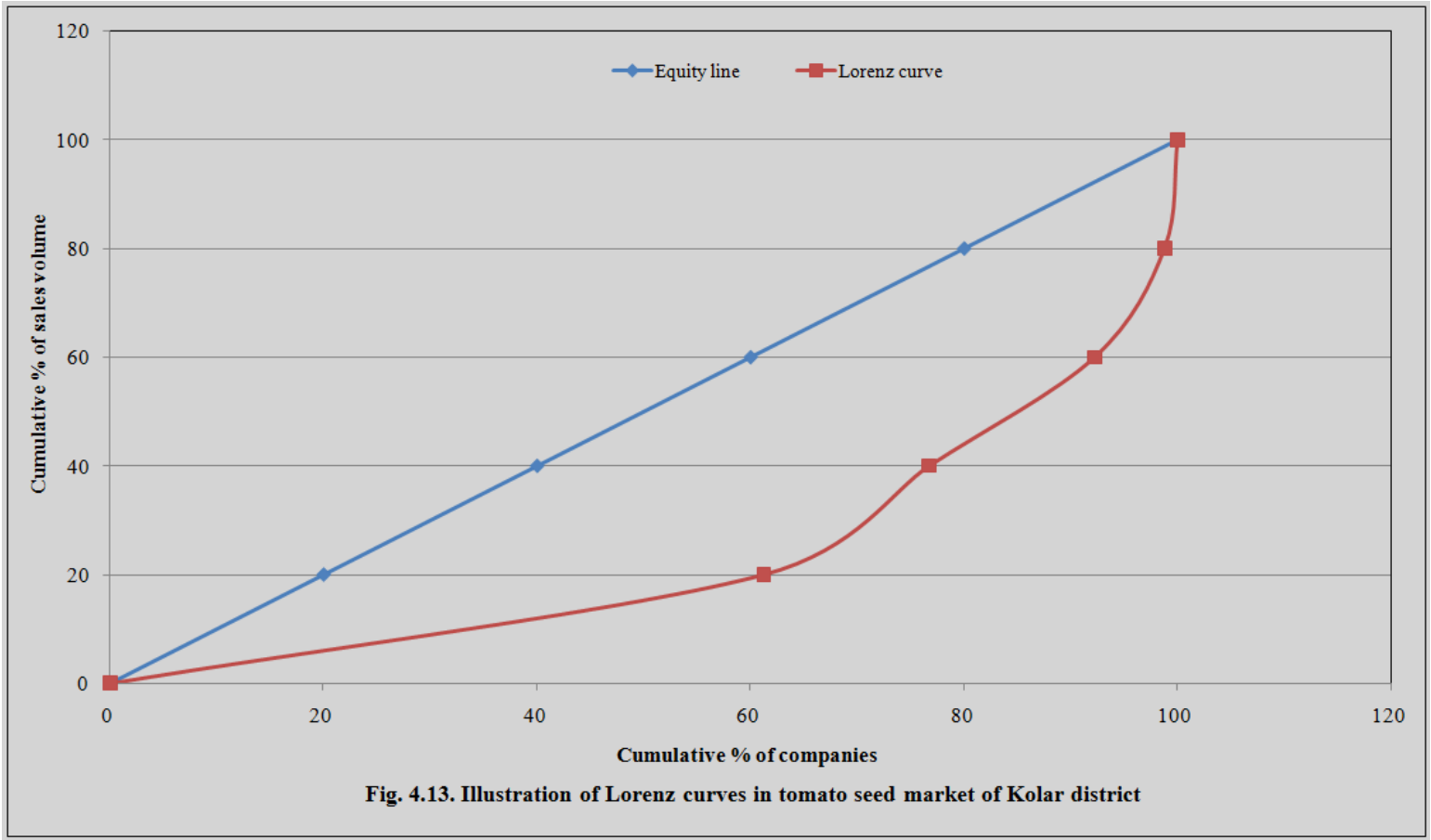

Fig. 4.13. Illustration of Lorenz curves in tomato seed market of Kolar distric

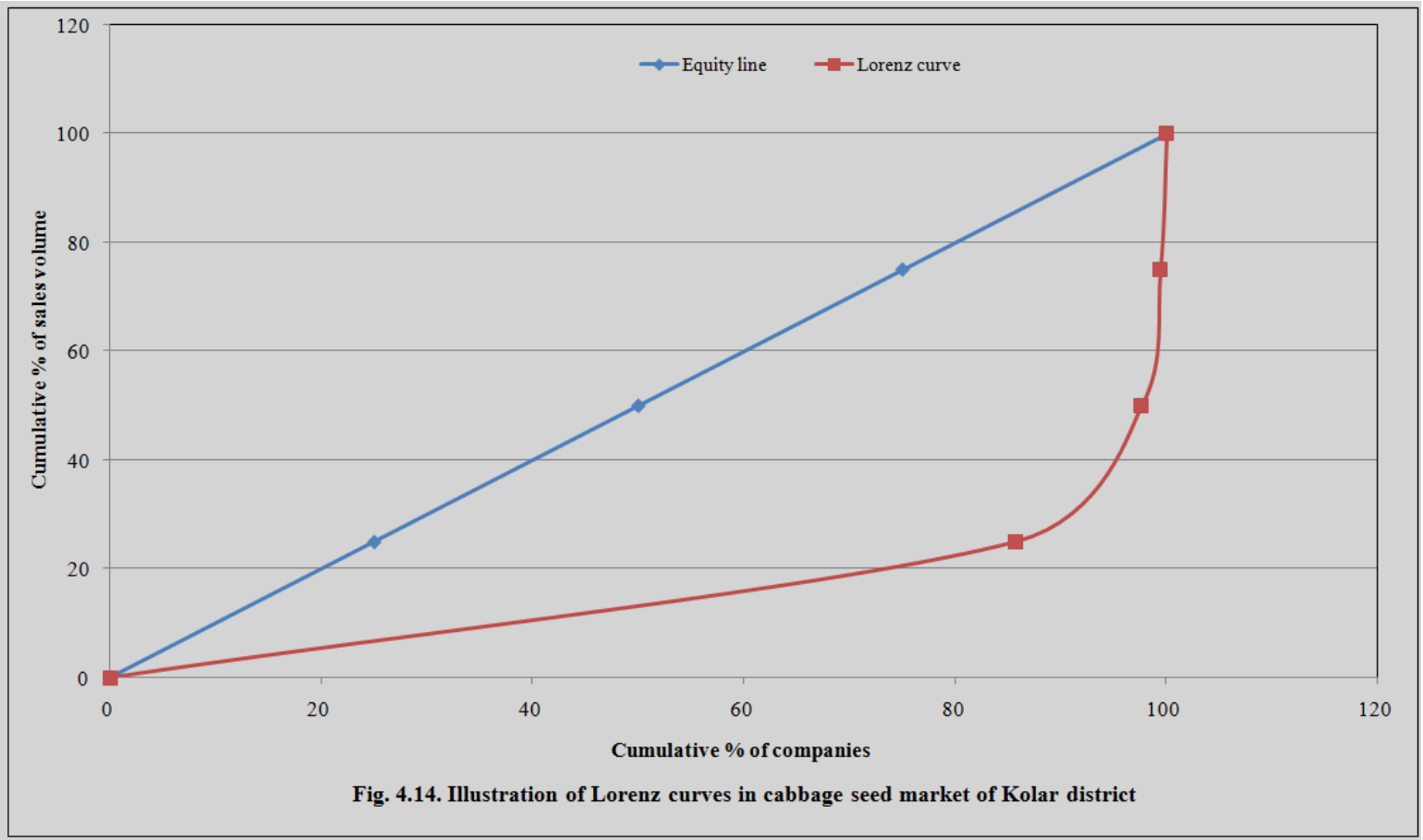

Fig. 4.14. Illustration of Lorenz curves in cabbage seed market of Kolar district

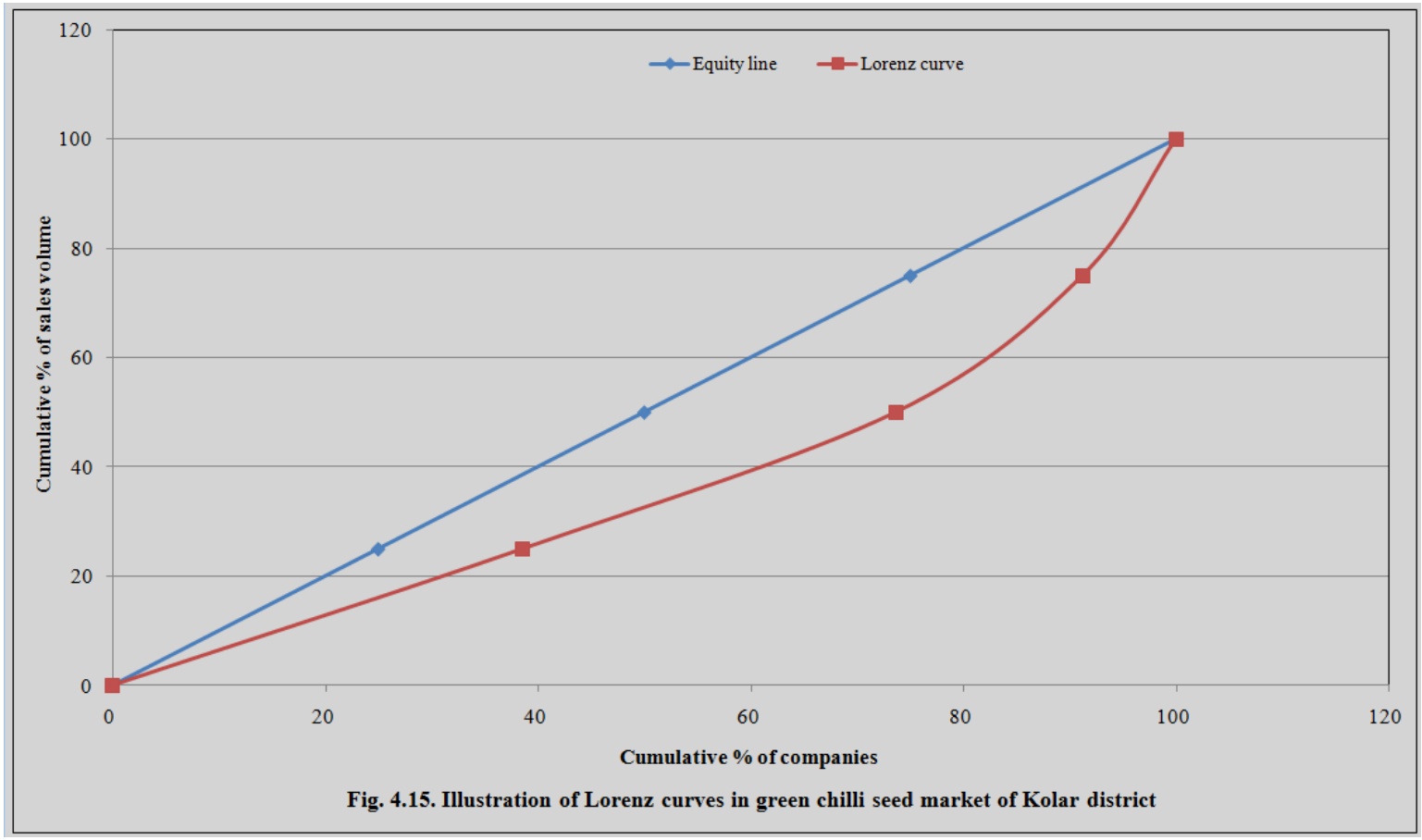

Fig. 4.15. Illustration of Lorenz curves in green chilli seed market of Kolar district

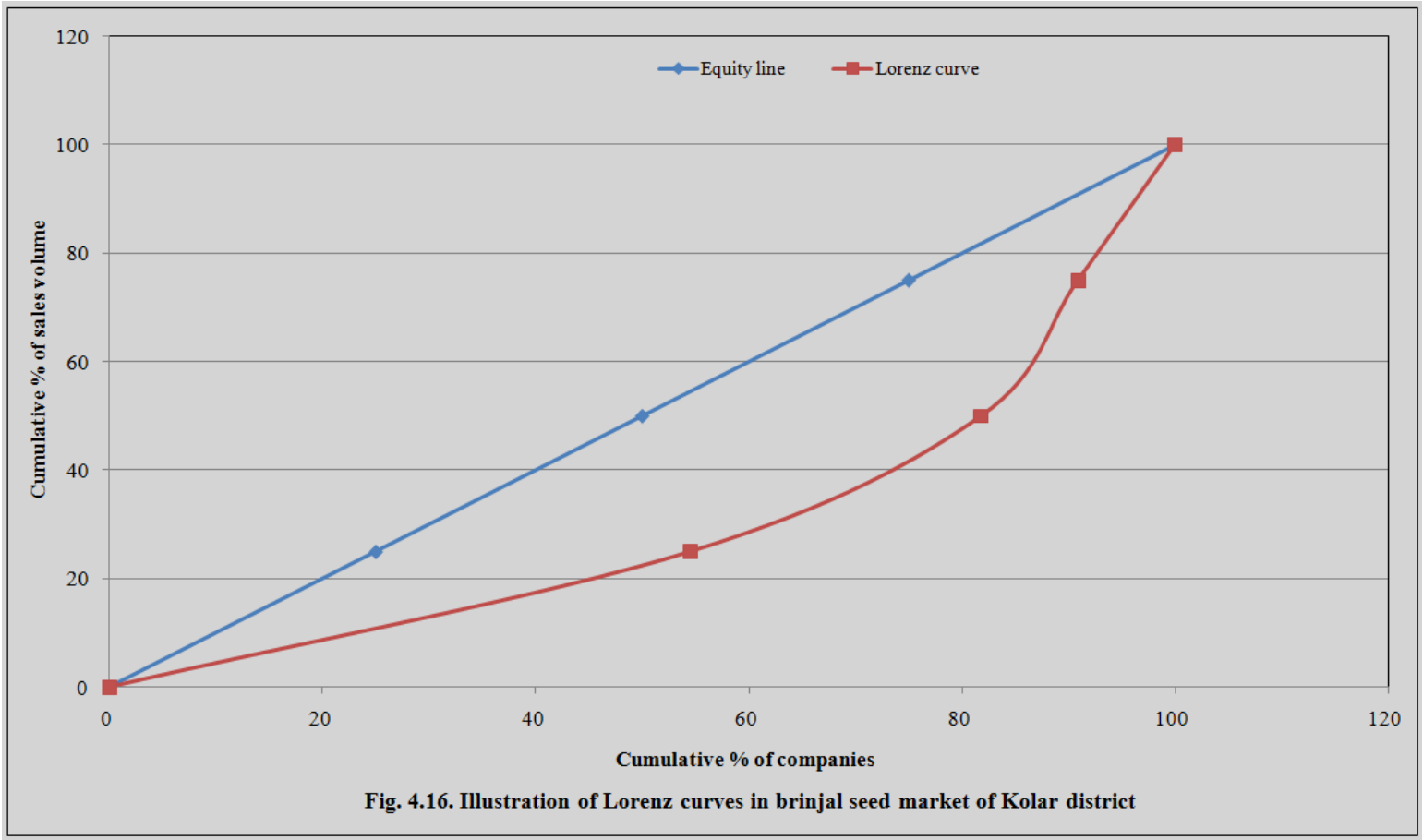

Fig. 4.16. Illustration of Lorenz curves in brinjal seed market of Kolar district

To know the product promotion activities conducted by the different vegetable seeds companies, the four districts of Karnataka, Haveri, Belagavi, Hassan and Kolar and crops *viz.* tomato, cabbage, green chilli and brinjal from each district were selected and from each crop, major four companies were selected for study on the bases of their sales volume.

4.4.1.1 Company distribution system for seed sales

Seed companies use different channels for distribution in order to maximise sales and market share.

4.4.1.1.1 Company –distributor system

This channel makes use of distributors for selling company seeds. Normally one or two distributors are appointed by the company for the entire district and are not allowed to take up distribution of competing brands of specific crop type. Independent distributors are likely to have their own well-developed network of dealers and customers of the seeds promoted by such distributors. The company's performance of a product type for the entire district depends on the commitment of distributor in sales promotion. The distributor of one company could be the dealer of other companies. Farmers and nursery operators source seeds from either dealers or distributors.

4.4.1.1.2 Dealer-distribution system

Companies sell their product through dealers who sell vegetable seeds to farmers or nurserymen. Dealers are frequently in touch with the local farmers and can maintain liaison with companies and farmers. Independent dealers are more highly motivated to serve the local farmers' needs better than the company employees. The disadvantage with such distribution network is that the dealers as business entities handle seeds of various companies and are interested in maximising profits from their sales efforts. Therefore, individual companies are not sure whose product would be promoted by such seed dealers.

4.4.1.1.3 Nursery -distribution system

This channel makes use of nurserymen for selling the seeds and seedlings. Normally nurserymen gets the seeds from the distributor and sell both seeds and seedlings to the farmers based on their choice. Half of the payment is made in advance by the farmers to the nurserymen in order to get good quality seedlings of their preferred variety.

4.4.1.2 Product promotion measures adopted by vegetable seed companies in Haveri district

4.4.1.2.1 Tomato

The promotional measures adopted by the different vegetable seed companies for the tomato crop in the district are listed in table 4.13. Rasi seeds had conducted 18 field days, 10 dealer's meeting, 5 farmers meetings, 10 jeep campaigns, 250 banners and 3,000 posters were displayed and 250 calendars were distributed. Bio seeds mainly concentrated on the farmer numbers of meetings (140), followed by 10 jeep campaigns, 8 field days, 4 field demonstrations and 2 dealers meetings. Bio seeds also posted 50 banners, 2,000 posters and distributed 50 calendars. Mahyco seeds conducted 4 field demonstrations, 6 field days, 2 dealers meetings, 7 jeep campaigns, distributed 10 calendars, 2,000 posters and 30 banners were displayed. US Agri seeds conducted 5 field days, 35 farmers meetings, one dealers meeting and 10 jeep campaigns. Rasi seeds and US Agri seeds had not given any field demonstration. Bio seeds also displayed 2,000 posters and 150 banners. Rasi seeds company occupied 33.33 per cent of posters display in the district among four vegetable seeds companies.

4.4.1.2.2 Cabbage

Different promotional measures were adopted by the companies as shown in Table 4.14. Welcome seeds conducted the highest number of field days 15, followed by the Seminis seeds and Mahyco seeds. Seminis seeds covered 32.97 per cent of the overall poster displayed followed by Mahyco seeds (28.57 %), Welcome seeds (27.47 %) and Ankur seeds (10.99 %). In the case of farmers meeting, Seminis seeds conducted highest (33.33 %) followed by Welcome seeds (30.56 %), Mahyco seeds (19.44 %) and Ankur seeds (16.67 %). Only Welcome seeds had given 5 field demonstrations on cabbage crop. Further, Mahyco seeds had taken 15 jeep campaigns, followed by Seminis seeds (10), Welcome seeds (7) and Ankur seeds (5). A total of 9,100 banners were displayed and 70 calendars were distributed. Seminis seeds and Welcome seeds have distributed 35.71 per cent of calendars in the district. Whereas Seminis seeds, Welcome seeds and Mahyco seeds conducted one dealer meeting each and Ankur seeds did not conduct dealers meetings. The 34.15 per cent of banners were displayed by Seminis seeds stood for top and followed by Welcome seeds (29.27 %), Mahyco seeds (21.95 %) and Ankur seeds (14.63 %).

4.4.1.2.3 Green chilli

It could be observed from the results in table 4.15 that Beejo Sheetal had conducted 10 field days and followed by Mahyco seeds (8), Seminis seeds (7) and Sungro seeds (2). Similarly, Mahyco seeds had conducted 6 field demonstrations, followed by Beejo Sheetal (5), while Seminis seeds and Sungro seeds has not conducted any field demonstration. In the case of jeep campaign, Sungro seeds had conducted 40 jeep campaign, followed by Beejo Sheetal (20), Seminis seeds (15) and Mahyco seeds (5). Altogether 4 dealers meetings were conducted and out of that, Beejo Sheetal has conducted 2 dealers meetings followed by Seminis seeds (1) and Mahyco seeds (1). Beejo Sheetal had conducted 38.71 per cent of farmers meetings, followed by Sungro (25.81 %), Seminis seeds (19.35 %) and Mahyco seeds (16.13 %). In the case of posters display, Sungro seeds displayed 40.00 per cent posters, whereas Beejo Sheetal, Seminis seeds and Mahyco seeds had displayed 20.00 per cent of posters, respectively. However, Sungro seeds did not distribute any calendars, whereas 66.67 per cent calendars were distributed by Beejo Sheetal and followed by Seminis seeds (23.81 %) and Mahyco seeds (9.52 %). In total, around 340 banners and 12,500 posters were displayed in the Haveri district for green chilli crop.

4.4.1.2.4 Brinjal

The promotional measures adopted by the different vegetable seed companies for the brinjal crop are presented in table 4.16. The results from table revealed that, Mahyco seeds conducted 40 famer's meetings followed by Beejo Sheetal (25), Rasi seeds (5) and East-West (1) seeds. Only Beejo Sheetal had conducted 6 field demonstrations. A total of 71 farmers meetings were conducted by all the four companies and in that, Mahyco seeds conducted 40 farmers meetings, followed by Beejo Sheetal (25), Rasi seeds (5) and East-West (1). Rasi seeds conducted 4 dealers meetings, followed by Beejo Sheetal (1) and East-West (1). Likewise in the case of jeep campaign, Beejo Sheetal had conducted 15 jeep campaigns, followed by Mahyco seeds (5), East-West (5) and Rasi seeds (4). A total of 6,000 posters, 170 banners were displayed and 24 field days 6 field demonstrations, 71 farmers meetings, 6 dealers meetings, 29 jeep campaigns were conducted by four different vegetable seed companies in district during the study period.

Table 4.13: Product promotion measures of vegetable seed companies in Haveri district for tomato seed

Sl. No.	Promotional Measures	Companies				Total
		Rasi seeds	US. Agi seeds	Mahyco seeds	Bio seeds	
1	Field days	18 (48.6)	5 (13.5)	6 (16.2)	8 (21.6)	**37 (100)**
2	Posters	3,000 (33.3)	2,000 (22.2)	2,000 (22.2)	2,000 (22.2)	**9,000 (100)**
3	Field demonstration	0 (0.0)	0 (0.0)	4 (50.0)	4 (50.0)	**8 (100)**
4	Farmer meeting	5 (2.0)	35 (14.0)	70 (28.0)	140 (56.0)	**250 (100)**
5	Dealers meeting	10 (66.7)	1 (6.7)	2 (13.3)	2 (13.3)	**15 (100)**
6	Banners	250 (52.1)	150 (31.3)	30 (6.3)	50 (10.4)	**480 (100)**
7	Calendar	250 (69.4)	50 (13.9)	10 (2.8)	50 (13.9)	**360 (100)**
8	Jeep campaign	10 (27.0)	10 (27.0)	7 (18.9)	10 (27.0)	**37 (100)**

Note: figures in parenthesis shows percentages to total

Table 4.14: Product promotion measures of vegetable seed companies in Haveri district for cabbage seeds

Sl. No.	Promotional Measures	Companies				Total
		Seminis seeds	Welcome seeds	Mahyco seeds	Ankur seeds	
1	Field days	8 (25.81)	15 (48.39)	6 (19.35)	2 (6.45)	**31 (100)**
2	Posters	3,000 (32.97)	2,500 (27.47)	2,600 (28.57)	1,000 (10.99)	**9,100 (100)**
3	Field demonstration	0 (0.00)	5 (100.00)	0 (0.00)	0 (0.00)	**5 (100)**
4	Farmer meeting	60 (33.33)	55 (30.56)	35 (19.44)	30 (16.67)	**180 (100)**
5	Dealers meeting	1 (33.33)	1 (33.33)	1 (33.33)	0 (0.00)	**3 (100)**
6	Banners	70 (34.15)	60 (29.27)	45 (21.95)	30 (14.63)	**205 (100)**
7	Calendar	25 (35.71)	25 (35.71)	20 (28.57)	0 (0.00)	**70 (100)**
8	Jeep campaign	10 (27.03)	7 (18.92)	15 (40.54)	5 (13.51)	**37 (100)**

Note: figures in parenthesis shows percentages to total

4.4.1.3 Product promotion measures adopted by vegetable seed companies in Belagavi district

4.4.1.3.1 Tomato

The results of the various promotional measures adopted by the different vegetable seed companies for the tomato crop are presented in table 4.17. The results showed that, Sungro seeds had conducted 20 farmers meetings, followed by Syngenta (10), US Agri seeds (5) and Rasi seeds (2). Similarly, in the case of filed days, Rasi seeds had conducted 22 field days, followed by Sungro seeds (10), Syngenta (3) and US Agri seeds (2). A total of 7 dealers meetings had conducted for tomato crop, out of that Rasi seeds had conducted 4 dealers meetings followed by Sungro seeds (2) and US Agri seeds (1). However, Syngenta has dot conducted any dealers meeting during the study period. In case of jeep campaign, Rasi seeds had conducted 8 jeep campaigns, followed by US Agri seeds (4), Sungro seeds (2) and Syngenta (1). Similarly, in the case of field demonstration, Rasi seeds was conducted 52.63 per cent and followed by Syngenta (26.32 %), Sungro seeds (10.53 %) and US Agri seeds (10.53 %). US Agri seeds and Syngenta did not distributed calendars during the study period, whereas Sungro seeds and Rasi seeds have distributed 200 calendars each, respectively. Altogether, 400 calendars were distributed by all the four companies. Likewise, total 7,800 posters and 430 banners were displayed for tomato crop in the Belagavi district.

4.4.1.3.2 Cabbage

Various measures adopted by different vegetable seed companies for promotion of cabbage crop are listed in Table 4.18. The total number of field days had conducted by different vegetable seeds was 9 and in that Seminis seeds has contributed 33.33 per cent followed by Mahyco seeds, Tokita seeds and Welcome seeds, to the extent of 22.22 per cent each, respectively. The Mahyco seeds company had conducted 5 field demonstrations, followed by Seminis seeds (2), Tokia seeds (2) and Welcome seeds (1). Seminis seeds had conducted 10 farmers meetings, followed by Mahyco seeds (5), Tokita seeds (4) and Welcome seeds (4). In case of banner display, Mahyco seeds had displayed 150 banners, followed by Seminis seeds (80), Tokita seeds and Welcome seeds displayed 50 banners each. A total of 450 calendars had been distributed by all companies in the district, in that Seminis seeds accounts for 33.33 per cent and Mahyco seeds, Tokita seeds and Welcome seeds accounts for 22.22 per cent each, respectively. Whereas, Tokita seeds had conducted 3 dealers meetings, followed by Seminis seeds (2), Mahyco seeds (2) and Welcome seeds (1). About 6,600 posters and 330 banners were displayed and 450 calendars were distributed by all companies put together, during the study period.

4.4.1.3.3 Green chilli

Vegetable seed companies employed several promotional measures for green chilli crop as indicated in table 4.19. A total of 8,500 posters and 230 banners were displayed in the district for the chilli crop, in that Tanindo seeds accounts for 29.41 per cent in posters display and Seminis seeds 34.78 per cent in banner display. In case of jeep campaign, Seminis seeds had conducted 10 jeep campaigns followed by Tanindo seeds (5), Nangwoo Bio seeds (5) and Syngenta (1). About 45 farmers meetings were conducted by different vegetable seed companies and in that, Nangwoo Bio seeds had conducted 15 farmers meetings followed by Tanindo seeds, Syngenta and Seminis seeds with a total of 10 farmers meetings each.

Table 4.15: Product promotion measures of vegetable seed companies in Haveri district for green chilli seeds

Sl. No.	Promotional Measures	Companies				Total
		Beejo sheetal	Sungro seeds	Seminis seeds	Mahyco seeds	
1	Field days	10 (37.04)	2 (7.41)	7 (25.93)	8 (29.63)	**27 (100)**
2	Posters	2,500 (20.00)	5,000 (40.00)	2,500 (20.00)	2,500 (20.00)	**12,500 (100)**
3	Field demonstration	5 (45.45)	0 (0.00)	0 (0.00)	6 (54.55)	**11 (100)**
4	Farmer meeting	60 (38.71)	40 (25.81)	30 (19.35)	25 (16.13)	**155 (100)**
5	Dealers meeting	2 (50.00)	0 (0.00)	1 (25.00)	1 (25.00)	**4 (100)**
6	Banners	150 (44.12)	100 (29.41)	60 (17.65)	30 (8.82)	**340 (100)**
7	Calendar	70 (66.67)	0 (0.00)	25 (23.81)	10 (9.52)	**105 (100)**
8	Jeep campaign	20 (25.00)	40 (50.00)	15 (18.75)	5 (6.25)	**80 (100)**

Note: figures in parenthesis shows percentages to total

Table 4.16: Product promotion measures of vegetable seed companies in Haveri district for Brinjal seeds

Sl. No.	Promotional Measures	Companies				Total
		Mahyco seeds	Rasi seeds	Beejo sheetal	East-West	
1	Field days	6 (25.00)	15 (62.5)	2 (8.33)	1 (4.17)	**24 (100)**
2	Posters	2,500 (41.67)	2,000 (33.33)	1,500 (25.00)	0 (0.00)	**6,000 (100)**
3	Field demonstration	0 (0.00)	0 (0.00)	6 (100)	0 (0.00)	**6 (100)**
4	Farmer meeting	40 (56.34)	5 (7.04)	25 (35.21)	1 (1.41)	**71 (100)**
5	Dealers meeting	0 (0.00)	4 (66.67)	1 (16.67)	1 (16.67)	**6 (100)**
6	Banners	30 (17.65)	100 (58.82)	20 (11.76)	20 (11.76)	**170 (100)**
7	Calendar	10 (2.33)	250 (58.14)	70 (16.28)	100 (23.26)	**430 (100)**
8	Jeep campaign	5 (17.24)	4 (13.79)	15 (51.72)	5 (17.24)	**29 (100)**

Note: figures in parenthesis shows percentages to total

Table 4.17: Product promotion measures of vegetable seed companies in Belagavi district for tomato seed

Sl. No.	Promotional Measures	Companies				Total
		Sungro seeds	US. Agri seeds	Rasi seeds	Syngenta	
1	Field days	10 (27.03)	2 (5.41)	22 (59.46)	3 (8.11)	**37 (100.00)**
2	Posters	2,000 (25.64)	1,000 (12.82)	2,800 (35.90)	2,000 (25.64)	**7,800 (100.00)**
3	Field demonstration	2 (10.53)	2 (10.53)	10 (52.63)	5 (26.32)	**19 (100.00)**
4	Farmer meeting	20 (54.05)	5 (13.51)	2 (5.41)	10 (27.03)	**37 (100.00)**
5	Dealers meeting	2 (28.57)	1 (14.29)	4 (57.14)	0 (0.00)	**7 (100.00)**
6	Banners	50 (11.63)	30 (6.98)	300 (69.77)	50 (11.63)	**430 (100.00)**
7	Calendar	200 (50.00)	0 (0.00)	200 (50.00)	0 (0.00)	**400 (100.00)**
8	Jeep campaign	2 (13.33)	4 (26.67)	8 (53.33)	1 (6.67)	**15 (100.00)**

Note: figures in parenthesis shows percentages to total

Table 4.18: Product promotion measures of vegetable seed companies in Belagavi district for cabbage seed

Sl. No.	Promotional Measures	Companies				Total
		Seminis seeds	Mahyco seeds	Tokita seeds	Welcome seeds	
1	Field days	3 (33.33)	2 (22.22)	2 (22.22)	2 (22.22)	**9 (100.00)**
2	Posters	2,000 (30.30)	2,000 (30.30)	1,400 (21.21)	1,200 (18.18)	**6,600 (100.00)**
3	Field demonstration	2 (20.00)	5 (50.00)	2 (20.00)	1 (10.00)	**10 (100.00)**
4	Farmer meeting	10 (43.48)	5 (21.74)	4 (17.39)	4 (17.39)	**23 (100.00)**
5	Dealers meeting	2 (25.00)	2 (25.00)	3 (37.50)	1 (12.50)	**8 (100.00)**
6	Banners	80 (24.24)	150 (45.45)	50 (15.15)	50 (15.15)	**330 (100.00)**
7	Calendar	150 (33.33)	100 (22.22)	100 (22.22)	100 (22.22)	**450 (100.00)**
8	Jeep campaign	10 (47.62)	5 (23.81)	4 (19.05)	2 (9.52)	**21 (100.00)**

Note: figures in parenthesis shows percentages to total

Tanindo seeds, Nangwoo and Syngenta accounts for 29.41 per cent each respectively, in the case of field demonstration, where as Seminis seeds accounts for 11.76 per cent. In the case of dealers meetings, Tanindo seeds conducted 3 dealers meetings, followed by Nangwoo bio seeds and Seminis seeds which accounts for 29.41 per cent each, respectively. A total of 500 calendars were distributed in the district for green chilli crop.

4.4.1.3.4 Brinjal

Results in the table 4.20 show the promotional measures adopted by the different vegetable seed companies for the brinjal crop. It could be observed from the table that very less promotional activities were conducted as compared to other crops in the district. Only 5 field days had been conducted by different vegetable seed companies. Likewise, about 2,800 posters and 80 banners were displayed in the district and in that, Mahyco seeds and Seminis seeds had taken 46.4 and 53.6 per cent of total posters displayed in the district, whereas East-West seeds and Rasi seeds did not display any posters. No company had conducted any field demonstration for brinjal crop. Total 12 farmer's meetings were conducted in the district and out of that, Seminis seeds had conducted 6 farmers meetings, followed by East-West seeds (3) and Mahyco seeds (3). Further, Seminis seeds conducted 6 jeep campaigns, followed by Mahyco seeds (4) while East-West and Rasi seeds did not conducted any jeep campaign.

4.4.1.4 Product promotion measures adopted by vegetable seed companies in Hassan district

4.4.1.4.1 Tomato

It could be observed from Table 4.21 that all the companies were actively involved in promotional activities. A total of 17,500 posters were displayed and in that, Syngenta alone had displayed 6,000 posters followed by Seminis seeds (5,000), Clausa seeds (4,000) and Bio seeds (2,500). A total of 350 farmers meetings were conducted in that, Bio Seeds accounts for 34.29 per cent, followed by Syngenta (28.57 %), Seminis seeds (22.86 %) and Clausa seeds (14.29 %) and in total 49 field demonstrations were conducted by different vegetable seed companies in that, Syngenta stood for 61.22 per cent, followed by Seminis seeds (20.41 %), Clausa seeds (10.20 %) and Bio Seeds (8.16 %). In the case of jeep campaigns Syngenta conducted 40 per cent of campaigns and other three companies accounts for 20 per cent each. Similarly, in the case of posters display, Syngenta has displayed maximum number of poster (6,000), followed by Seminis seeds (5,000), Clausa seeds (4,000) and Bio seeds (2,500). All the four vegetable seed companies had conducted one dealers meeting each. Besides, about total 50 jeep campaigns and 90 field days were conducted on tomato crops in the district during the study period.

4.4.1.4.2 Cabbage

The results in table 4.22 that show about 16,000 posters 670 banners were displayed across the district. Likewise, 76 field days, 45 field demonstrations and 27 jeep campaigns had been conducted by different vegetable seed companies in the district. Syngenta, Seminis seeds and Nunhems seeds companies conducted one dealer meeting each. A total of 76 calendars were distributed in the district during the study period. Syngenta had conducted 100 farmers meetings, followed by Seminis seeds (80), Nunhems seeds (55) and Mahyco seeds (40).

Table 4.19: Product promotion measures of vegetable seed companies in Belagavi district for green chilli seed

Sl. No.	Promotional Measures	Companies				Total
		Tanindo seeds	Nangwoo bio seeds	Syngenta	Seminis seeds	
1	Field days	2 (15.38)	5 (38.46)	3 (23.08)	3 (23.08)	**13 (100.00)**
2	Posters	2,500 (29.41)	2,000 (23.53)	2,000 (23.53)	2,000 (23.53)	**8,500 (100.00)**
3	Field demonstration	5 (29.41)	5 (29.41)	5 (29.41)	2 (11.76)	**17 (100.00)**
4	Farmer meeting	10 (22.22)	15 (33.33)	10 (22.22)	10 (22.22)	**45 (100.00)**
5	Dealers meeting	3 (42.86)	2 (28.57)	0 (0.00)	2 (28.57)	**7 (100.00)**
6	Banners	50 (21.74)	50 (21.74)	50 (21.74)	80 (34.78)	**230 (100.00)**
7	Calendar	200 (40.00)	150 (30.00)	0 (0.00)	150 (30.00)	**500 (100.00)**
8	Jeep campaign	5 (23.81)	5 (23.81)	1 (4.76)	10 (47.62)	**21 (100.00)**

Note: figures in parenthesis shows percentages to total

Table 4.20: Product promotion measures of vegetable seed companies in Belagavi district for brinjal seed

Sl. No.	Promotional Measures	Companies				Total
		East-West	Mahyco seeds	Seminis seeds	Rasi seeds	
1	Field days	3 (60.0)	0 (0.0)	2 (40.0)	0 (0.0)	**5 (100.00)**
2	Posters	0 (0.0)	1,300 (46.4)	1,500 (53.6)	0 (0.0)	**2,800 (100.00)**
3	Field demonstration	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	**0 (00.00)**
4	Farmer meeting	3 (25.0)	3 (25.0)	6 (50.0)	0 (0.0)	**12 (100.00)**
5	Dealers meeting	0 (0.0)	2 (50.0)	2 (50.0)	0 (0.0)	**4 (100.00)**
6	Banners	0 (0.0)	50 (62.5)	30 (37.5)	0 (0.0)	**80 (100.00)**
7	Calendar	200 (44.4)	100 (22.2)	150 (33.3)	0 (0.0)	**450 (100.00)**
8	Jeep campaign	0 (0.0)	4 (40.0)	6 (60.0)	0 (0.0)	**10 (100.00)**

Note: figures in parenthesis shows percentages to total

Table 4.21: Product promotion measures of vegetable seed companies in Hassan district for tomato seeds

Sl. No.	Promotional Measures	Companies				Total
		Clausa seeds	Syngenta	Seminis seeds	Bio seeds	
1	Field days	20 (22.22)	35 (38.89)	25 (27.78)	10 (11.11)	90 (100.00)
2	Posters	4,000 (22.86)	6,000 (34.29)	5,000 (28.57)	2,500 (14.29)	17,500 (100.00)
3	Field demonstration	5 (10.20)	30 (61.22)	10 (20.41)	4 (8.16)	49 (100.00)
4	Farmer meeting	50 (14.29)	100 (28.57)	80 (22.86)	120 (34.29)	350 (100.00)
5	Dealers meeting	1 (25.00)	1 (25.00)	1 (25.00)	1 (25.00)	4 (100.00)
6	Banners	300 (31.91)	300 (31.91)	280 (29.79)	60 (6.38)	940 (100.00)
7	Calendar	0 (0.00)	0 (0.00)	40 (44.44)	50 (55.56)	90 (100.00)
8	Jeep campaign	10 (20.00)	20 (40.00)	10 (20.00)	10 (20.00)	50 (100.00)

Note: figures in parenthesis shows percentages to total

Table 4.22: Product promotion measures of vegetable seed companies in Hassan district for cabbage seeds

Sl. No.	Promotional Measures	Companies				Total
		Syngenta seeds	Seminis seeds	Mahyco seeds	Nunhems seeds	
1	Field days	30 (39.47)	25 (32.89)	6 (7.89)	15 (19.74)	**76 (100.00)**
2	Posters	6,000 (37.50)	5,000 (31.25)	2,500 (15.63)	2,500 (15.63)	**16,000 (100.00)**
3	Field demonstration	30 (66.67)	10 (22.22)	0 (0.00)	5 (11.11)	**45 (100.00)**
4	Farmer meeting	100 (36.36)	80 (29.09)	40 (14.54)	55 (20.00)	**275 (100.00)**
5	Dealers meeting	1 (33.33)	1 (33.33)	0 (0.00)	1 (33.33)	**3 (100.00)**
6	Banners	300 (44.78)	280 (41.79)	30 (4.48)	60 (8.96)	**670 (100.00)**
7	Calendar	0 (0.00)	40 (53.33)	10 (13.33)	25 (33.33)	**75 (100.00)**
8	Jeep campaign	5 (39.47)	10 (32.89)	5 (7.89)	7 (19.74)	**27 (100.00)**

Note: figures in parenthesis shows percentages to total

Similarly, Seminis seeds conducted 10 jeep campaign followed by Nunhems seeds (7), Mahyco seeds (5) and Syngenta (5) in the district during the study period. Whereas, 66.67 per cent of field demonstration conducted by Syngenta, followed by Seminis seeds (22.22 %) and Nunhems seeds (11.11 %). Meanwhile, Syngents displayed 44.78 per cent of banners in the district, followed by Seminis seeds (41.79 %), Nunhems seeds (8.96 %) and Mahyco seeds (4.48 %). Similarly, in the case of jeep campaigns, Syngenta accounts for 39.47 per cent, followed by Seminis seeds (32.89 %), Nunhems seeds (19.74 %) and Mahyco seeds (7.89 %). Wheras, Syngenta company did not conduct any calendar distribution in the district during the study period.

4.4.1.4.3 Green chilli

The various promotional activities employs by different companies for green chilli are presented in table 4.23. A total of 22,000 posters 880 banners were displayed in the district. The total number of field days and field demonstrations and farmer meetings conducted by different vegetable companies were 32, 70 and 215, respectively. One dealers meeting was conducted by East-West, Seminis seeds and Kalash seeds companies each. East-West seeds company had conducted 20 field days, followed by Seminis seeds (5), Beejo Sheetal (5) and Kalash seeds (2). Likewise, Seminis seeds conducted 40 field demonstrations and other three companies had organised 10 field demonstrations each, respectively. Apart from that, East-West seeds had conducted 75 farmers meetings, followed by Beejo Sheetal (60), Seminis seeds (50) and Kalash seeds (30). Seminis seeds accounts for 31.82 per cent in posters displayed in the district, followed by East-West seeds, Beejo Sheetal and Kalash seeds which accounts for 22.73 per cent each, respectively. Similarly, in the case of banners displayed in the district Seminis seeds accounts for highest (31.82 %) followed by East-West (28.41 %), Beejo Sheetal (22.73 %) and Kalash seeds (17.05 %), respectively.

4.4.1.4.4 Brinjal

It could be observed from the table 4.24 that about 10 field demonstrations were conducted in the district and Mahyco seeds company had an upper hand with highest number of demonstration (10). Similarly, in the case of field days Mahyco seeds had upper hand which accounts for 52.63 per cent, followed by Rasi seeds (26.32 %), Golden Seeds (15.79 %) and Sungro seeds (5.26 %). Likewise, Mahyco seeds had conducted 36.36 per cent of farmers meetings, followed by Golden seeds (31.82 %), Sungro seeds (27.27 %) and Rasi seeds (4.55 %) in the district. About 34 jeep campaigns were conducted and out of that, Golden seeds had conducted 15 jeep campaigns, followed by Mahyco seeds (10), Sungro seeds (5) and Rasi seeds (4). Whereas, Mahyco seeds, Golden seeds and Rasi seeds have conducted one dealers meeting each. Similarly, Mahyco seeds and Golden seeds accounts for 6.90 per cent each in the case of colanders distribution in the district and Rasi seeds accounts for 86.21 per cent. Likewise, Sungro seeds and Rasi seeds accounts for 10.42 per cent in the case of posters display and Mahyco seeds accounts for 52.08 per cent during the study period. In total, 9,600 posters and 275 banners were displayed and 290 calendars had been distributed.

Table 4.23: Product promotion measures of vegetable seed companies in Hassan district for green chilli seeds

Sl. No.	Promotional Measures	Companies				Total
		East-West	Seminis seeds	Beejo sheetal	Kalash seeds	
1	Field days	20 (62.50)	5 (15.63)	5 (15.63)	2 (6.25)	**32 (100.00)**
2	Posters	5,000 (22.73)	7,000 (31.82)	5,000 (22.73)	5,000 (22.73)	**22,000 (100.00)**
3	Field demonstration	10 (14.29)	40 (57.14)	10 (14.29)	10 (14.29)	**70 (100.00)**
4	Farmer meeting	75 (34.88)	50 (23.26)	60 (27.91)	30 (13.95)	**215 (100.00)**
5	Dealers meeting	1 (33.33)	1 (33.33)	1 (33.33)	0 (0.00)	**3 (100.00)**
6	Banners	250 (28.41)	280 (31.82)	200 (22.73)	150 (17.05)	**880 (100.00)**
7	Calendar	100 (22.73)	40 (9.09)	100 (22.73)	200 (45.45)	**440 (100.00)**
8	Jeep campaign	10 (18.18)	20 (36.36)	10 (18.18)	15 (27.27)	**55 (100.00)**

Note: figures in parenthesis shows percentages to total

Table 4.24: Product promotion measures of vegetable seed companies in Hassan district for brinjal seeds

Sl. No.	Promotional Measures	Companies				Total
		Mahyco seeds	Golden seeds	Sungro seeds	Rasi seeds	
1	Field days	20 (52.63)	6 (15.79)	2 (5.26)	10 (26.32)	**38 (100.00)**
2	Posters	5,000 (52.08)	2,600 (27.08)	1,000 (10.42)	1,000 (10.42)	**9,600 (100.00)**
3	Field demonstration	10 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	**10 (100.00)**
4	Farmer meeting	40 (36.36)	35 (31.82)	30 (27.27)	5 (4.55)	**110 (100.00)**
5	Dealers meeting	1 (33.33)	1 (33.33)	0 (0.00)	1 (33.33)	**3 (100.00)**
6	Banners	100 (36.36)	45 (16.36)	30 (10.91)	100 (36.36)	**275 (100.00)**
7	Calendar	20 (6.90)	20 (6.90)	0 (0.00)	250 (86.21)	**290 (100.00)**
8	Jeep campaign	10 (29.41)	15 (44.12)	5 (14.71)	4 (11.76)	**34 (100.00)**

Note: figures in parenthesis shows percentages to total

4.4.1.5 Product promotion measures adopted by vegetable seed companies in Kolar district

4.4.1.5.1 Tomato

The results in Table 4.25 revealed that Syngenta and US Agri seeds had conducted 20 and 35 field days, respectively, followed by Namdhari seeds (15) and In-American seeds (8). The total number of posters posted in the district by all the four competitors was 15,500. Syngenta company organised 30 field demonstrations followed by US Agri seeds (10), Namdhari seeds (5) and Indo-American seeds (4). Indo-American company had conducted 37.84 per cent of overall farmers meetings for tomato crop, followed by Syngenta (27.03 %), US Agri seeds (20.27 %) and Namdhari seeds (14.86 %), respectively. Further, Indo-American company had conducted 2 dealers meetings and other three companies had conducted 1 dealers meeting each. Whereas, Syngenta had conducted 20 jeep campaigns, followed by US Agri seeds (10), Indo-American seeds (10) and Namdhari seeds (7). A total of 660 banners were displayed and 175 calendars were distributed in the study area during the study period.

4.4.1.5.2 Cabbage

Results in table 4.26 indicated that, Nunhems seeds and Seminis seeds had conducted 10 field days each, followed by Mahyco seeds (6) and Rasi seeds (5). About 9,500 posters were displayed for cabbage crop in the district, in that Seminis seeds accounts for 31.58 per cent, followed by Nunhems seeds (26.32 %), Rasi seeds and Mahyco seeds accounts for 21.05 per cent each, respectively. Nunhems seeds and Seminis seeds conducted 60 farmers' meetings each. Likewise, Rasi seeds and Seminis seeds conducted one dealers meeting each and Mahyco seeds and Nunhems seeds conducted 2 farmers meeting each. Numhemps conducted 41.67 per cent of field demonstration in the district, followed by Mahyco seeds (33.33 %), Seminis seeds (25.00 %). Whereas, Rasi seeds did not conduct field demonstration on cabbage crop during the study period. Similarly, Nunhems seeds conducted 20 jeep campaigns, followed by Seminis seeds (10), Rasi seeds (10) and Mahyco seeds (7), respectively. In total, 400 banners were displayed and 155 calendars were distributed for cabbage seed in the Kolar district by four major cabbage seed selling companies.

4.4.1.5.3 Green chilli

It is revealed in table 4.27 that, East-West seeds company conducted field days (8), followed by US Agri seeds (6) and Namdhari seeds (5). In case of posters, majority (30 %) was posted by East-West company followed by Namdhari seeds and Kalash seeds with equal proportion (25 %), respectively. With respect to field demonstrations, majority (43.48 %) was conducted by East-West, followed by Kalash seeds (26.09 %), Namdhari seeds (21.74 %) and US Agri seeds (8.70 %). East-West had conducted majority (40.32 %) of farmers meetings, followed by Namdhar (24.19 %), US Agri seeds (19.35 %) and Kalash seeds (16.13 %). Namdhari seeds had conducted 50 per cent of dealers meetings, followed by US Agri seeds and East-West with 25 per cent each. A total of 10,000 posters were displayed under green chilli crop in Kolar district. A total of an equal number of calendars and banners (750 each) was distributed and displayed, respectively, in the district during the study period.

Table 4.25: Product promotion measures of vegetable seed companies in Kolar district for tomato seeds

Sl. No.	Promotional Measures	Companies				Total
		US. Agri seeds	Syngenta	Indo American seeds	Namdhari seeds	
1	Field days	20 (25.64)	35 (44.87)	8 (10.26)	15 (19.23)	**78 (100.00)**
2	Posters	5,000 (32.26)	6,000 (38.71)	2,000 (12.90)	2,500 (16.13)	**15,500 (100.00)**
3	Field demonstration	10 (20.41)	30 (61.22)	4 (8.16)	5 (10.20)	**49 (100.00)**
4	Farmer meeting	75 (20.27)	100 (27.03)	140 (37.84)	55 (14.86)	**370 (100.00)**
5	Dealers meeting	1 (20.00)	1 (20.00)	2 (40.00)	1 (20.00)	**5 (100.00)**
6	Banners	250 (37.88)	300 (45.45)	50 (7.58)	60 (9.09)	**660 (100.00)**
7	Calendar	100 (57.14)	0 (0.00)	50 (28.57)	25 (14.29)	**175 (100.00)**
8	Jeep campaign	10 (21.28)	20 (42.55)	10 (21.28)	7 (14.89)	**47 (100.00)**

Note: figures in parenthesis shows percentages to total

Table 4.26: Product promotion measures of vegetable seed companies in Kolar district for cabbage seeds

Sl. No.	Promotional Measures	Companies				Total
		Nunhems seeds	Seminis seeds	Rasi seeds	Mahyco seeds	
1	Field days	10 (32.26)	10 (32.26)	5 (16.13)	6 (19.35)	**31 (100.00)**
2	Posters	2,500 (26.32)	3,000 (31.58)	2,000 (21.05)	2,000 (21.05)	**9,500 (100.00)**
3	Field demonstration	5 (41.67)	3 (25.00)	0 (0.00)	4 (33.33)	**12 (100.00)**
4	Farmer meeting	60 (26.67)	60 (26.67)	35 (15.56)	70 (31.11)	**225 (100.00)**
5	Dealers meeting	2 (33.33)	1 (16.67)	1 (16.67)	2 (33.33)	**6 (100.00)**
6	Banners	150 (37.50)	70 (17.50)	150 (37.50)	30 (7.50)	**400 (100.00)**
7	Calendar	70 (45.16)	25 (16.13)	50 (32.26)	10 (6.45)	**155 (100.00)**
8	Jeep campaign	20 (42.55)	10 (21.28)	10 (21.28)	7 (14.89)	**47 (100.00)**

Note: figures in parenthesis shows percentages to total

4.4.1.5.4 Brinjal

It could be observed from the results in table 4.28 that Mahyco seeds has conducted 71.43 per cent of field days on brinjal crop, followed by Ankur seeds and East-West which accounts for 14.29 per cent each, respectively. About 3,800 posters were displayed out of which East-West had displayed 1,500, followed by Mahyco seeds (1,300) and Ankur seeds (1,000). Whereas, Rasi seeds did not display posters in the district during the study period. In case of field demonstrations, 6 were conducted by East-West and 2 by Mahyco seeds. In total, 65 farmers meetings were conducted, out of that, majority (46.15 %) of meetings were conducted by Ankur seeds, followed by East-West (38.46 %) and Mahyco seeds (15.38 %). Similarly, 66.67 per cent of dealers meetings conducted by Mahyco seeds company, followed by East-West seeds (33.33 %). Likewise, East-West company had conducted 15 jeep campagines, followed by Ankur seeds (5) and Mahyco seeds (4). Similarly, Mahyco seeds distributed 58.82 per cent calanders, followed by East-West (41.18 %). Rasi seeds did not conduct any promotional activities on brinjal crop in the Kolar district during the study period.

4.4.2 Market performance

One of the objectives of this study was to analyse market performance in the study area. Certain indicators were devised for the study ranging from product quality to distribution depth and width. Market performance is a process of comparing the cost, time or quality of what one organization does against another organization. The result is often a business case for making changes in order to make improvements. It is a continuous effort to improve company's manufacturing process, distribution process, advertisement process, consumer satisfaction process and so on. Normally, benchmarking is required by a company to have market leadership in the industry and competitive advantages over others due to its enhanced performance. Better performance is directly linked to financial performance in terms of net profit of the company. The distribution depth of a company indicates the sales volume of a particular company among distributors of other companies. More distribution depth signifies a market leader. Thus, depth of distribution system indicates the penetration of a particular company in a particular market among distributors.

The distribution width of a company indicates the reach of a particular company among distributors. More distribution width signifies a better distribution network.

Dealer's depth shows the penetration of a company among dealers and dealer's width of a company indicates the reach of a particular company among dealers. More dealers' width signifies the number of dealers selling a company's product out of the total products sold by the dealers.

Push-pull index is an important criterion to judge the loyalty of farmers. Pushing more of the products of a company signifies dealer's loyalty towards the firm. The companies consider the value of push-pull index for ascertaining the loyalty of its dealers and nurserymen, the profiteering business that distributor may yield for the company. On the other hand, market pull indicates that, the product is having good reach amongst the farmers and is widely popular. Increasing the sales volume of these products invites fewer efforts on the part of the company. These product promotion measures adopted by different companies in this selected districts for major vegetable seeds for the year 2015-16 are elaborated in the following sub-heads.

Table 4.27: Product promotion measures of vegetable seed companies in Kolar district for green chilli seeds

Sl. No.	Promotional Measures	Companies				Total
		Namdhari seeds	US Agri seeds	East-West	Kalash seeds	
1	Field days	5 (23.81)	6 (28.57)	8 (38.10)	2 (9.52)	**21 (100.00)**
2	Posters	2,500 (25.00)	2,000 (20.00)	3,000 (30.00)	2,500 (25.00)	**10,000 (100.00)**
3	Field demonstration	5 (21.74)	2 (8.70)	10 (43.48)	6 (26.09)	**23 (100.00)**
4	Farmer meeting	30 (24.19)	24 (19.35)	50 (40.32)	20 (16.13)	**124 (100.00)**
5	Dealers meeting	2 (50.00)	1 (25.00)	1 (25.00)	0 (0.00)	**4 (100.00)**
6	Banners	250 (33.33)	100 (13.33)	250 (33.33)	150 (20.00)	**750 (100.00)**
7	Calendar	200 (26.67)	250 (33.33)	100 (13.33)	200 (26.67)	**750 (100.00)**
8	Jeep campaign	20 (54.05)	4 (10.81)	8 (21.62)	5 (13.51)	**37 (100.00)**

Note: figures in parenthesis shows percentages to total

Table 4.28: Product promotion measures of vegetable seed companies in Kolar district for brinjal seeds

Sl. No.	Promotional Measures	Companies				Total
		Mahyco seeds	Ankur seeds	Rasi seeds	East-West	
1	Field days	10 (71.43)	2 (14.29)	0 (0.00)	2 (14.29)	**14 (100.00)**
2	Posters	1,300 (34.21)	1,000 (26.32)	0 (0.00)	1,500 (39.47)	**3,800 (100.00)**
3	Field demonstration	2 (25.00)	0 (0.00)	0 (0.00)	6 (75.00)	**8 (100.00)**
4	Farmer meeting	10 (15.38)	30 (46.15)	0 (0.00)	25 (38.46)	**65 (100.00)**
5	Dealers meeting	2 (66.67)	0 (0.00)	0 (0.00)	1 (33.33)	**3 (100.00)**
6	Banners	50 (50.00)	30 (30.00)	0 (0.00)	20 (20.00)	**100 (100.00)**
7	Calendar	100 (58.82)	0 (0.00)	0 (0.00)	70 (41.18)	**170 (100.00)**
8	Jeep campaign	4 (16.67)	5 (20.83)	0 (0.00)	15 (62.50)	**24 (100.00)**

Note: figures in parenthesis shows percentages to total

4.4.2.1 Overall performance of different vegetable seed companies on selected parameters in Haveri district

4.4.2.1.1 Tomato

The results (Table 4.29) indicate that in terms of promptness in delivery, Rasi seeds and Mahyco seeds were uppermost followed by US Agri seeds and Bio seeds. In the cases of product display of Mahyco seeds was high. In the case ofcordial nature of Rasi seeds and Bio seeds, product quality of Rasi seeds, transportation facility of Rasi seeds and Mahyco seeds, account settlement of Rasi seeds were foremost. Whereas, in the cases of time period of dealing and promptness in delivery of Bio seeds, account settlement, US Agri seeds had indicated lower performance. In the case of push-pull index, US Agri seeds and Mahyco seeds had more push volume and it indicated more loyalty among dealers and nurserymen. Whereas, Rasi seeds and Bio seeds had more pull volume (Fig. 4.17). Dealer width of US Agri seeds was less as compared to other three companies. Hence, US Agri seeds had less reach to its dealers and nurserymen as compared to its close competitors. Distribution width and dealers depth of Rasi seeds was highest whereas in case of distribution depth, Rasi seeds and US Agri seeds had more depth. The overall performance suggests that Rasi seeds was leading, followed by Mahyco seeds, Bio seeds and US Agri seeds companies with respect to tomato seeds in Haveri district.

4.4.2.1.2 Cabbage

As shown in table 4.30 the results revealed that, product quality of Seminis seeds was best followed by Mahyco seeds. Whereas, Mahyco seeds was best in providing transportation facility. In the case of problem solving and appropriating schemes, all the companies performed equally in the district. The transportation facility of Ankur seeds was shown lower performance, similarly, Seminis seeds in the case of time period of dealing, Mahyco seeds in the case of cordial nature. In the case of work force and account settlement, Seminis seeds and Ankur seeds performed equally foremost. In case of push-pull index, Seminis seeds had good reach among the farmers (Fig. 4.18). Whereas, Welcome seeds, Mahyco seeds and Ankur seeds had more push volume and it indicated more loyalty among dealers and nurseryman. Dealer width of Seminis seeds was more as compared to other three competitors. Distribution width of Mahyco seeds and Ankur seeds had upper hand. In case of Distribution depth, Seminis seeds had more depth, which showed that Seminis seeds had more sales volume as compared to Welcome seeds, Mahyco seeds and Nobel seeds. Similarly, Seminis seeds also had more depth in the case of dealers. Overall performance of Seminis seeds was prime, followed by Ankur seeds, Mahyco seeds and Welcome seeds.

4.4.2.1.3 Green chilli

According to the results in table 4.31, it is evident that Beejo Sheetal had the better problem solving. In the case of product display and transportation facility, Seminis seeds and Mahyco seeds performed best. Similarly, Beejo Sheetal and Seminis seeds in the case of appropriating schemes. In the case of push-pull index all the companies performed almost equally both in push volume and pull volume of chilli seeds (Fig. 4.19). The product quality of Beejo Sheetal was upmost, followed by Seminis seeds and Sungro seeds. Whereas, Mahyco seeds performed least with respect to product quality.

Table 4.29: Overall performance scores of tomato seed companies in Haveri district

Sl. No.	Parameters	Weightage	Companies			
			Rasi seeds	US. Agri seeds	Mahyco seeds	Bio seeds
1	Product display	5	3	2	4	2
2	Problem solving	5	3	3	3	3
3	Transportation facility	5	4	3	4	2
4	Work force	5	3	3	3	2
5	Payment habits	5	4	4	3	4
6	Time period of dealing	5	4	4	4	3
7	Promptness in delivery	5	5	4	5	3
8	Appropriating schemes	5	2	3	3	3
9	Account settlement	5	5	2	3	3
10	Coordinal nature	5	4	3	3	4
11	Product quality	7	5	3	3	3
12	Push-pull index	7	5	3	4	5
13	Dealers width	7	4	3	4	4
14	Dealers depth	7	3	2	2	2
15	Distribution width	7	4	2	2	2
16	Distribution depth	15	4	2	2	1
Total		**100**	392	276	310	280
Rank			**I**	**IV**	**II**	**III**

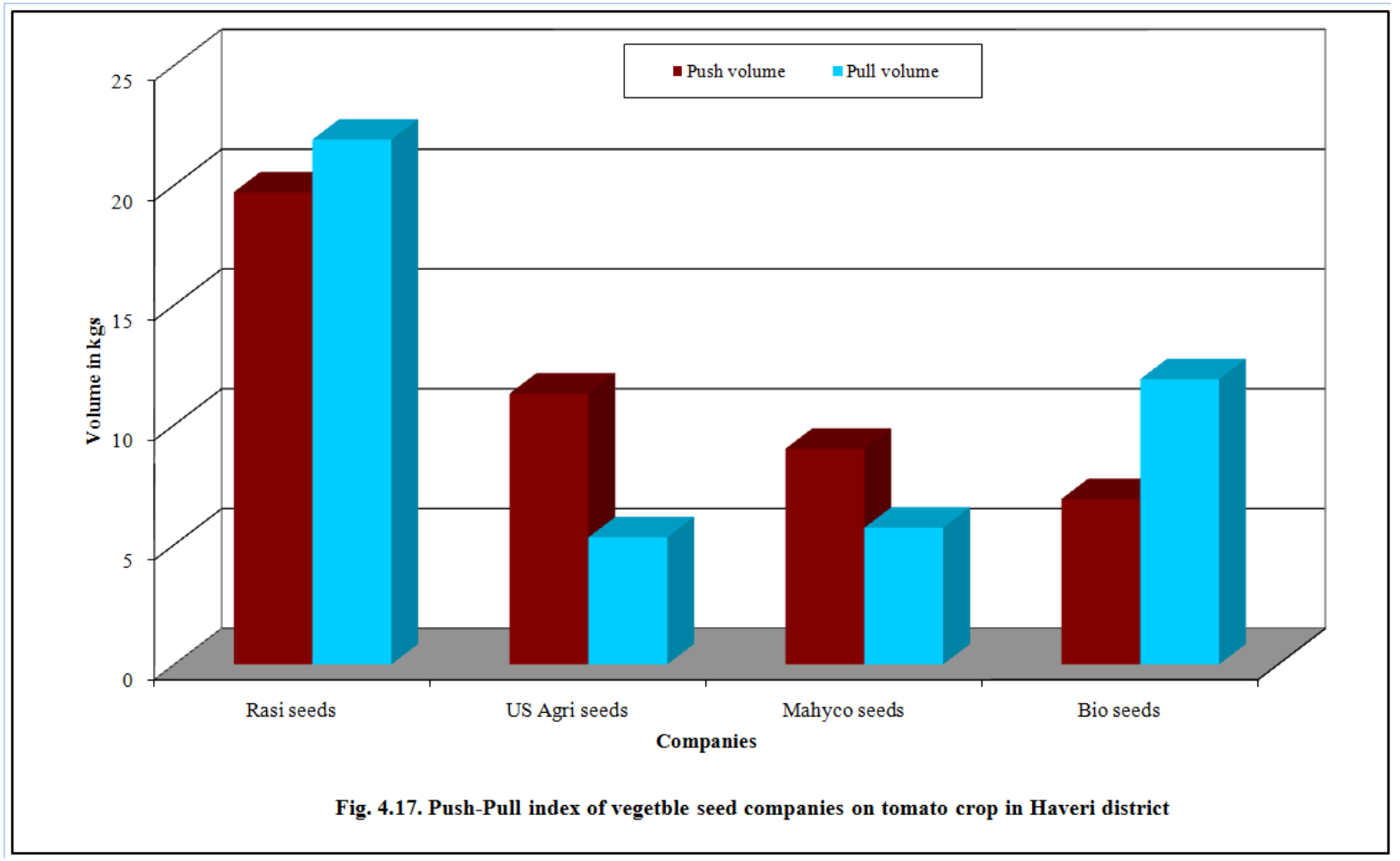

Fig. 4.17. Push-Pull index of vegetble seed companies on tomato crop in Haveri district

Fig. 4.17. Push-Pull index of vegetble seed companies on tomato crop in Haveri district

Table 4.30: Overall performance scores of cabbage seed companies in Haveri district

Sl. No.	Parameters	Weightage	Companies			
			Seminis seeds	Welcome seeds	Mahyco seeds	Ankur seeds
1	Product display	5	4	3	4	4
2	Problem solving	5	3	3	3	3
3	Transportation facility	5	4	4	4	3
4	Work force	5	4	3	3	4
5	Payment habits	5	4	4	3	3
6	Time period of dealing	5	3	4	4	4
7	Promptness in delivery	5	4	3	5	3
8	Appropriating schemes	5	4	4	4	4
9	Account settlement	5	4	3	3	4
10	Coordinal nature	5	4	4	3	4
11	Product quality	7	5	2	3	2
12	Push-pull index	7	3	2	2	2
13	Dealers width	7	5	4	3	4
14	Dealers depth	7	4	2	2	2
15	Distribution width	7	2	2	3	3
16	Distribution depth	15	4	2	2	2
Total		**100**	383	274	286	286
Rank			**I**	**IV**	**II**	**II**

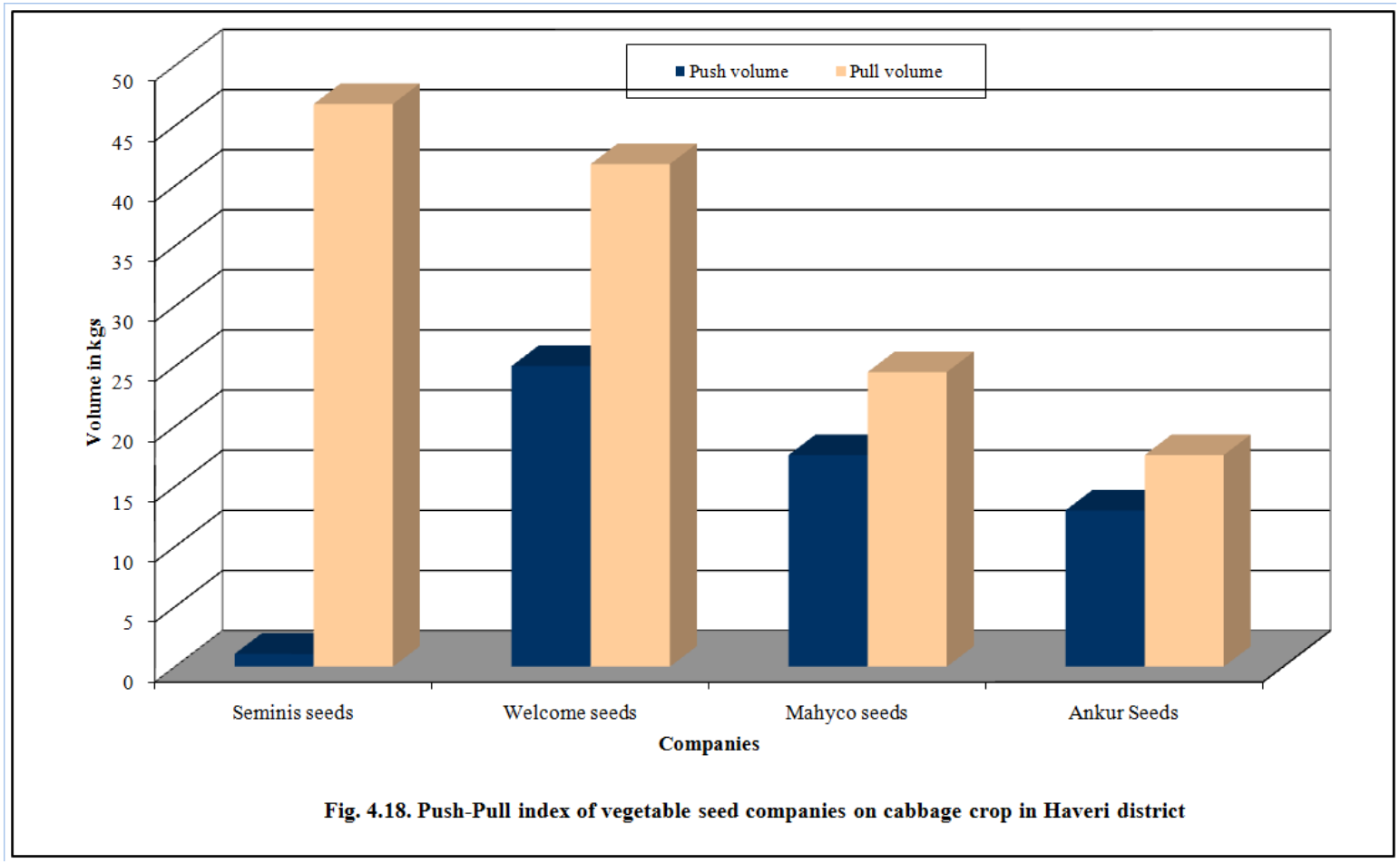

Fig. 4.18. Push-Pull index of vegetable seed companies on cabbage crop in Haveri district

Fig. 4.18. Push-Pull index of vegetable seed companies on cabbage crop in Haveri district

Table 4.31: Overall performance scores of green chilli seed companies in Haveri district

Sl. No.	Parameters	Weightage	Companies			
			Beejo Sheetal	Sungro seeds	Seminis seeds	Mahyco seeds
1	Product display	5	3	3	4	4
2	Problem solving	5	4	3	3	3
3	Transportation facility	5	3	3	4	4
4	Work force	5	3	3	4	3
5	Payment habits	5	3	3	4	3
6	Time period of dealing	5	3	4	3	4
7	Promptness in delivery	5	3	3	4	5
8	Appropriating schemes	5	4	2	4	3
9	Account settlement	5	3	4	4	3
10	Coordinal nature	5	3	3	4	3
11	Product quality	7	5	4	4	3
12	Push-pull index	7	3	3	3	3
13	Dealers width	7	5	4	5	3
14	Dealers depth	7	3	2	2	2
15	Distribution width	7	3	2	2	3
16	Distribution depth	15	5	2	2	2
Total		**100**	368	290	332	288
Rank			**I**	**III**	**II**	**IV**

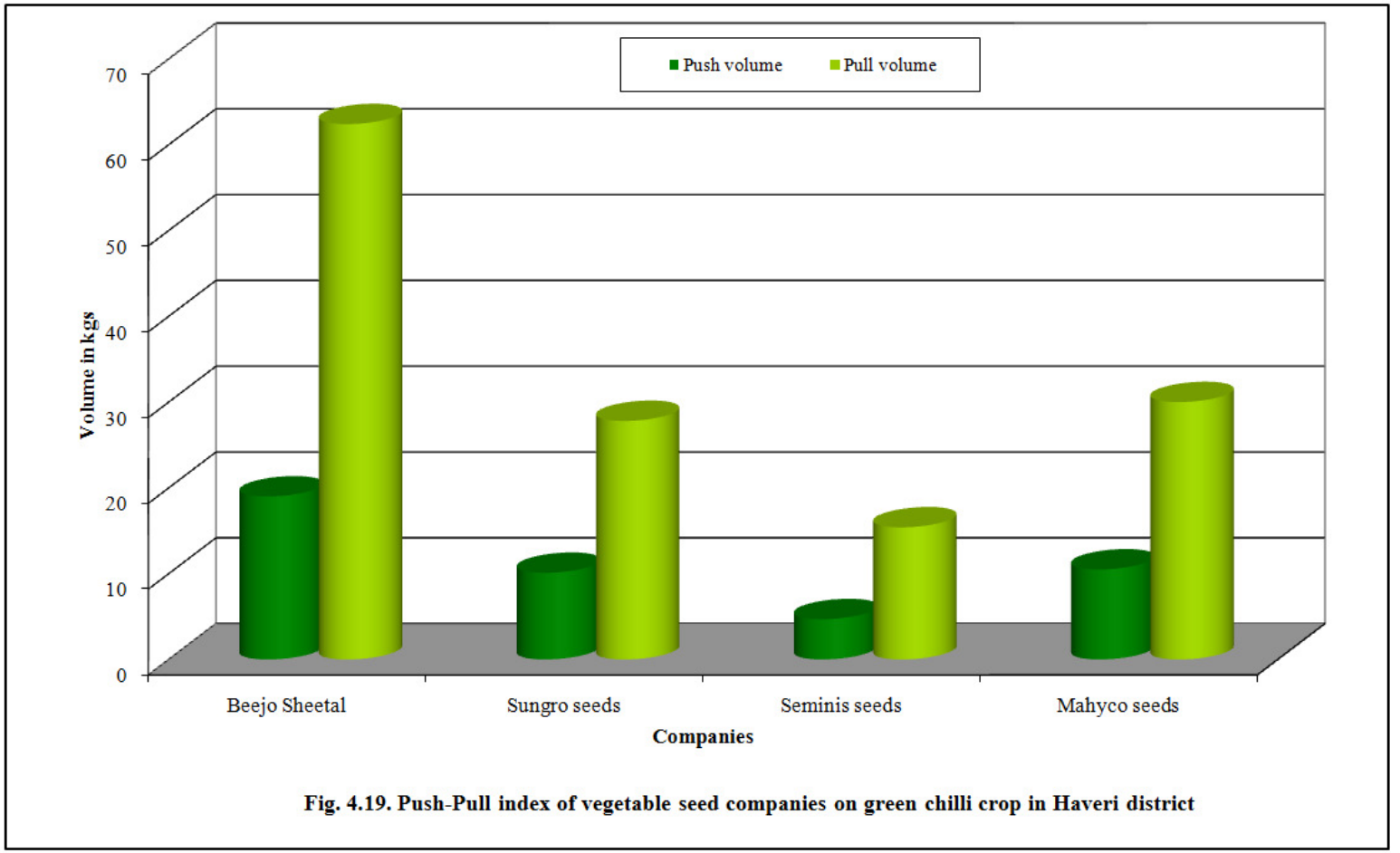

Fig. 4.19. Push-Pull index of vegetable seed companies on green chilli crop in Haveri district

Fig. 4.19. Push-Pull index of vegetable seed companies on green chilli crop in Haveri district

In case of dealer width, Beejo Sheetal and Seminis seeds were leading which shows that these two companies had better reach to its dealers and nurseryman. The distribution width of Beejo Sheetal and Mahyco seeds were better than Sungro seeds and Seminis seeds. In case of dealer's depth and distribution depth, Beejo Sheetal had more sales volume. Hence, the overall performance of Beejo Sheetal was leading, followed by Seminis seeds, Sungro seeds and Mahyco seeds.

4.4.2.1.4 Brijal

It was observed that Rasi seeds was foremost in promptness in delivery, followed by Mahyco seeds, Beejo Sheetal and East-West (Table 4.32). In the cases of transportation facility, payment habits, account settlement and cordial nature of Rasi seeds was leading. A Rasi seeds was also found to be leader in product quality, followed by Beejo sheetal. However, product display of Mahyco seeds performance was least, similarly East-West in the case of transportation facility and work force. In case of push-pull index, Beejo Sheetal and East-West companies had more loyalty among the dealers and nurseryman (Fig. 4.20). Whereas, Rasi seeds and Mahyco seeds had better reach to farmers in the district. Dealer width of Mahyco seeds was less as compared to its competitors. Hence, Mahyco seeds had less reach to its dealers and nurseryman as compared to its close competitors. All the competitors had equal distributor's width in the district. In case of dealers depth and distributor's depth of Rasi seeds was foremost, followed by Mahyco seeds, Beejo Sheetal and East-West. Hence, the overall performance of Rasi seeds was foremost followed by Mahyco seeds, Beejo Sheetal and East-West seed company.

4.4.2.2 Overall performance of different vegetable seed companies on selected parameters in Belagavi district

4.4.2.2.1 Tomato

It was evident from the results in table 4.33 that the product quality of Sungro seeds had upper hand. Dealers width, distribution width and depth (Fig. 4.21) of Sungro seeds and US Agri seeds were leading. In the case of problem solving, transportation facility, work force, cordial nature and product quality of Syngetna indicated least performance in the district during the study period. Similarly, US Agri seeds in the case of account settlement. In the case of dealer's depth, Sungro seeds and Rasi seeds were scored least as compared to US Agri seeds and Syngenta. Push-pull index of Sungro seeds and US Agri seedsand Syngenta were foremost and had better reach to farmers (Fig. 4.21). In the case of time period of dealing and promptness in delivery, US Agri seeds was having upper hand. The overall performance of Sungro seeds was best, followed by US Agri, Rasi seeds and Syngenta.

4.4.2.2.2 Cabbage

The results from the table 4.34 shows that product display, cordial nature of Tokita seeds was achieve least, whereas Mahyco seeds achieve highest in product display. Similarly, Welcome seeds achievement was least in appropriating schemes for cabbage crop during the study period. In the case of work force, all the companies performance was equal. Account settlement, dealers depth and distribution depth of Seminis seeds was prime.

Table 4.32: Overall performance scores of brinjal seed companies in Haveri district

Sl. No.	Parameters	Weightage	Companies			
			Mahyco seeds	Rasi seeds	Beejo Sheetal	East-West
1	Product display	5	2	3	3	3
2	Problem solving	5	3	3	4	2
3	Transportation facility	5	3	4	3	2
4	Work force	5	3	3	3	2
5	Payment habits	5	3	4	3	3
6	Time period of dealing	5	4	4	3	3
7	Promptness in delivery	5	3	5	3	3
8	Appropriating schemes	5	4	2	4	4
9	Account settlement	5	4	5	3	3
10	Coordinal nature	5	3	4	3	2
11	Product quality	7	3	5	4	3
12	Push-pull index	7	2	4	1	1
13	Dealers width	7	3	4	4	4
14	Dealers depth	7	2	3	2	2
15	Distribution width	7	2	2	2	2
16	Distribution depth	15	2	4	1	1
Total		**100**	274	371	266	234
Rank			**II**	**I**	**III**	**IV**

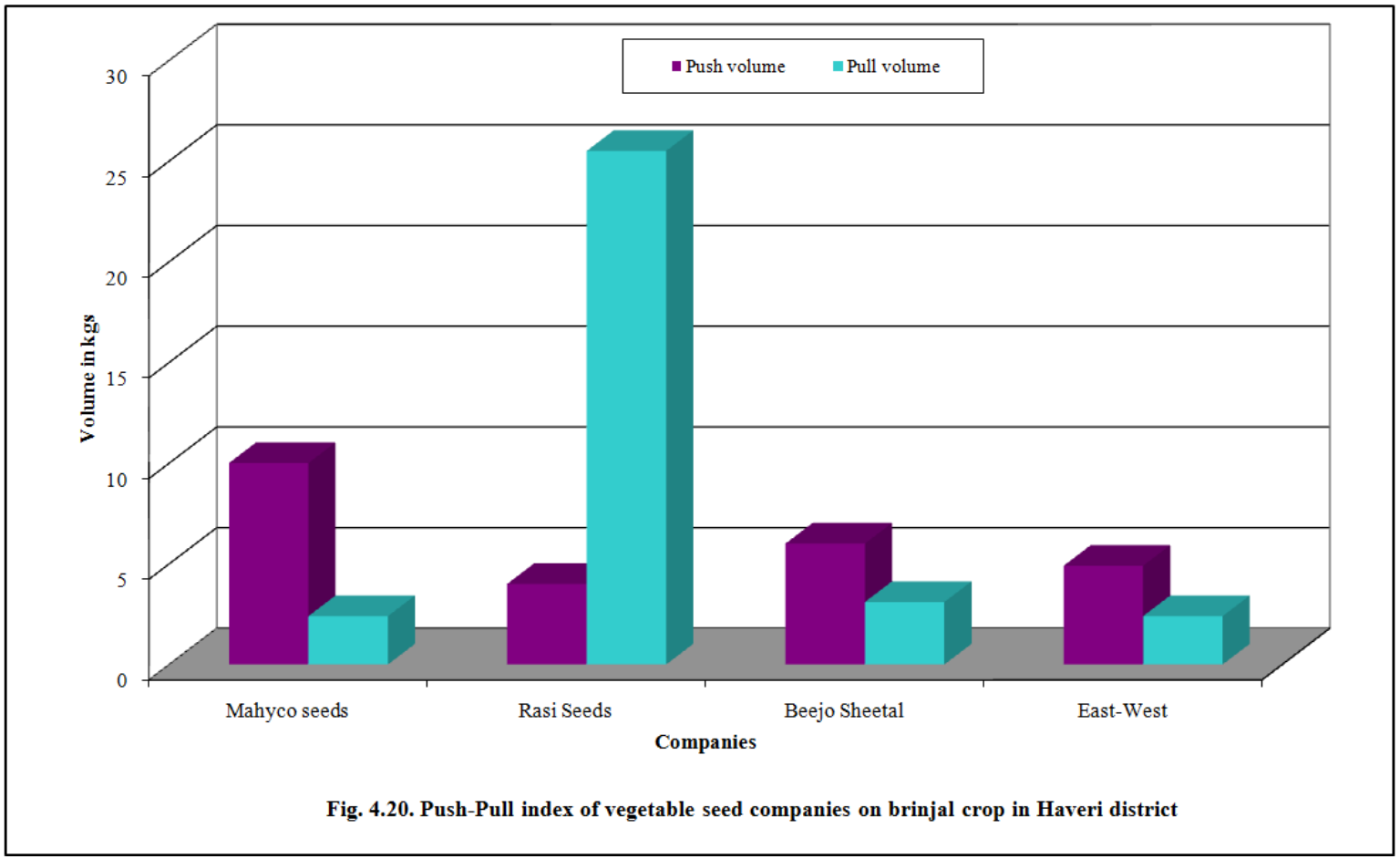

Fig. 4.20. Push-Pull index of vegetable seed companies on brinjal crop in Haveri district

Fig. 4.20. Push-Pull index of vegetable seed companies on brinjal crop in Haveri district

Table 4.33: Overall performance scores of tomato seed companies in Belagavi district

Sl. No.	Parameters	Weightage	Companies			
			Sungro seeds	US. Agri seeds	Rasi seeds	Syngenta
1	Product display	5	3	3	3	3
2	Problem solving	5	4	3	4	2
3	Transportation facility	5	3	3	3	2
4	Work force	5	3	3	3	2
5	Payment habits	5	4	4	4	3
6	Time period of dealing	5	3	4	3	3
7	Promptness in delivery	5	3	4	3	3
8	Appropriating schemes	5	4	3	4	3
9	Account settlement	5	3	2	3	3
10	Coordinal nature	5	3	3	3	2
11	Product quality	7	5	3	3	2
12	Push-pull index	7	3	3	2	3
13	Dealers width	7	5	5	4	4
14	Dealers depth	7	2	3	2	3
15	Distribution width	7	3	3	2	2
16	Distribution depth	15	3	3	2	2
Total		**100**	336	324	300	273
Rank			**I**	**II**	**III**	**IV**

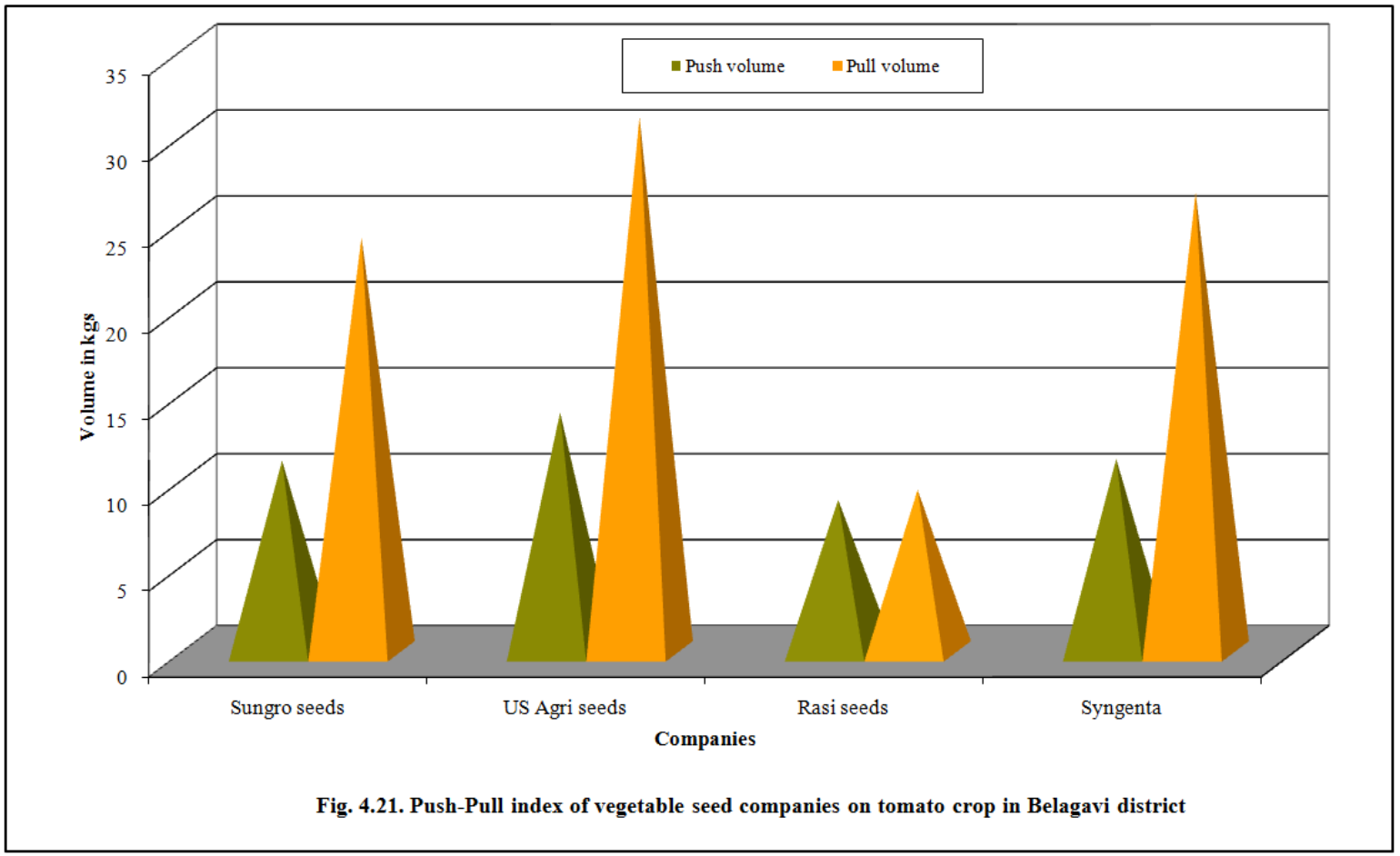

Fig. 4.21. Push-Pull index of vegetable seed companies on tomato crop in Belagavi district

Fig. 4.21. Push-Pull index of vegetable seed companies on tomato crop in Belagavi district

In the case of product quality and payment habits, Seminis and Welcome seeds were leading. Likewise, in the case of push-pull index, Seminis seeds was leading, followed by Welcome seeds, Tokita seeds and Mahyco seeds (Fig. 4.22), where Seminis seeds better reach among all competitors. In the case of dealers width, Seminis seeds and Mahyco seeds were foremost, In the case of Distribution depth, Seminis seeds showed upper hand. The overall performance of Seminis seeds was prime, followed by Welcome seeds, Mahyco seeds and Tokita seeds.

4.4.2.2.3 Green chilli

It was evident from the results in table 4.35 that the product quality, dealer's depth and distribution depth of Tandindo seeds having upper hand. Whereas, in the case of dealer's width of Nangwoo bio seeds was uppermost as compared to its competitors. Likewise, in the case of push-pull index (Fig. 4.23) and distributor's width, Seminis seeds was leading as compare to its close competitors. In the case of problem solving, work force, transportation facility, payment habits and account settlement, time period of dealing, promptness in delivering Nangwoo bio seeds achieved least. Likewise, in the case of product display, Syngenta seeds gained least. The dealers depth and distribution depth of Nangwoo bio seeds, Syngenta and Seminis seeds performed equally and it was least as compare to Tanindo seeds. The overall performance of Tanindo seeds was foremost, followed by Seminis seeds, Syngenta and Nangwoo bio seeds.

4.4.2.2.4 Brinjal

It was observed from the table 4.36 that the push-pull index of Mahyco seeds was leading, followed by Seminis seeds. Whereas, Rasi seeds and East-West seeds companies achieved lower hand (Fig. 4.24). However, in the case of payment habits, cordial nature, transportation facility, dealer's width, Mahyco seeds, Seiminis and Rsi seeds performed equally. Likewise, Mahyco seeds and Seminis seeds performed least in appropriating schemes. Similarly, East-West seeds company in the case of transportation facility, work force, problem solving and cordinatal nature. In the case of distribution depth of Mahyco seeds was gained highest achievement, followed by Seminis seeds. Whereas, Rasi seeds and East-West performed least in the case of distribution depth and distribution width. However, distribution width of Mahyco seeds and Seminis seeds demonstrated equal and higher score. Hence, the overall performance of Mahyco seeds was upmost, followed by Seminis seeds, Rasi seeds and East-West seeds company.

4.4.2.3 Overall performance of different vegetable seed companies on selected parameters in Hassan district

4.4.2.3.1 Tomato

According to results from the table 4.37, time period of dealing, cordial nature and problem solving of Clausa seeds was leading, followed by Seminis seeds. In the case of promptness in delivery, appropriating schemes, account settlement, product quality, dealer's width, product display, transportation facility, payment habits, appropriating schemes, distribution width of Clausa seeds and Synegnta performed equally upmost. Push-pull index of Clausa seeds was highest (Fig. 4.25), whereas push-pull index of Bio seeds was least and it shows more loyal to its dealers and nurseryman but not reach to farmers.

Table 4.34: Overall performance scores of cabbage seed companies in Belagavi district

Sl. No.	Parameters	Weightage	Companies			
			Seminis seeds	Mahyco seeds	Tokita seeds	Wel come
1	Product display	5	3	4	2	3
2	Problem solving	5	4	3	3	3
3	Transportation facility	5	3	4	3	4
4	Work force	5	3	3	3	3
5	Payment habits	5	4	3	3	4
6	Time period of dealing	5	4	3	4	4
7	Promptness in delivery	5	5	5	4	5
8	Appropriating schemes	5	4	3	4	2
9	Account settlement	5	5	3	3	4
10	Coordinal nature	5	3	3	2	4
11	Product quality	7	5	3	3	5
12	Push-pull index	7	4	1	2	3
13	Dealers width	7	5	5	4	4
14	Dealers depth	7	4	2	2	2
15	Distribution width	7	3	3	2	2
16	Distribution depth	15	4	1	1	1
Total		**100**	397	273	268	307
Rank			**I**	**III**	**IV**	**II**

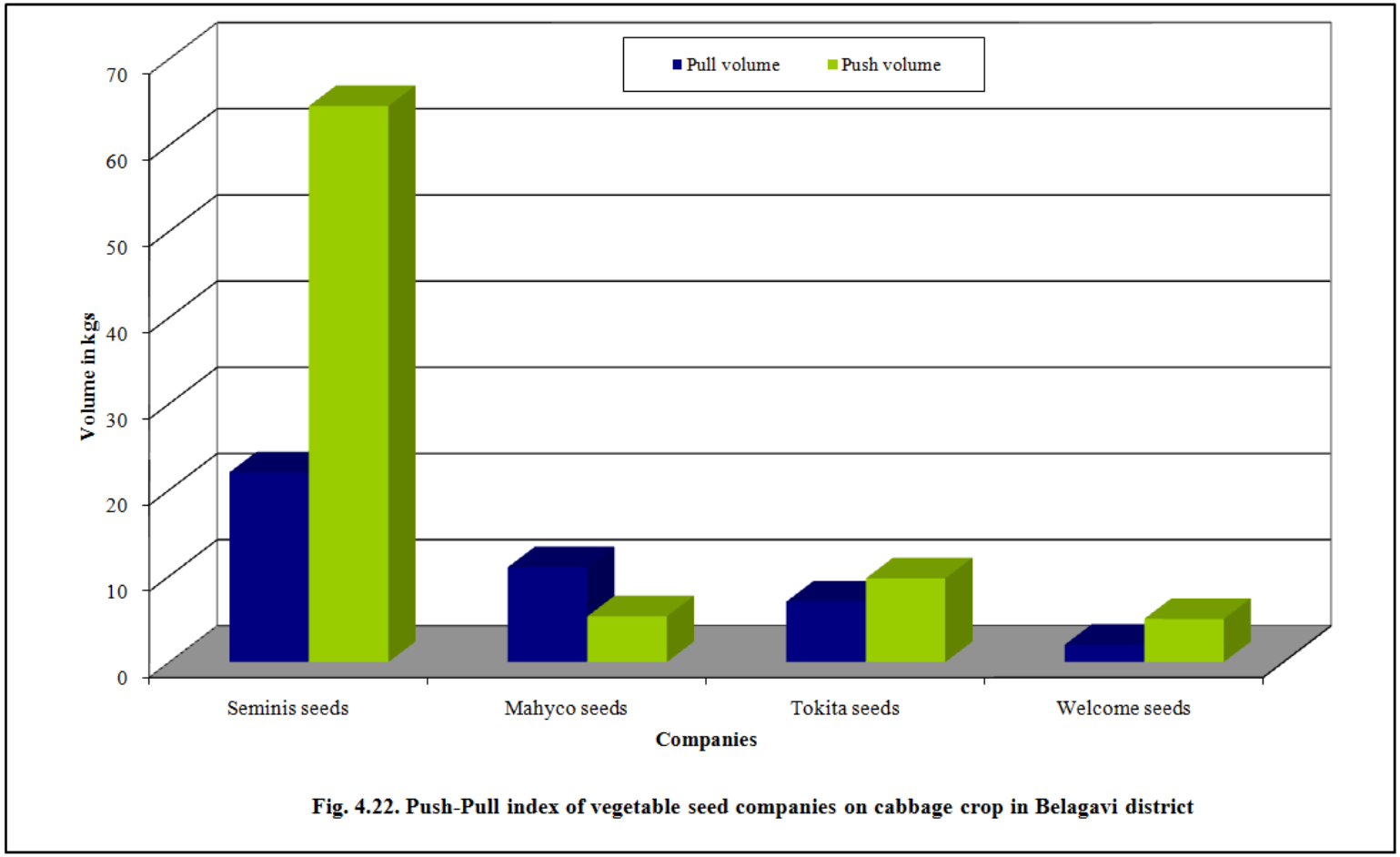

Fig. 4.22. Push-Pull index of vegetable seed companies on cabbage crop in Belagavi district

Fig. 4.22. Push-Pull index of vegetable seed companies on cabbage crop in Belagavi district

Table 4.35: Overall performance scores of green chilli seed companies in Belagavi district

Sl. No.	Parameters	Weightage	Companies			
			Tanindo seeds	Nangwoo bio seeds	Syngenta	Seminis seeds
1	Product display	5	3	2	1	2
2	Problem solving	5	3	1	2	2
3	Transportation facility	5	3	2	3	3
4	Work force	5	3	1	3	2
5	Payment habits	5	3	1	3	3
6	Time period of dealing	5	5	2	3	4
7	Promptness in delivery	5	3	2	3	4
8	Appropriating schemes	5	4	2	3	2
9	Account settlement	5	3	1	3	4
10	Coordinal nature	5	3	2	2	3
11	Product quality	7	4	2	3	4
12	Push-pull index	7	2	2	2	3
13	Dealers width	7	4	5	4	4
14	Dealers depth	7	3	2	2	2
15	Distribution width	7	2	2	2	3
16	Distribution depth	15	4	2	2	2
Total		**100**	330	201	236	272
Rank			**I**	**IV**	**III**	**II**

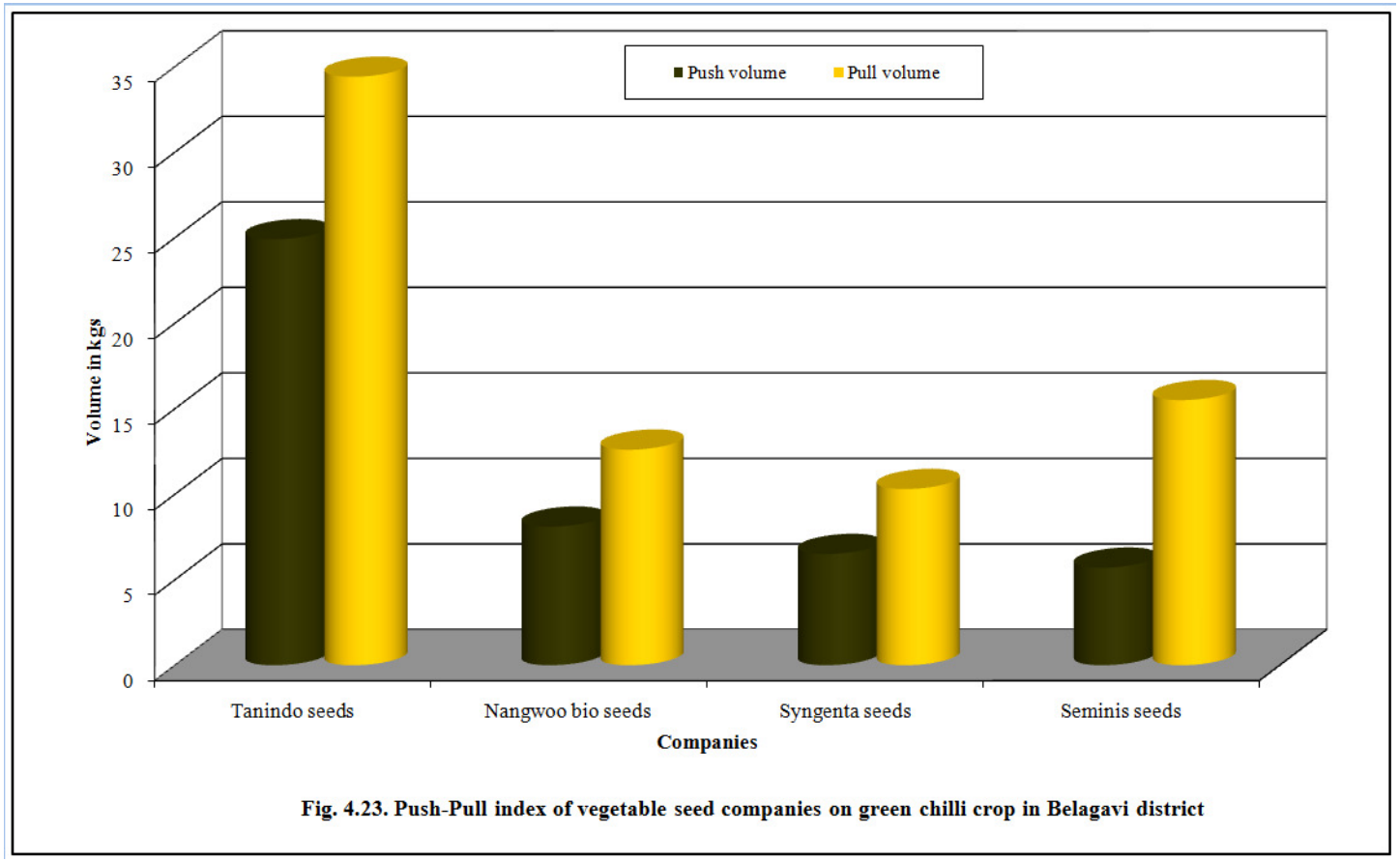

Fig. 4.23. Push-Pull index of vegetable seed companies on green chilli crop in Belagavi district

Fig. 4.23. Push-Pull index of vegetable seed companies on green chilli crop in Belagavi district

Table 4.36: Overall performance scores of brinjal seed companies in Belagavi district

Sl. No.	Parameters	Weightage	Companies			
			Mahyco seeds	Seminis seeds	Rasi seeds	East-West
1	Product display	5	2	2	3	2
2	Problem solving	5	2	2	3	1
3	Transportation facility	5	3	3	3	1
4	Work force	5	2	2	3	1
5	Payment habits	5	3	3	3	2
6	Time period of dealing	5	4	3	3	2
7	Promptness in delivery	5	4	3	3	2
8	Appropriating schemes	5	1	1	3	2
9	Account settlement	5	4	3	3	2
10	Coordinal nature	5	3	3	3	1
11	Product quality	7	4	3	4	2
12	Push-pull index	7	3	2	1	1
13	Dealers width	7	4	4	4	3
14	Dealers depth	7	3	2	2	2
15	Distribution width	7	3	3	1	1
16	Distribution depth	15	3	2	1	1
Total		**100**	304	253	249	158
Rank			**I**	**II**	**III**	**IV**

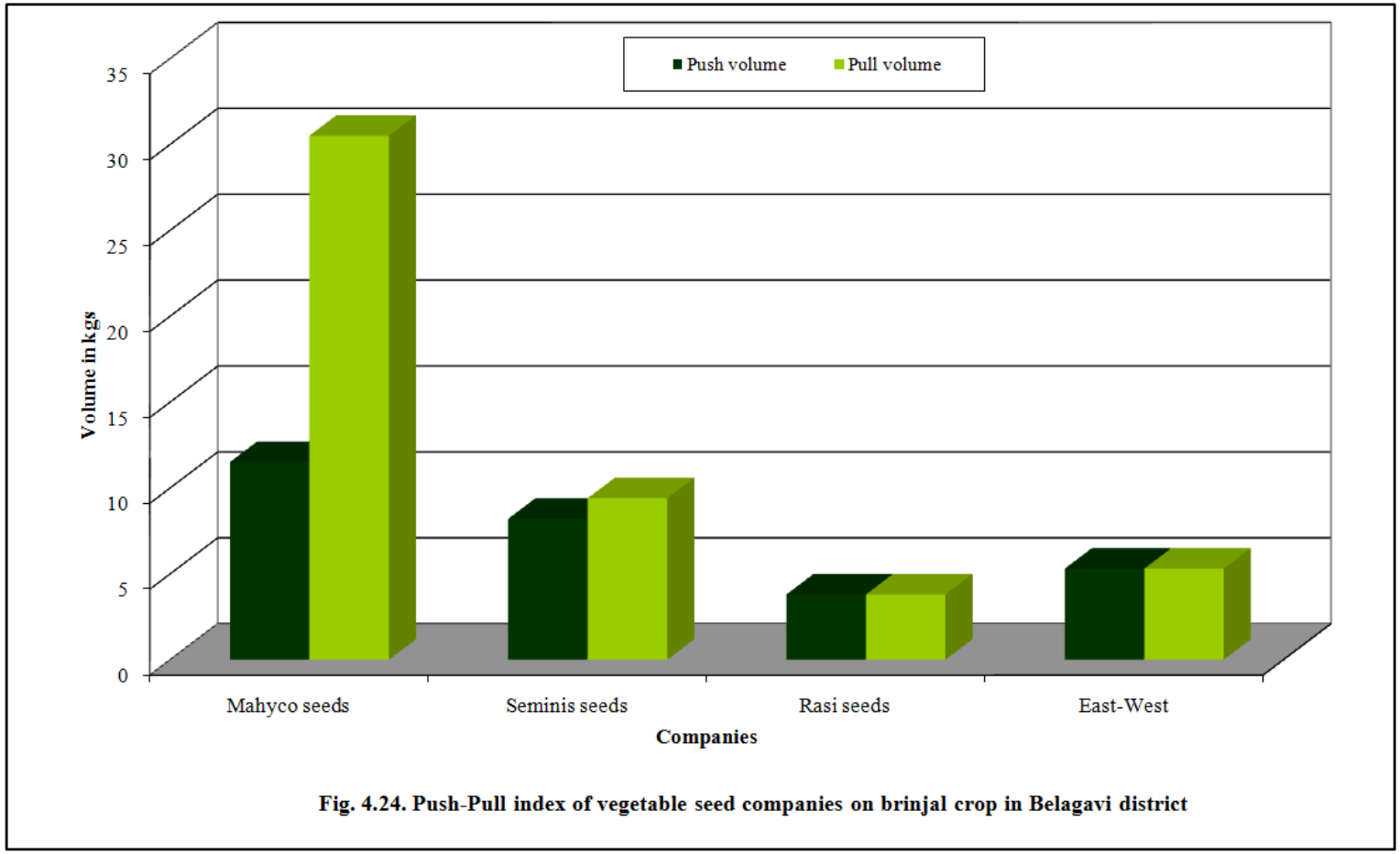

Fig. 4.24. Push-Pull index of vegetable seed companies on brinjal crop in Belagavi district

Fig. 4.24. Push-Pull index of vegetable seed companies on brinjal crop in Belagavi district

Similarly, in the case of promptness in delivery, appropriating schemes and cordial nature performance of Bio seed was least. Likewise, in the case of problem solving, transportation facility, time period of dealing, product quality of Seminis seeds performance was least. Distribution depth of Clasusa seeds was prime and followed by other three competitors with gained equal score. Hence, the overall performance of Clausa seeds was foremost, followed by Seminis seeds, Namdhari seeds and Bio seeds.

4.4.2.3.2 Cabbage

It was evident from the results in the table 4.38 that the problem solving, workforce, payment habits, transportation facility, time period of dealing, promptness in delivery, cordial nature, account settlement, product quality, dealers width, dealers depth and distribution depth of the Syngenta company had upper hand. Whereas, in the case of appropriating schemes, Mahyco seeds and Nunhems seeds was topmost, fowlloed by Sngenta and Seminis seeds which scores equally. Likewise, distribution width of Seminis seeds and Mahyco seeds have upper hand and Syngenta and Bio seeds had lower hand. In the case of push-pull index, Syngeta had better reach to farmers and whereas as other three competitors performed almost equally in push and pull volume sales in the district during the study period (Fig. 4.26). The overall performance of Syngenta seeds was topmost, followed by Seminis seeds, Mahyco seeds and Nunhems seeds.

4.4.2.3.3 Green chilli

According to results from the table 4.39 show that the products display, product quality and distribution depth of East-West company had upper hand. Whereas, in the case of distribution width and cordial nature, Beejo Sheetal and Kalash seeds was foremost and achieved equally, whereas, East-West and Seminis seeds was lowermost and achieved equally. All the companies achieved equality in the case of dealer's depth in the district. In case of push-pull index, Beejo Sheetal was foremost and Kalash seeds was lowermost during the study period (Fig. 4.27). In the case of dealer's width, Beejo Sheetal and Kalash seeds had upper hand and East-West and Seminis seeds had upper hand. Similarly, in the case of work force, Seminis seeds and Beejo Sheetal was foremost. With respect to problem solving, Beejo Sheetal was upmost, in the case of transportation facility, Seminis seeds was foremost, in the case of time period of dealing and account settlement of Kalash seeds was leading. Whereas, payment habits and account settlement of Seminis seeds was least. The overall performance of East-West and Beejo Sheetal companies were foremost, followed by Kalash seeds and Seminis seeds.

4.4.2.3.4 Brinjal

The results from the table 4.40 that the product quality and appropriate schemes, problem solving of Mahyco seeds was upmost and Rasi seeds was lowermost and with contrast to this, promptness in delivery, Rasi seeds was foremost and Mahyco seeds achieved lowest. In case of distribution width of all the four companies achievement was equal. With respect to problem solving, appropriating schemes, product quality, deales width and dealers depth of Rasi seeds was least. Whereas, In the case of dealer's width, Rasi seeds gained very attain least among its competitors. In the case of push-pullindex Mahyco seeds had higher pull volume (Fig. 4.28). The distribution depth of Mahyco seeds was foremost and the other three competitors achieved least equally. The overall performance of Mahyco seeds was upmost, followed by Golden seeds, Sungro seeds and Rasi seeds.

Table 4.37: Overall performance scores of tomato seed in Hassan district

Sl. No.	Parameters	Weightage	Companies			
			Clausa	Syngenta	Seminis	Bio seeds
1	Product display	5	3	3	2	2
2	Problem solving	5	5	4	2	3
3	Transportation facility	5	3	3	2	3
4	Work force	5	2	3	2	3
5	Payment habits	5	4	4	3	3
6	Time period of dealing	5	5	4	2	3
7	Promptness in delivery	5	5	5	3	2
8	Appropriating schemes	5	4	4	3	2
9	Account settlement	5	5	5	3	3
10	Coordinal nature	5	4	3	3	2
11	Product quality	7	5	5	2	3
12	Push-pull index	7	4	3	3	1
13	Dealers width	7	5	5	4	4
14	Dealers depth	7	2	2	2	2
15	Distribution width	7	3	3	2	2
16	Distribution depth	15	3	2	2	2
Total		**100**	378	346	246	244
Rank			**I**	**II**	**III**	**IV**

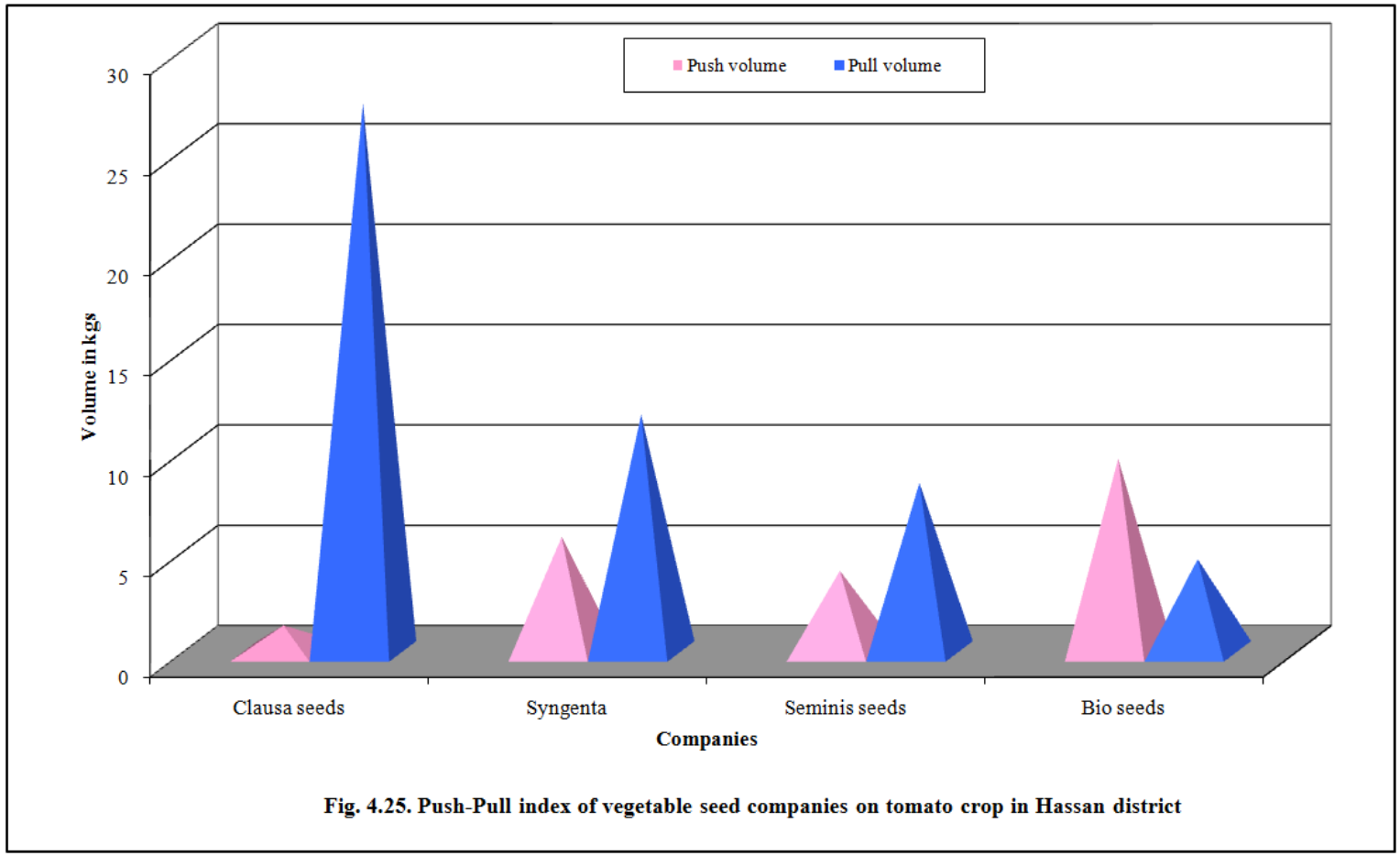

Fig. 4.25. Push-Pull index of vegetable seed companies on tomato crop in Hassan district

Fig. 4.25. Push-Pull index of vegetable seed companies on tomato crop in Hassan district

Table 4.38: Overall performance scores of cabbage seed companies in Hassan district

Sl. No.	Parameters	Weightage	Companies			
			Syngenta	Semins	Mahyco	Numhems
1	Product display	5	4	4	2	2
2	Problem solving	5	5	3	3	3
3	Transportation facility	5	5	4	2	2
4	Work force	5	5	4	3	3
5	Payment habits	5	4	2	3	3
6	Time period of dealing	5	5	3	3	3
7	Promptness in delivery	5	5	4	3	3
8	Appropriating schemes	5	3	3	4	4
9	Account settlement	5	5	2	3	3
10	Coordinal nature	5	4	2	2	2
11	Product quality	7	5	3	3	3
12	Push-pull index	7	4	2	2	2
13	Dealers width	7	5	4	4	4
14	Dealers depth	7	3	2	2	2
15	Distribution width	7	2	3	3	2
16	Distribution depth	15	3	2	2	1
Total		**100**	403	283	268	246
Rank			**I**	**II**	**III**	**IV**

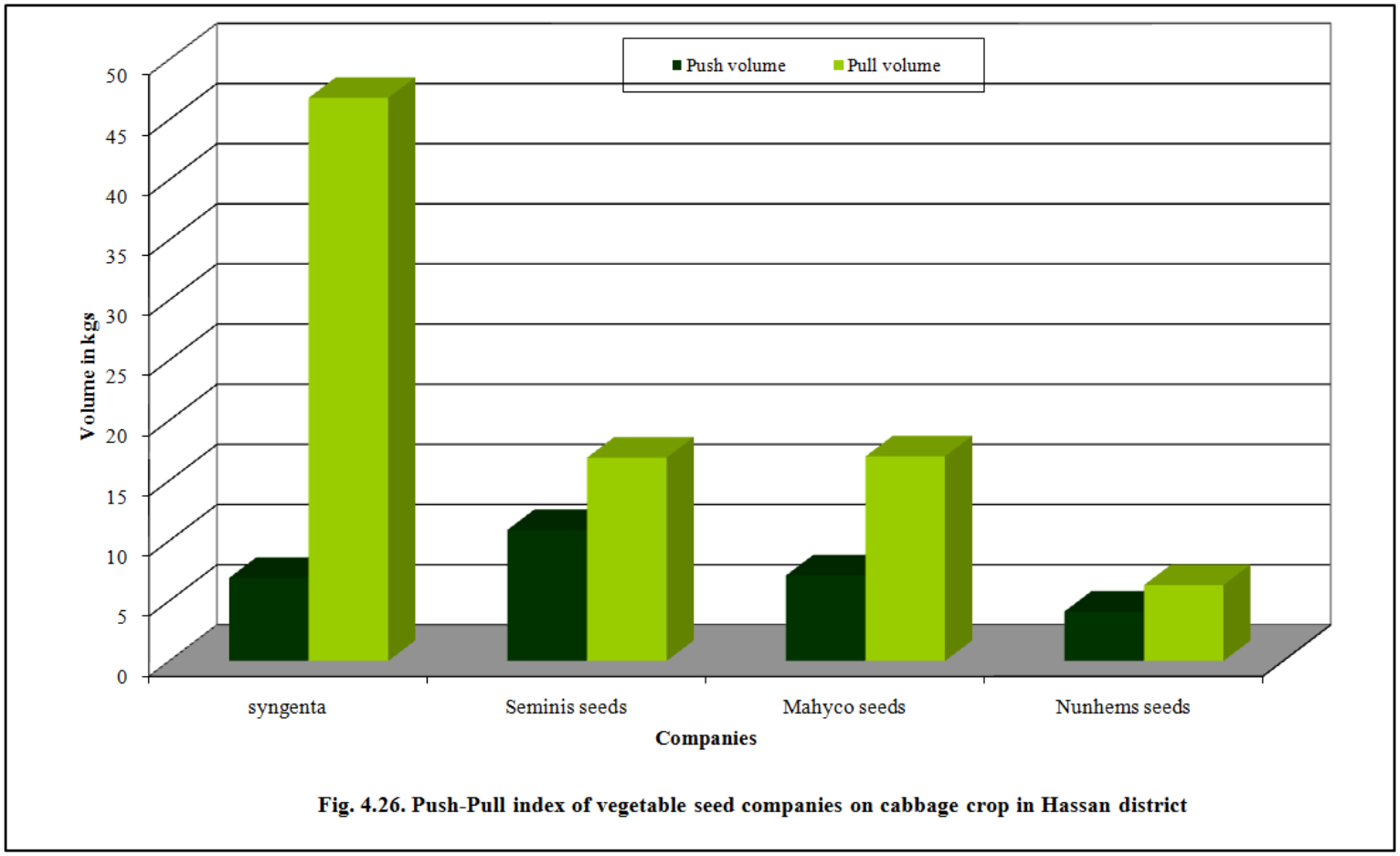

Fig. 4.26. Push-Pull index of vegetable seed companies on cabbage crop in Hassan district

Fig. 4.26. Push-Pull index of vegetable seed companies on cabbage crop in Hassan district

Table 4.39: Overall performance scores of green chilli seed companies in Hassan district

Sl. No.	Parameters	Weightage	Companies			
			East-West	Seminis seeds	Beejo Sheetal	Kalash seeds
1	Product display	5	4	3	3	2
2	Problem solving	5	2	2	4	2
3	Transportation facility	5	3	4	3	3
4	Work force	5	2	3	3	2
5	Payment habits	5	3	2	3	3
6	Time period of dealing	5	3	3	3	4
7	Promptness in delivery	5	3	4	3	4
8	Appropriating schemes	5	4	2	4	2
9	Account settlement	5	3	2	3	4
10	Coordinal nature	5	2	2	3	3
11	Product quality	7	5	4	4	4
12	Push-pull index	7	2	1	3	2
13	Dealers width	7	4	4	2	2
14	Dealers depth	7	3	3	3	3
15	Distribution width	7	2	2	3	3
16	Distribution depth	15	3	2	2	2
Total		**100**	302	263	302	280
Rank			**I**	**IV**	**I**	**III**

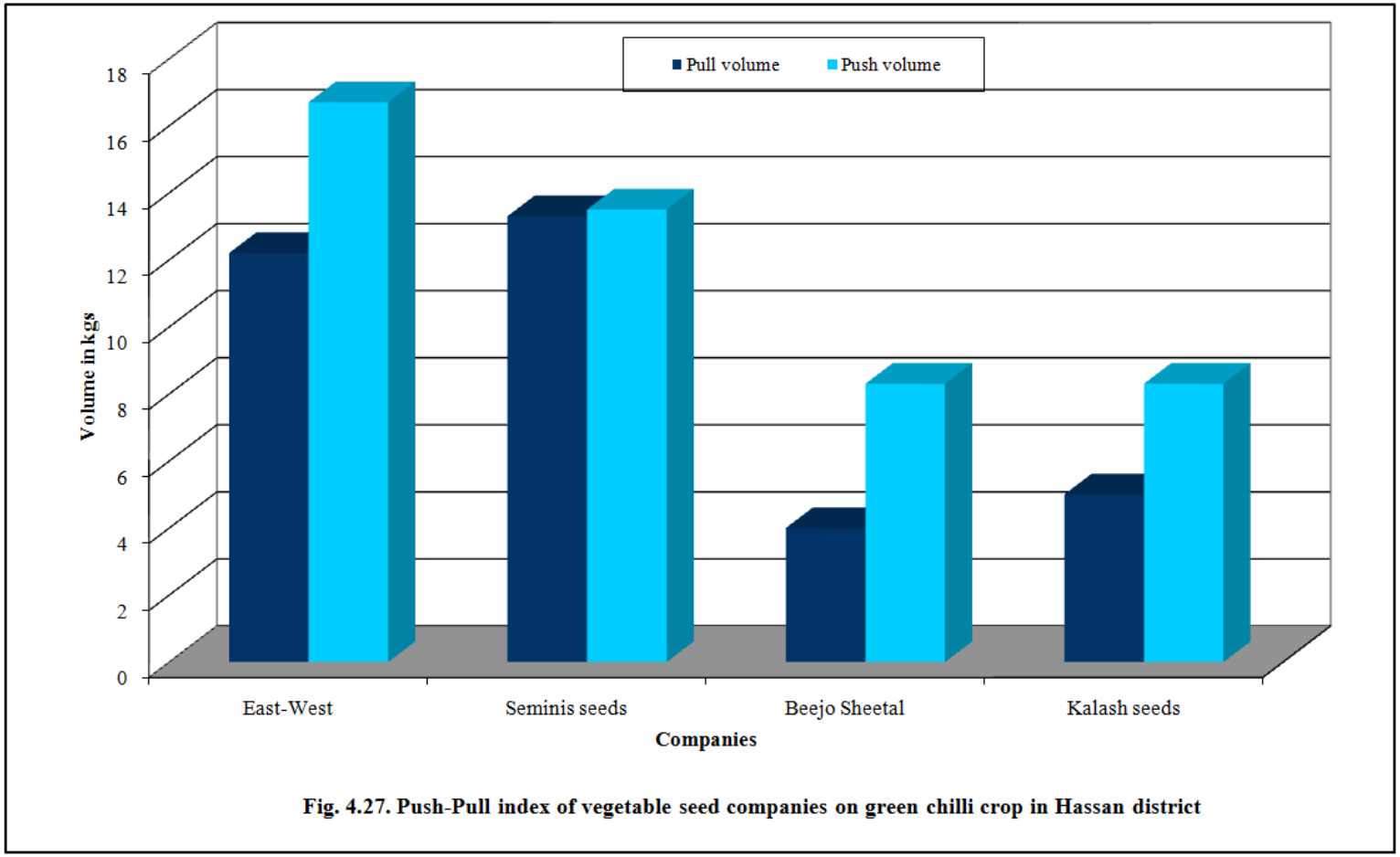

Fig. 4.27. Push-Pull index of vegetable seed companies on green chilli crop in Hassan district

Fig. 4.27. Push-Pull index of vegetable seed companies on green chilli crop in Hassan district

Table 4.40: Overall performance scores of brinjal seed companies in Hassan district

Sl. No.	Parameters	Weightage	Companies			
			Mahyco seeds	Golden seeds	Sungro seeds	Rasi seeds
1	Product display	5	2	2	3	3
2	Problem solving	5	3	3	3	1
3	Transportation facility	5	3	3	4	4
4	Work force	5	3	3	3	3
5	Payment habits	5	3	5	4	4
6	Time period of dealing	5	4	4	4	4
7	Promptness in delivery	5	3	4	4	5
8	Appropriating schemes	5	4	3	4	1
9	Account settlement	5	4	2	2	4
10	Coordinal nature	5	3	4	3	4
11	Product quality	7	5	2	2	1
12	Push-pull index	7	4	2	2	5
13	Dealers width	7	4	4	3	1
14	Dealers depth	7	3	3	2	1
15	Distribution width	7	2	2	2	2
16	Distribution depth	15	5	1	1	1
Total		**100**	361	285	276	250
Rank			**I**	**II**	**III**	**IV**

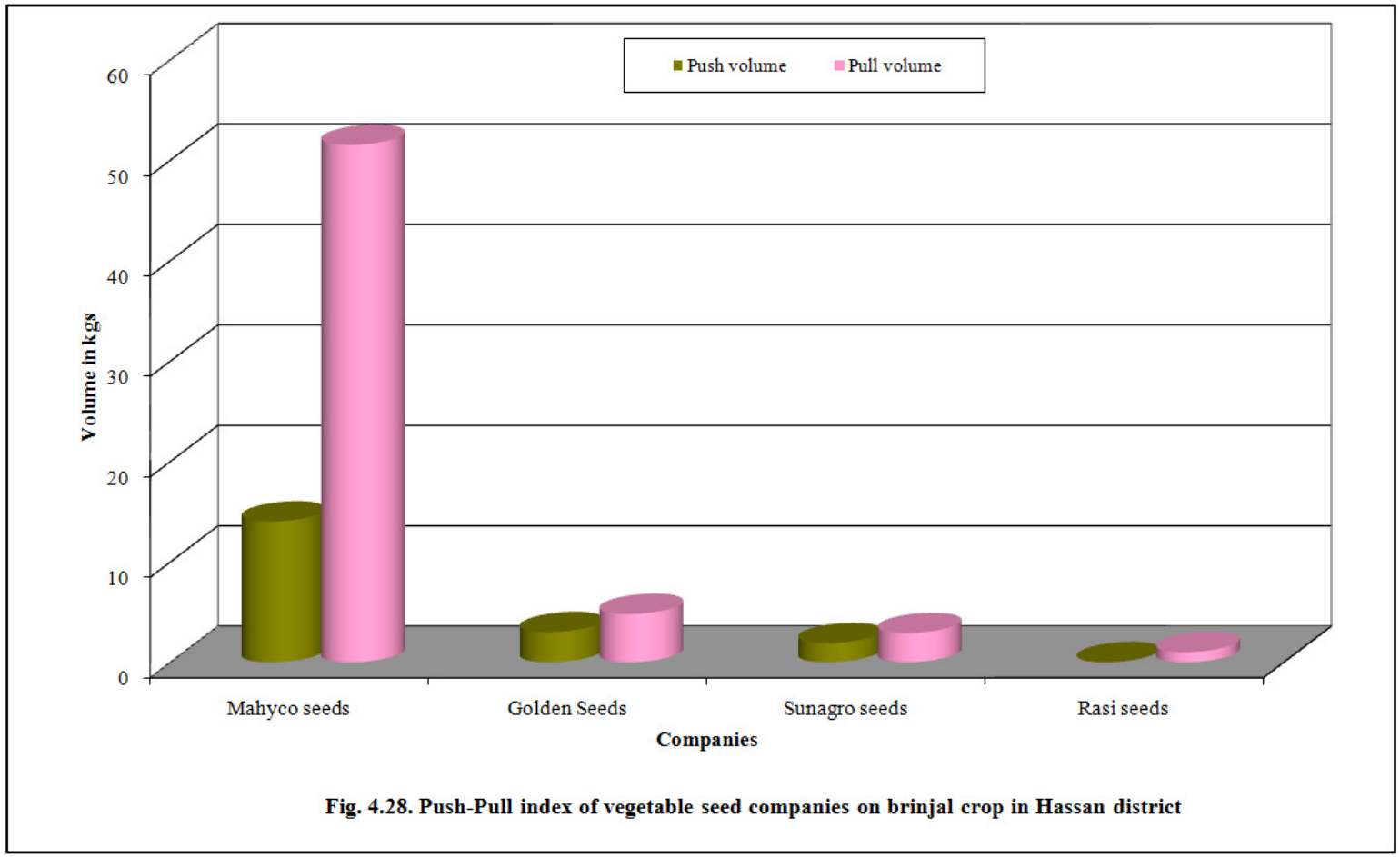

Fig. 4.28. Push-Pull index of vegetable seed companies on brinjal crop in Hassan district

Fig. 4.28. Push-Pull index of vegetable seed companies on brinjal crop in Hassan district

4.4.2.4 Overall performance of different vegetable seed companies on selected parameters in Kolar district

4.4.2.4.1 Tomato

Results from the table 4.41 shows that the product display, problem solving and payment habits of all the companies performance was equal. Whereas, product quality of US Agri seeds and Syengenta was prime, followed by Indo-America and Namdhari seeds. With respect to push-pull index, Namdhari seeds has achieved least as compared to its competitors (Fig. 4.29) and it indicated that Namdhari seeds was not reached to farmers and it showing dealers and nurseryman pushing the product and pull volume of US Agro seeds was topmost. Similarly, in the case of transportation facility, work force, time period of dealing and promptness in delivery of Namdhari seeds performance was least. In the case of dealers width, US Agri seeds and Syngenta performed equally high, whereas, Indo-America seeds and Namdhari seeds performed equally low. However, in the case of dealer's depth also, US Agri seeds was topmost, followed by its competitors which performed equally (Fig. 4.29). Similarly, distribution depth of US Agri seeds was prime. The overall highest score gained by US Agri seeds, followed by, Syngenta, Indo-Amercian seeds and Namdhari seeds.

4.4.2.4.2 Cabbage

According to results from the table 4.42 revealed that in case of product quality, Nunhems seeds achievement was foremost, followed by Mahyco seeds. With respect to push-pull index, Nunhems seeds was prime leader (Fig. 4.30). In case of dealers width Nunhems seeds got highest score, followed by equal proportion of score gained by other competitors. In the case of dealers depth and distribution depth, Nunhems seeds was prime followed by Rasi seeds. All the companies performed equally with respect to distribution width in the district during the study period and in contrast to this, Mahyco seeds achievement was least in the case of appropriating schemes, product quality and dealers width. Likewise in the case of dealers depth and distribution, Seminis seeds and Mahyco seeds performance was least. Similarly, in the case of push-pull index, Seminis seeds, Rasi seeds and Mahyco seeds performance were least which indicate dealers and nurseryman pushing the product in the market. The overall performance of Nunhems seeds gained highest score, followed by Rasi seeds, Seminis seeds and Mahyco seeds, respectively.

4.4.2.4.3 Green chilli

It could be evident from results in the table 4.43 that in the case of time period of dealing, account settlement and product quality, Namdhari seeds achievement was supreme. With contrast to this, appropriating schemes of Namdhari seeds was least. In case of push-pull index, Namdhari seeds and US Agri seeds were ultimate, followed by Kalash seeds and East-West seeds companies (Fig. 4.31). Whereas, in the cases of product display, transportation facility, work force, payment habits, promptness in delivery, cordial nature, dealer's width, distribution width and dealers depth, all the competitors performed equally good. In case of distribution depth, Namdhari seeds and US Agri seeds chievement was equally better and followed East-West and Kalash seeds were achieved equally good. The overall performances among competitors were calculated and result found that, Namdhari seeds was prime leader, followed by US Agri seeds, East-West and Kalash seed, respectively.

Table 4.41: Overall performance scores of tomato seed companies in Kolar district

Sl. No.	Parameters	Weightage	Companies			
			US. Agri seeds	Syngenta	Indo American seeds	Namdhari seeds
1	Product display	5	3	3	3	3
2	Problem solving	5	3	3	3	3
3	Transportation facility	5	4	4	4	3
4	Work force	5	4	3	3	2
5	Payment habits	5	4	4	4	4
6	Time period of dealing	5	4	4	4	3
7	Promptness in delivery	5	4	5	5	3
8	Appropriating schemes	5	3	2	2	3
9	Account settlement	5	3	5	5	3
10	Coordinal nature	5	3	4	4	4
11	Product quality	7	5	5	3	3
12	Push-pull index	7	4	4	4	3
13	Dealers width	7	5	5	4	4
14	Dealers depth	7	3	2	2	2
15	Distribution width	7	2	2	2	2
16	Distribution depth	15	4	2	2	1
Total		**100**	368	237	234	176
Rank			**I**	**II**	**II**	**IV**

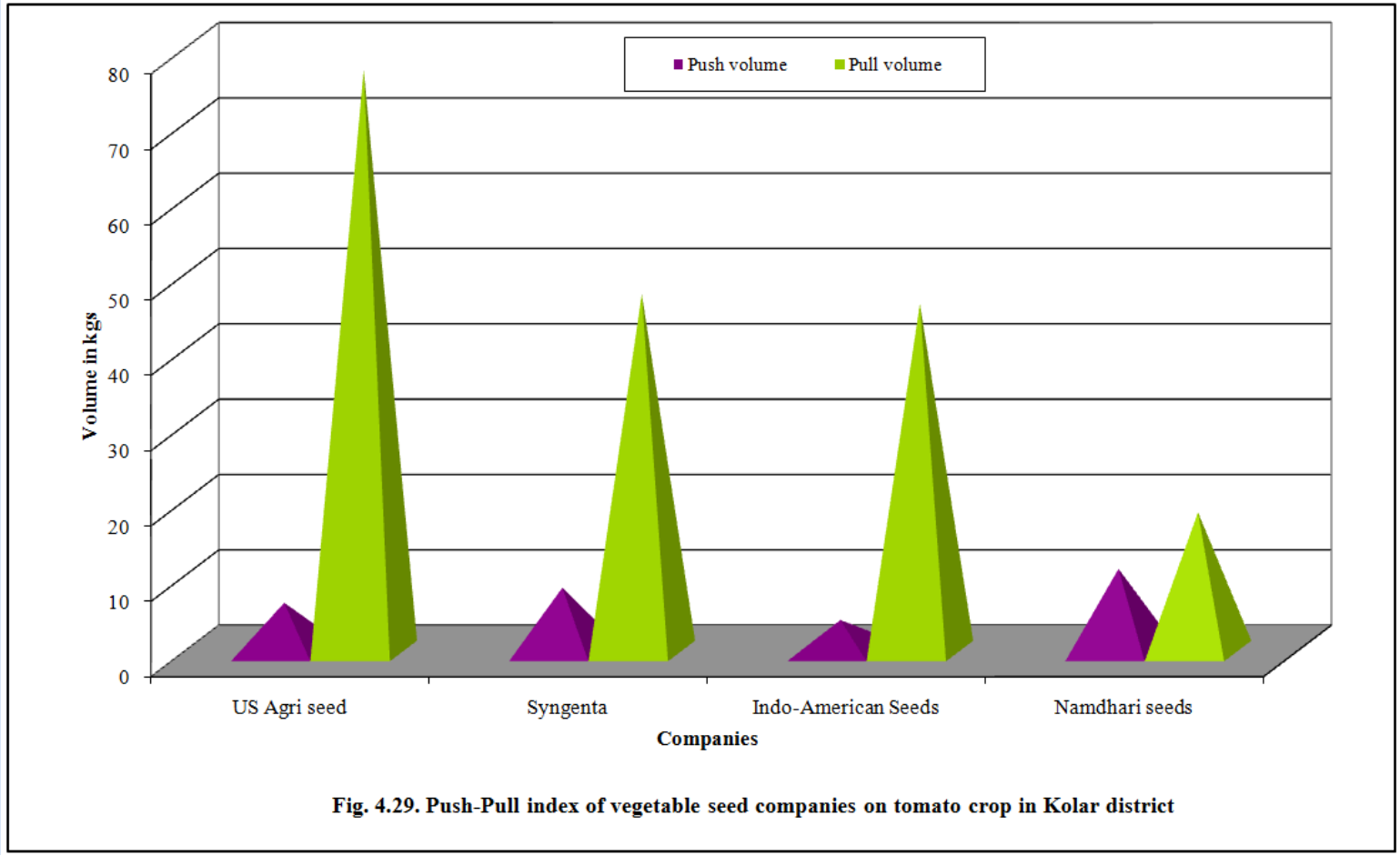

Fig. 4.29. Push-Pull index of vegetable seed companies on tomato crop in Kolar district

Fig. 4.29. Push-Pull index of vegetable seed companies on tomato crop in Kolar district

Table 4.42: Overall performance scores of cabbage seed companies in Kolar district

Sl. No.	Parameters	Weightage	Companies			
			Nunhems seeds	Seminies seeds	Rasi seeds	Mahyco seeds
1	Product display	5	3	3	3	2
2	Problem solving	5	3	3	3	3
3	Transportation facility	5	4	3	4	2
4	Work force	5	3	3	3	2
5	Payment habits	5	3	4	4	3
6	Time period of dealing	5	4	4	4	3
7	Promptness in delivery	5	4	5	3	3
8	Appropriating schemes	5	3	4	2	1
9	Account settlement	5	4	4	3	3
10	Coordinal nature	5	3	3	4	2
11	Product quality	7	5	2	2	1
12	Push-pull index	7	4	1	1	1
13	Dealers width	7	5	4	4	1
14	Dealers depth	7	4	1	2	1
15	Distribution width	7	2	2	2	2
16	Distribution depth	15	4	1	2	1
Total		**100**	370	265	272	177
Rank			**I**	**III**	**II**	**IV**

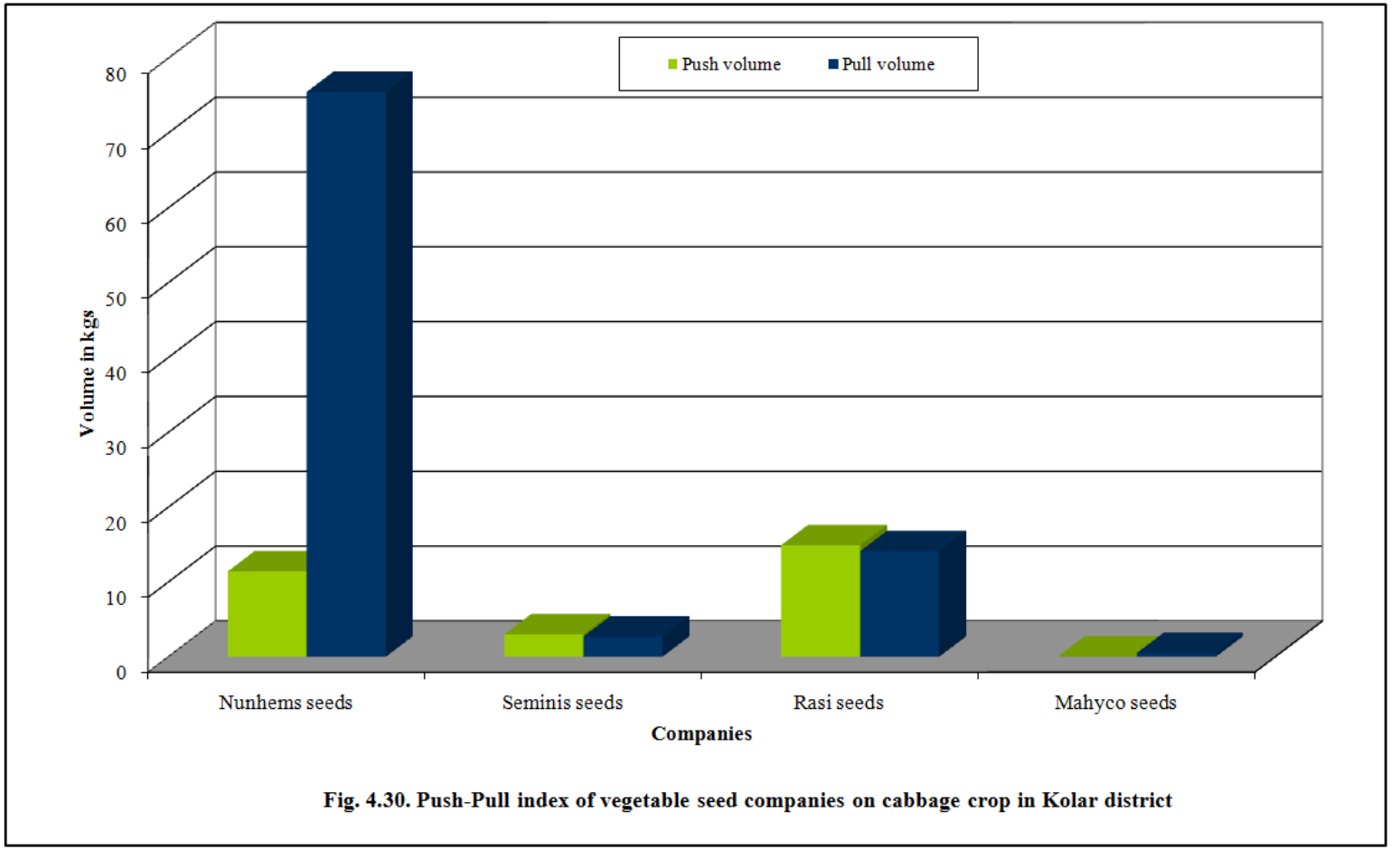

Fig. 4.30. Push-Pull index of vegetable seed companies on cabbage crop in Kolar district

Fig. 4.30. Push-Pull index of vegetable seed companies on cabbage crop in Kolar district

4.4.2.4.4 Brinjal

According to results from the table 4.44 that in case of product quality, Mahyco seeds and Ankur seeds archived equally and it was best, followed by Rasi seeds and East-West. Similarly, in the case of product display of Rasi seeds and East-West seeds was foremost. With respect to problem solving of East-West seeds company was upmost, likewise Rasi seeds was upmost in transportation facility. In the case of work force, payment habits and promptness in delivery of Ankur seeds was prime. With contrast to this, account settlement of Ankur seeds performance of least. Whereas, in the case of push-pull index of East-West was least and Rasi seeds was prime (Fig. 4.32). However, Namdhari seeds and US Agri seeds performed best. With respect to dealer's width, all competitors were achieved equal high. In the case of dealers depth highest achievement opted by Mahyco seeds, followed by all the three competitors. Similarly, in case of distribution width, where all the competitors were performed equally. In the case of distribution depth, Mahyco seeds performance was best, followed by its close competitors. The overall performance Mahyco seeds was uppermost, followed by Ankur seeds, Rasi seeds and East-West seeds, respectively.

4.5 Factors influencing farmers in vegetable seed purchase decision

In order to assess the relative importance attached by farmers in choosing vegetable seeds in selected district, standardized index was computed. The factors considered in the analysis were; suitability of soil, productivity, suitability of climate, market price at the planting stage, company promotion activities, germination percentage, neighbor's opinion, brand name, dealers guidance and availability of credit. The district wise results of the analysis are presented in the tables 4.45, 4.46, 4.47 and 4.48, respectively.

4.5.1 Haveri district

In the case of tomato seeds, the market price at the planting stage was found to be the most important factor (Table 4.45), followed by company promotional activities, suitability of soil, brand name and whereas, germination percentage, availability of credit and neighbors opinion were least factor which influence the farmers to buy tomato vegetable seeds. For cabbage, the market price at the planting stage was regarded as the most significant factor, followed by suitability of climate, company promotional activities and brand name. Likewise, dealer's guidance, productivity and neighbors opinion were considered to be least important factors. Similarly, in the case of green chilli, the major factors considered were the suitability of soil, productivity and market price at the planting stage and neighbor's opinion was considered as least factor. In case of brinjal, the market price at the planting stage was measured as the most important factor, followed by suitability of climate and company promotional activities. Thus, the determinants of farmers purchase decisions mostly based on market price at the planting stage was considered in tomato, cabbage and brinjal, whereas neighbours opinion was least factor in all the crops.

Table 4.43: Overall performance scores of green chilli seed companies in Kolar district

Sl. No.	Parameters	Weightage	Companies			
			Namdhari seeds	US Agri seeds	East-West	Kalash Seeds
1	Product display	5	3	3	3	3
2	Problem solving	5	3	4	4	3
3	Transportation facility	5	3	3	3	3
4	Work force	5	3	3	3	3
5	Payment habits	5	3	3	3	3
6	Time period of dealing	5	4	3	3	3
7	Promptness in delivery	5	3	3	3	3
8	Appropriating schemes	5	3	4	4	4
9	Account settlement	5	4	3	3	3
10	Coordinal nature	5	3	3	3	3
11	Product quality	7	5	4	4	3
12	Push-pull index	7	4	4	2	3
13	Dealers width	7	4	4	4	4
14	Dealers depth	7	2	2	2	2
15	Distribution width	7	2	2	2	2
16	Distribution depth	15	3	3	2	1
Total		**100**	324	309	288	268
Rank			**I**	**II**	**III**	**IV**

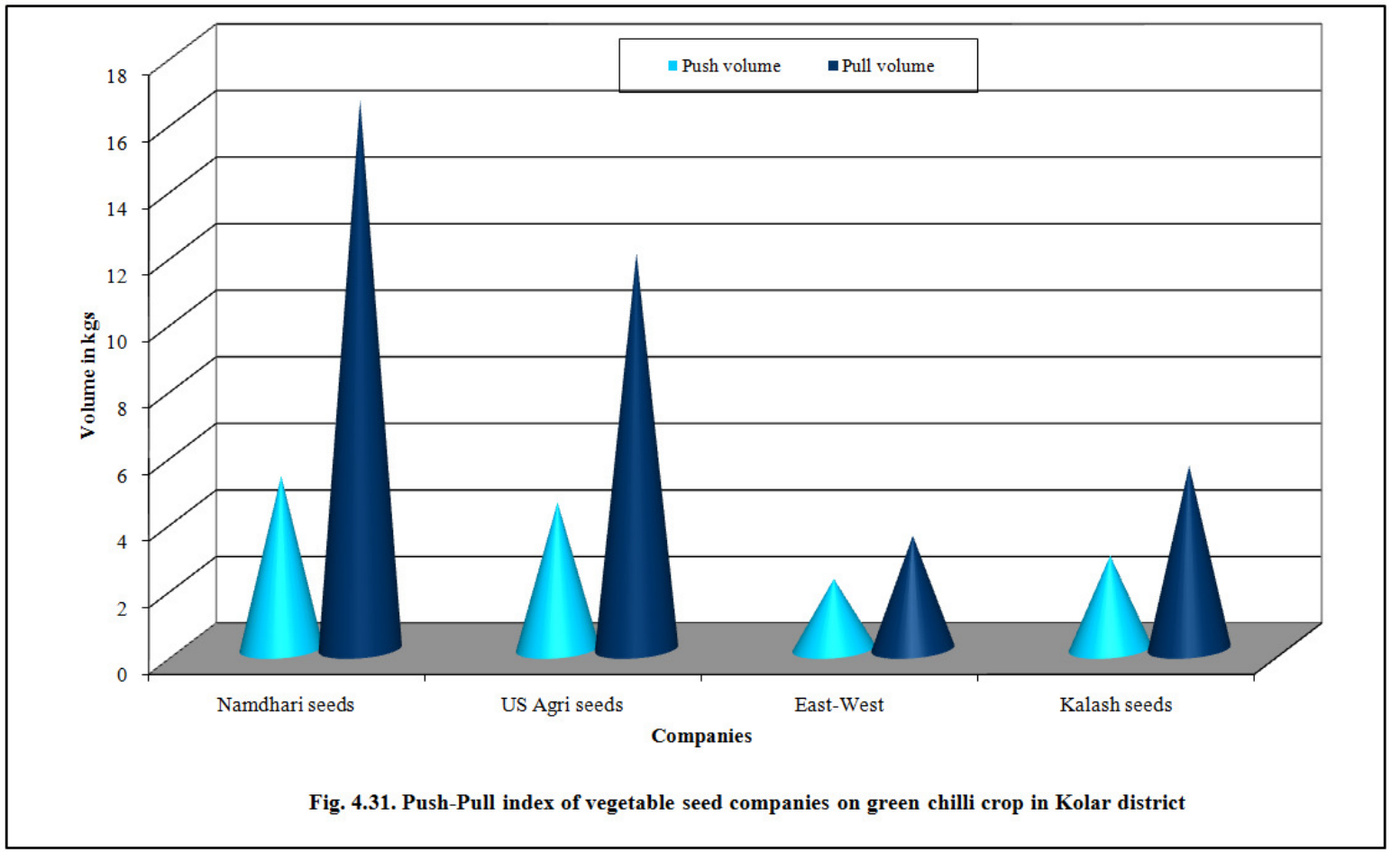

Fig. 4.31. Push-Pull index of vegetable seed companies on green chilli crop in Kolar district

Fig. 4.31. Push-Pull index of vegetable seed companies on green chilli crop in Kolar district

Table 4.44: Overall performance scores of brinjal seed companies in Kolar district

Sl. No	Parameters	Weightage	Companies			
			Mahyco seeds	Ankur seeds	Rasi seeds	East-West
1	Product display	5	2	2	3	3
2	Problem solving	5	3	3	3	4
3	Transportation facility	5	2	3	4	3
4	Work force	5	2	4	3	3
5	Payment habits	5	3	5	4	3
6	Time period of dealing	5	3	4	4	3
7	Promptness in delivery	5	3	4	3	3
8	Appropriating schemes	5	4	3	2	4
9	Account settlement	5	3	2	3	3
10	Coordinal nature	5	2	4	4	3
11	Product quality	7	5	5	2	2
12	Push-pull index	7	3	3	3	1
13	Dealers width	7	4	4	4	4
14	Dealers depth	7	3	2	2	2
15	Distribution width	7	2	2	2	2
16	Distribution depth	15	3	1	1	2
Total		**100**	299	297	271	267
Rank			**I**	**II**	**III**	**IV**

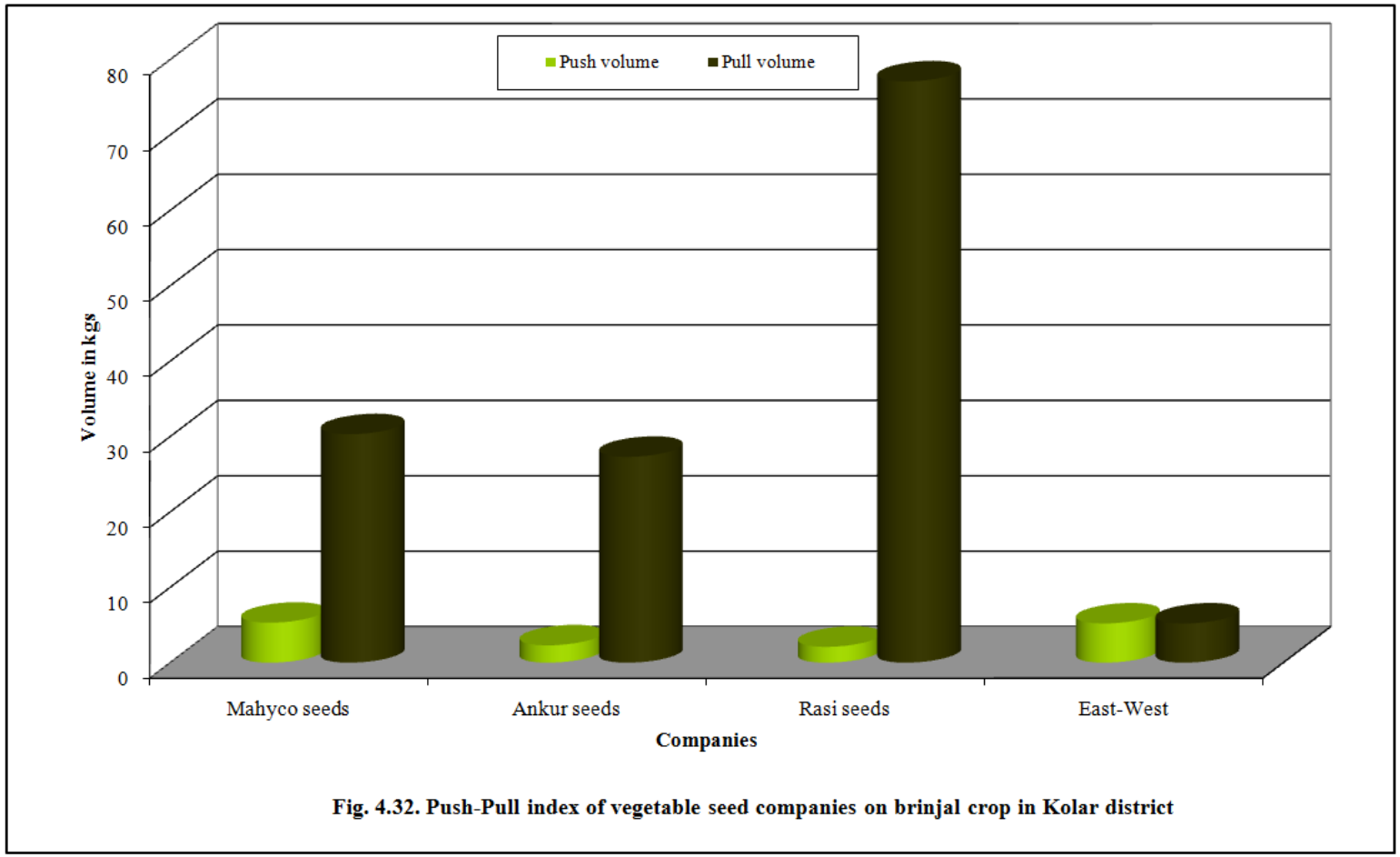

Fig. 4.32. Push-Pull index of vegetable seed companies on brinjal crop in Kolar district

Fig. 4.32. Push-Pull index of vegetable seed companies on brinjal crop in Kolar district

Table 4.45: Factors influencing seed purchase decision of farmers in Haveri district

Sl. No	Factors	Tomato n=10	Cabbage n=10	Grren chilli n=10	Brinjal n=10
		S.I Rank	S.I Rank	S.I Rank	S.I Rank
1	Suitability of Soil	III	V	I	V
2	Productivity	VII	IX	II	IX
3	Suitability of climate	V	II	IX	II
4	Market price at the planting stage	I	I	III	I
5	Companies promotion activities	II	III	IV	III
6	Germination percentage	VIII	VI	VIII	VI
7	Neighbor’s opinion	X	X	X	X
8	Brand name	IV	IV	V	IV
9	Dealers guidance	VI	VIII	VII	VIII
10	Availability of credit	IX	VII	VI	VII

S.I: Standardized Index

4.5.2 Belagavi district

The results in table 4.46, shows that, the availability of credit was regarded as a major factor influencing tomato farmer decisions of purchasing, followed by suitability of soil and the market price at the time of planting stage, likewise dealers guidance and availability of credit was considered as least important factors. However, suitability of soil was considered as major factor in case of cabbage, followed by productivity and suitability of climate, whereas dealer's guidance and availability of credit was considered was least important factor. Likewise, when it comes to green chilli, suitability of soil was viewed as major factor, followed by suitability of climate and productivity, whereas brand name and dealers guidance were considered as least important factors. Similarly, in the case of brinjal, the major factors measured as the suitability of soil, market price at time of planting and company promotional activities. However, availability of credit and neighbors option were considered as least important factors. Thus, the determinants of farmers purchase decision were different from one type of vegetable to others in the district.

4.5.3 Hassan district

It was observed from the table 4.47 that, in the case of tomato seeds, market price at the planting stage was considered the most important factor, followed by suitability of soil, whereas, neighbors opinion was considered as least important factor. Likewise, in the case of cabbage, the market price at the planting stage was regarded as the most important factor, followed by suitability of climate, company promotional activities and brand name, however productivity and neighbor's opinion were considered as least important factors. Similar observations were made in the case of green chilli, the major factors were found to be the market price at the planting stage, germination percentage and company promotional activities, the dealer's guidance and neighbor's opinion were considered as least important factors. Scenario is different in case of brinjal, the suitability of soil was measured the most important factor, followed by suitability of climate and productivity. Thus, the determinants of farmers purchase decisions were different from one type of vegetable to others in the district.

4.5.4 Kolar district

The factors considered in the vegetable seed purchases in Kolar district are presented in table 4.48. The result indicted that, in the case of tomato seeds, market price at the time of planting was found to be the most important factor, followed by suitability of soil and company promotional activities, whereas availability of credit and neighbours opinion was considered as least important factors. Likewise, it was observed in the case of cabbage seeds that, market price at the time of planting was considered to be the major factor, followed by dealer's guidance and brand name. However, in case of green chilli, the suitability of soil was considered the major factor, followed by the suitability of climate and productivity. When it comes brinajl, the major factors considered to be the market price at the time of planting, suitability of climate, company promotional activities and brand name, whereas productivity and neighbors opinion was considered were least important factors. Evidently, the determinants of farmers purchase decisions varied across vegetable types in the district.

Table 4.46: Factors influencing seed purchase decision of farmers in Belagavi district

Sl. No.	Factors	Tomato n=10	Cabbage n=10	Green chilli n=10	Brinjal n=10
		S.I Rank	S.I Rank	S.I Rank	S.I Rank
1	Suitability of Soil	II	I	I	II
2	Productivity	VIII	II	III	VII
3	Suitability of climate	IX	III	II	IV
4	Market price at the planting stage	III	IV	IV	I
5	Companies promotion activities	VI	V	VI	III
6	Germination percentage	X	VI	VIII	VIII
7	Neighbor’s opinion	IV	VII	VII	X
8	Brand name	VII	VIII	IX	VI
9	Dealers guidance	V	IX	X	V
10	Availability of credit	I	X	V	IX

S.I: Standardized Index

Table 4.47: Factors influencing seed purchase decision of farmers in Hassan district

Sl. No.	Factors	Tomato n=10	Cabbage n=10	Green chilli n=10	Brinjal n=10
		S.I Rank	S.I Rank	S.I Rank	S.I Rank
1	Suitability of Soil	II	V	IV	I
2	Productivity	V	IX	VII	III
3	Suitability of climate	III	II	VI	II
4	Market price at the planting stage	I	I	I	IV
5	Companies promotion activities	VI	III	III	VI
6	Germination percentage	IX	VI	II	VIII
7	Neighbor’s opinion	X	X	X	VII
8	Brand name	IV	IV	V	IX
9	Dealers guidance	VII	VIII	IX	X
10	Availability of credit	VIII	VII	VIII	V

S.I: Standardized Index

4.6 Problems in the vegetable seed marketing

Vegetable seed marketing is a challenging task considering the competing many competitors available in the market. In the process dealers, nurseryman and distributors have to face specific challenges which vary from place to place and across markets.

4.6.1 Haveri district

It is evident from the table 4.49, in the case of dealers competition with other dealers was considered the most important problem, followed by competition with nurseries, competition from product development personnel (PD) and poor credit recovery from farmers, whereas, nonavailability of preffered seeds in time and lack of storage facilities were considered as least important problem. In case of nurserymen, poor credit recovery from farmers was considered as major problem, followed by difficulty in convencing of farmers about the new seeds, competition with other nurserymen, low margins in seed business and delay in response by the companies in the case of crop failure, likewise nonavailability of skilled labours and competition from product development personnel (PD) were considered as least important problems. Similarly, in the case of distributors, the major problems were the competition from product development personnel (PD), low margins in seed business and competition with other distributors. However, delay in response by the companies in the case of crop failure and nonavailability of preffered seeds in time were considered as least important factor considering distributors problem in the district during the study period.

4.6.2 Belagavi district

The results in the table 4.50 indicates that for dealers, competition with other dealers was considered as the most important problem, followed by competition with nurseries, competition from product development personnel (PD) and poor credit recovery from farmers, low margins in seed business, difficulty in conveniencing of farmers about the new seeds, delay in response by the companies in the case of crop failure, nonavailability of skilled labours. In case of nurserymen, poor credit recovery from farmers was considered the major problem, followed by difficulty in convenience of farmers about the new seeds, competition with other nurseryman, low margins in seed business and delay response of the companies in the case of crop failure, whereas delay in response of the companies in the case of crop failure and lack of storage facilities was considered as least important problem in the district. Similarly, for distributors, the major problems were computation from product development personnel (PD), low margins in seed business and credit recovery from dealers/nurseries.

4.6.3 Hassan district

The result in the table 4.51 reveals that in the case of dealers, competition with other dealers was considered the most important problem, followed by competition with nurseries, competition from product development personnel (PD) and poor credit recovery from farmers. Whereas, unavailability of skilled labours and lack of storage facility were considered as least important problems in the district. For nurserymen, poor credit recovery from farmers was considered as major problem, followed by difficulty in convenience of farmers about the new seeds, competition with other nurserymen, low margins in seed business and delay response of the companies in the case of crop failure, competition from product development and competition with dealers were considered as least important problems.

Table 4.48: Factors influencing seed purchase decision of farmers in Kolar district

Sl. No.	Factors	Tomato n=10	Cabbage n=10	Green chilli n=10	Brinjal n=10
		S.I Rank	S.I Rank	S.I Rank	S.I Rank
1	Suitability of Soil	II	V	I	V
2	Productivity	VII	VIII	III	IX
3	Suitability of climate	IV	IV	II	II
4	Market price at the planting stage	I	I	IV	I
5	Companies promotion activities	III	VI	VII	III
6	Germination percentage	VIII	VII	VI	VI
7	Neighbor’s opinion	X	X	X	X
8	Brand name	VI	III	V	IV
9	Dealers guidance	V	II	VIII	VIII
10	Availability of credit	IX	IX	IX	VII

S.I: Standardized Index

Table 4.49: Problems faced by the dealers, nurseries and distributors in Haveri district

Sl. No	Constraints	Dealers RBQ N=15	Nurseries RBQ N=15	Distributors RBQ N=16
1	Timely unavailable of preferred seeds	IX	VIII	X
2	Convincing the farmers about the new seeds	V	II	V
3	Credit recovery from farmers	IV	I	VI
4	Low margins in seed business	V	IV	II
5	Lack availability of skilled labours	VIII	VII	VII
6	Delay response of the companies in the case of crop failure	VII	V	IX
7	Lack of storage facilities	X	IX	VIII
8	Competition from product development personnel (PD)	III	X	I
9	Credit recovery from dealers/nurseries	-	-	III
10	Competition with other distributors	-	-	IV
11	Competition with dealers	I	VI	-
12	Competition with nurseries	II	III	-

RBQ: Rank Based quotient

Table 4.50: Problems faced by the dealers, nurseries and distributors in Belgavi district

Sl. No	Constraints	Dealers RBQ N=15	Nurseries RBQ N=15	Distributors RBQ N=16
1	Timely unavailable of preferred seeds	IX	VIII	X
2	Convincing the farmers about the new seeds	VI	II	V
3	Credit recovery from farmers	IV	I	VI
4	Low margins in seed business	V	IV	II
5	Lack availability of skilled labours	VIII	V	VII
6	Delay response of the companies in the case of crop failure	VII	IX	IX
7	Lack of storage facilities	X	VII	VIII
8	Competition from product development personnel (PD)	III	X	I
9	Credit recovery from dealers/nurseries	-	-	III
10	Competition with other distributors	-	-	IV
11	Competition with dealers	I	VI	-
12	Competition with nurseries	II	III	-

RBQ: Rank Based quotient

Table 4.51: Problems faced by the dealers, nurseries and distributors in Hassan district

Sl. No	Constraints	Dealers RBQ N=15	Nurseries RBQ N=15	Distributors RBQ N=16
1	Timely unavailable of preferred seeds	V	VI	VII
2	Convincing the farmers about the new seeds	VII	IV	IX
3	Credit recovery from farmers	VI	II	X
4	Low margins in seed business	I	VIII	II
5	Lack availability of skilled labours	IX	I	V
6	Delay response of the companies in the case of crop failure	VIII	V	VIII
7	Lack of storage facilities	X	VII	VI
8	Competition from product development personnel (PD)	IV	IX	I
9	Credit recovery from dealers/nurseries	-	-	III
10	Competition with other distributors	-	-	IV
11	Competition with dealers	III	X	-
12	Competition with nurseries	II	III	-

RBQ: Rank Based quotient

Likewise, in the case of distributors, the major problems considered were the competition from product development personnel (PD), low margins in seed business and difficulty in credit recovery from dealers/nurseries. However, convenience of farmers about the new seeds and credit recovery from farmers were considered as least prominent problems in the district during the study period.

4.6.4 Kolar district

It is evident from the table 4.52 that, in case of dealers, low margins in seed business was regarded as the major problem, followed by competition with nurseries and competition with other dealers and lack of storage facility was considered as least problem with respect to dealers. Similarly, for nurserymen, the major problems were; credit recovery from farmers, conveniencing of farmers about the new seeds, competition with dealers and competition with other nurserymen, whereas, lack of storage and competition with product development was considered as least important problem with respect to nurseryman. In the case of distributors, credit recovery from dealers/nurseries was considered the most important problem, followed by from product development and low margins in seed business. However, conveniencing of farmers about the new seeds and credit recovery from the farmers were considered as least important problem in the district during the study period.

Table 4.52: Problems faced by the dealers, nurseries and distributors in Kolar district

Sl. No.	Constraints	Dealers RBQ N=15	Nurseries RBQ N=15	Distributors RBQ N=16
1	Timely unavailable of preferred seeds	IV	V	V
2	Convincing the farmers about the new seeds	V	II	IX
3	Credit recovery from farmers	VI	I	X
4	Low margins in seed business	I	VI	III
5	Lack availability of skilled labours	VII	VIII	VI
6	Delay response of the companies in the case of crop failure	VIII	VII	VII
7	Lack of storage facilities	X	IX	VIII
8	Competition from product development personnel (PD)	IX	X	II
9	Credit recovery from dealers/nurseries	-	-	I
10	Competition with other distributors	-	-	IV
11	Competition with dealers	III	III	-
12	Competition with nurseries	II	IV	-

RBQ: Rank Based quotient

5. DISCUSSION

The results of the investigation are discussed in the light of plausible reasons from the field survey and literature review. The discussion are presented under the following broad sub headings

5.1 Growth rates in vegetable crops

5.2 Projected demand for vegetable seeds

5.3 Market structure of vegetable seed business

5.4 Conduct and performance of vegetable seed business

5.5 Factors influencing farmers in vegetable seed purchase

5.6 Problems in the vegetable seed marketing

5.1 Growth rate in vegetable crops

5.1.1 Haveri district

The growth of area under vegetables in the Haveri district revealed that green chilli recorded the highest growth rate among all the selected vegetable crops during the study period. Likewise, in terms of production green chilli was found to have the highest growth rate among the other vegetables. Remarkably growth rate in tomato productivity stood far ahead of all other vegetable crops in the study area. Compound growth rate in productivity under tomato, cabbage and green chilli were positive, even though tomato recorded the highest growth rate of about 3.42 per cent. This indicated that the growth of vegetable crops in Haveri was area-led in green chilli while productivity-led growth in tomato. It further indicated that farmers used high yielding variety and other input packages in tomato production compared to other vegetables during the study period. These results are in line with Reddy and Samaya (2012), who studied the growth in area, production, productivity and export of India coffee for the period of 1990-91 to 2009-10.

5.1.2 Belagavi district

The result of area, production and productivity growth of vegetables showed that cabbage was the leading crop among vegetables in the district. Both the area and production of the crop recorded a growth rate of more than 10.00 per cent per annum over the study period. However, productivity of cabbage was increasing at a lower growth rate compared to the growth in area and productivity indicating that the growth in the production of cabbage was area-led growth during the period of the study. In contrast, green chilli recorded higher growth rates in area and production in Haveri district but recorded a negative growth rates both in area and production in Belagavi district.

5.1.3 Hassan district

It was found out that tomato had the highest growth rates in production and productivity among all the vegetables in the Hassan district. And the growth rate in productivity was much higher compared to that of area and production in tomato during the study period. This finding suggested that, in Hassan district, the change in the average production of tomato was highly influenced by productivity than the area. At the same time, area cultivation of brinjal was tremendously decreasing during the study period. That means, part of the area previously allocated to brinjal crop was shifted to the production of other crops.

5.1.4 Kolar district

In the district of Kolar, the results in growth rate of vegetable crops indicated a declining trend in area for all the vegetables with the exception of cabbage. Thus, the area for the production of other vegetables was decreasing while the area under cultivation of cabbage was increasing over the study period. Nevertheless, the productivity of cabbage was decreasing drastically lower than any of the vegetables during the period of the study. At the same time, tomato and green chilli recorded the highest production in the district.

5.2 Projected demand for vegetable seeds

5.2.1 Haveri district

Over the years from 20015-016, the actual demand of tomato seeds was 577.35 kgs (Table 4.5). Thus, the demand of tomato seeds in Haveri district has increased and it was forecasted till 2020-21. The demand forecasted for tomato seeds in Haveri district show that demand would increase at the rate of 3.72 per cent per annum. The demand for cabbage seeds in the Haveri district during the period of 2015-16 was 559.41 kgs and in 2020-21 the forecasted demand would be 663.95 kgs, growing at a rate of 3.42 per cent per annum during the study period. The demand for green chilli seed was increasing at the rate of 5.35 per cent per annum over the last five years and it was observed that during 2020-21 the demand would be 1986.71 kgs. Similarly, in case of brinjal crop the demand of seed had also increased over the years at the rate of 1.66 per cent per annum and about 408.77 kgs of brinjal seed would be required during the year 2020-21. Similar result was found in Mangala (2014).

5.2.2 Belagavi district

It was observed from table 4.6 that in the year 2015-16 the actual demand for tomato seeds was 760.06 kgs and demand for tomato seed increased at the rate of 3.62 per cent per annum. The deman for seeds cabbage and brinjal also increased during the study period and it is predicted that during the year 2020-21, the demand would be 1152.18 kgs and 583.63kgs and with the growth rate of 4.12 and 0.96 per cent, respectively. The demand for green chilli in the district showed that demand would be remain same from the year 2015-16 to 2020-21. However, the demand for tomato and cabbage seeds would be growing at an increasing rate as compared to other two vegetable crops in the district. The optimum area might be reached for the green chilli crop in the district so the demand for its seeds will be constant in future years.

5.2.3 Hassan district

The demand for tomato crop would be decreasing from the year 2015-16 to 2020-21 at the rate of -8.35 per cent, respectively. In case of brinjal the demand increasing at the rate of 30.68 kgs. In case of cabbage the demand of seed exhibited slight increase from 355.13kgs during 2015-16 to 437.61kgs during the year 2020-21 with the growth rate of 1.17 per cent per annum and the seed demand for green chilli in the district remains same for the forecasted year up to 2020-21. This shows that the tomato seed demand will be 9 times lower than the cabbage seeds demand rate in the study area because of the tomato market was very law in the past years and the brinjal seed demand will be shifting to other crops in the district because it shows negative rate with 2 times higher than the tomato growth rate. The optimum area might be reached for the green chilli crop in the district so the demand for its seeds will be constant in future years.

5.2.4 Kolar district

The results in table 4.8 revealed that seed demand for cabbage, green chillii and brinjal crops were decreasing over the last decade which suggests that the area under cultivation of those crops would be reduced in the projected years. The demand for tomato seeds in the district remain same during the predicted years 2016-17 to 2020-21 the seed demand would be 1205.63 kgs per years because of the markt rate of tomatos was law in the district eventhough the productivity of tomato crops was high in the district. It clearly shows that the demand for cabbage seed would be much higher as compare to green chilli and brinjal seeds demand in the coming years. The lack in availability of water and drought in the district from past few years hot the demand for the vegetable seeds like green chilli and brinjal. This agrees with the findings of Timmanna (2007).

5.3 Market structure of vegetable seed business

5.3.1 Haveri district

5.3.1.1 Tomato

The sales volume per cent share of different seed companies are presented in table 4.9. It could be observed from the table that around 61.30 per cent of the market share of tomato seed had been captured by the Rasi seeds company. The other competitors like US Agri seeds and Mahyco seeds companies had the share of 17.51 per cent each. Harfindal Index was 4,383.13 which indicated high degree of market concentration in tomato seed market. The reason behind higher tomato seed sales for Rasi seeds compared to other hybrid tomatoes seeds offered by competitors could be Rasi seeds have a hybrid “Shivum”, which has keeping quality, attractive colour, shape and size and higher yield. Even though the US Agri seeds hybrid, US-800, gives higher yield, there is wide variation in the size of the fruit. Bio Seeds brand, Bio-90, has demand in the market because of its attractive colour, shape and size. Mahyco seeds brands are Mahy-701 and Mahy-303 and these two hybrids bear more number of fruits compared to others but they do not have attractive size and much keeping quality.

5.3.1.2 Cabbage

It was observed from the results in table 4.9 that Harfindal Index of cabbage seed market was 4,070.59, which signified high degree of market concentration. Seminis seeds hybrid got the highest market share in cabbage seeds as compared to other competitors and had the highest share of 61 per cent, followed by Ankur seeds, Mahyco seeds and Welcome seeds. Reason behind more area coverage of “Saint” hybrid of Seminis seeds could be its attractive head as compared to other hybrids as well uniformity in size and good keeping quality. Although Ankur seeds’s “Manasa” hybrid and Mahyco seeds’s hybrid “Mahyco seeds-118” have attractive colour, there is wide variation in the size of cabbage heads. “Annaji” hybrid brand of Welcome seeds has low market share among the four companies because of oversized head bearing habits (no uniformity of head formation) and low keeping quality.

5.3.1.3 Green chilli

Market concentration in green chilli seed market was very high and Beejo Sheetal company had the majority of market share (Table 4.9). Herfindal Index was 4,575.11 which suggest that it is very difficult for new firms to enter in the green chilli seed market. Beejo Sheetal hybrid “BSS 414” had major share in Haveri market as compare to other chilli hybrids offered by competitors such as Seminis seeds’s “Sitara”, Sungro seeds’s “S-16” and Mahyco seeds’s “Teja-4”. The BSS 414 has more fruit bearing habit, tolerance to chilli leaf curl virus, and is also used as both green and dry chilli. Besides, it has good keeping quality, attractive colour and size, and higher pungency rate. In case of Seminis seeds, Mahyco seeds and Sungro, also have good keeping quality, colour, shape and size but they are poor in disease tolerance capacity in this particular district.

5.3.1.4 Brinjal

Around 73.53 per cent of the market share brinjal seed market is captured by Rasi seeds company (Table 4.9). Harfindal Index was 5,692.19 which indicated high degree of market concentration in brinjal seed market. In other words, there was no stiff competition among companies to capture the market. “Dhruva” hybrid of Rasi seeds stood at first position compared to other competitors hybrids such as Mahyco seeds “Super-10” and East-West seeds’s “Lalith”. Probably reason is that “Dhruva” has more fruit bearing habit, attractive size, colour and good keeping quality. Apart from that “Dhruva” has higher pest tolerance to shoot and fruit borer compare to offerings. However, Mahyco seeds and East west, Beejo Sheetal do not serious concerns regarding keeping quality.

5.3.2 Belagavi district

5.3.2.1 Tomato

Sungro seeds and US Agri seeds companies had the equal share in market to the extent of 25.48 per cent each, followed by Rasi seeds and Syngenta companies (Table 4.10). The Sungro seeds and US Agri seeds hybrids are S-85 and US-800, these had high keeping qulity, firmness in fruits, uniform in size and prove less to disease and pest attack. Whereas, Rasi seeds (Ryna) and Syngenta (1057) hybrids were had less firmness and susceptible to disease and pest. Herfindal Index was 1,811.10 which indicated moderate concentration in the tomato seeds market in the district.

5.3.2.2 Cabbage

It was observed from the table 4.10, that Seminis seeds company had largest market share of 76.92 per cent. Seminis seeds hybrid “Saint” had good keeping quality, one cabbage was suitable for one family and if there is no market rate for cabbage then farmers can keep the cabbage for more than a week in the field without harvest. Mahyco seeds and Tokita seeds hybrids are Mahyco “seeds-118” and “Green Rock”, these two hybrids did not have keeping quality and these two hybrids were introduced recently so the awareness of these two hybrids was less. Welcome seeds hybrid “Annji” which also not suitable for keeping for long time. Herfindal Index was 6,028.94 which indicate very high degree of concentration in the cabbage seed market. It directly suggested that in cabbage seed market there is no stiff competition. These results are in accordance with the findings of Timmanna (2007), where he observed that market concentration was computed with the help of Gini ratio analysis and Gini coefficient was observed to be 0.95, which indicates that less is the inequality in the marketing of Bt cotton seeds in the study area. This indicated high degree of concentration in cotton market market.

5.3.2.3 Green chilli

In green chilli seed market Tanindo seeds had the majority of market share of 57.69 per cent (Table 4.10). Tanindo seeds hybrid “Siri” is has high yielding crop with maximum fruit length and uniform size. Because of this reason traders in the market preferred this hybrid. Whereas, Nangwoo bio seeds (Tara), Syngenta (1900) and Seminis seeds (Sitara) hybrids fruits were not uniform size and also not had better fruit length. Harfindal Index was 3,635.79 which depicted high degree of market concentration in green chilli seed market. In other words, there were two major companies leading the market during study period.

5.3.2.4 Brinjal

It could be observed from the table 4.10, that Mahyco seeds company had captured a major share of the market to the extent of 49.32 per cent, followed by Seminis seeds. The Mahyco seeds hybrid “Super-10” has attractive colour, shape and good keeping quality, it has more branch which leads to more numbers of fruits and it has less vegetative growth. Whereas, Seminis seeds hybrid “Manjre” was less attractive in colour because of dark colour and number of thorns was more. The East-West seeds company hybrid “Meghana” was introduced recently in the market so the awareness was least among the farmers and Rasi seeds hybrid “Druva” is non thorny, which was least preferred in the Belagavi market. Herfindal Index was 3,121.28 which parlayed high degree of concentration in the brinjal market.

5.3.3 Hassan district

5.3.3.1 Tomato

Clausa seeds company having the majority of market share of 41.67 per cent (table 4.11). Harfindal Index of 2,366.48 implied a high degree of market concentration in tomato seeds market in the district. Clausa seeds tomato hybrid “Alankara” enjoyed higher market acceptance possibly due to its higher keeping quality and merchants from Hassan market were selling this hybrid to Mumbai and Channai. As a result, the market price of “Alankara” hybrid tomato fruit is more as compared to other hybrids. Syngenta hybrid “Syngenta-1057” and Seminis seeds hybrid “Ayushman” also bear good yield and are resistant to tomato leaf curl virus but the keeping quality of these hybrids was lower compared to “Alankara” hybrid.

5.3.3.2 Cabbage

Syngenta company was found to have a major market share of the cabbage seed market (40.85 %) followed by Seminis seeds and Mahyco seeds in the district. Herfindal Index of 2,899.72 indicated high degree of concentration in the cabbage seed market. Syngetnta hybrid “Quisto” had more market acceptance because the head of the cabbage were small and more suitable for nuclear family and high yield with uniform head size. Seminis seeds hybrid seeds also have uniform head size but a little bigger, hence not much suitable for the nuclear family and the demand is little lesser than hybrid “Quisto”.

5.3.3.3 Green chilli

It was observed that East–West company had market share of 55.12 per cent followed by Seminis seeds with 22.44 per cent (Table 4.11). Herfindal Index was 3,762.75 which depicted high degree of concentration in the green chilli seed market in Hassan district. The two hybrids, viz; East-West seeds company hybrid “Ulka and Seminies hybrid “Sitara” had the majority of market share because the higher pungency in pods and uniform size of the pods. In addition, these two hybrids are used both as green chilli and dry chilli if harvest is delayed.

5.3.3.4 Brinjal

Mahyco seeds company was found to have a lion's share of 95.97 per cent of brinjal seed market in the district (Table 4.11). Herfindal Index of 9,217.65 signified high degree of concentration of brinjal seed market. The Mahyco seeds hybrid "MH-9" has higher yield and the fruit would be long and this type of brinjal is having more acceptances by the merchants in the market. The fruit of other vegetable seed company's hybrids were round in shape and were not accepted in Hassan market.

5.3.4 Kolar district

5.3.4.1 Tomato

Evidence from the results in table 4.12 suggested that US Agri seeds had the major market share of 61.22 per cent in the tomato seed business in the district. Herfindal Index was 4,273.14 which indicated high degree of concentration of tomato seed market in the Kolar district. US Agri seeds hybrid "US-400", which is best suited for all the three seasons, disease tolerance, high yielding and fruits were having keeping quality. The hybrid "Abhinav" which belong to Syngenta company, was also disease tolerant, high yielding and had good keeping quality although it was suitable only for summer season. The Namdhari seeds hybrid was suitable only for the local markets and not for export market.

5.3.4.2 Cabbage

The results in table 4.12 also indicated that Nunhems seeds was having the major market share of 85.71 per cent during the study period. Herfindal Index of 7,491.38 suggested presence of high degree of market concentration. The Nunhems seeds hybrid "Unnati" had good keeping quality, was also exported to Kolkata market and it was suitable for both high temperature and cold conditions. The Rasi seeds hybrid "Uttam" had good keeping quality but it was not suitable for high temperature.

5.3.4.3 Green chilli

Namdhari seeds was having the major market share of 38.60 per cent of green chilli seed market in the district over the study period (Table 4.12). Herfindal Index was 3,105.83 which indicative of high degree of concentration. Further, it is found that the Namdhari seeds hybrid, "Namdhari seeds 1101" had good keeping quality, high yielding and its pod size was more preferred in Kolar market. The US Agri seeds and East-West seeds hybrids were also having good keeping quality, but lack in pod size as preferred in the Kolar market.

5.3.4.4 Brinjal

It is observed from the table 4.12, that Mahyco seeds had the major market share of 54.55 per cent in brinjal seed market in the district and Herfindal Index was 3884.61 which showed high degree of concentration. Mahyco seeds "MH-11" hybrid which is high yielding, disease resistant, suitable to Kolar climatic conditions and the fruits with purple white shine in colours was the most preferred type of fruit in the market. Ankur seeds, Rasi seeds and East-West seeds hybrids were not able to withstand the Kolar climatic condition to give a better result in fruit size, colour and yield.

5.4 Conduct and performance of vegetable seed business

5.4.1 Product promotion measures of vegetable seed companies in Haveri district

5.4.1.1 Tomato

The Rasi seeds indicated that field days creates more awareness among the farmers and they conducted 18 field days in the district during the year (2015-16), whereas Bio seeds opined that farmers meeting create more awareness among the farmers and conducted 140 farmers meetings in the year. In addition, Rasi seeds opined that dealers meeting (10) and distributing calendars (250) create more interest among dealers to push the product. All the four companies performed poster display and distributed calendars (Table 4.13).

5.4.1.2 Cabbage

Welcome seeds conducted more numbers of field days, field demonstrations and farmers meetings to reach the farmers, while Seminis seeds focused on farmers meetings and display of banners describe the study period. Mahyco seeds opined that jeep campaign (15) helps reach more farmers. With the exception of Welcome seeds, all the three companies did not consider field demonstration as the best promotional measure for cabbage in the district (Table 4.14).

5.4.1.3 Green chilli

Sungro seeds did not consider the field demonstration and distribution of calendars and dealers meetings would create awareness about chilli seeds in the district and similarly Seminis seeds in the case of field demonstration. Beejo Sheetal and Mahyco seeds used all the eight promotional measures to reach farmers and dealers (Table 4.15).

5.4.1.4 Brinjal

It was observed from table 4.16 that, Rasi seeds had conducted more numbers of dealers meetings as compared to other competitors to popularize the product among the dealers. Likewise, Mahyco seeds focused on farmers meetings, display of banners and poster to create awareness among the farmers. In the case of field demonstration, Mahyco seeds and Rasi seeds companies did not consider this strategy as best promotional measure to reach farmers and dealers.

5.4.2 Product promotion measures of vegetable seed companies in Belagavi district

5.4.2.1 Tomato

Results showed that Syngenta did not consider distribution of calendars and dealers meetings would result more awareness among dealers. Likewise, US Agri seeds in the case of distribution of calendars in the district during the study period. Sungro had conducted the highest number of farmers meetings (54.05 %) among four companies and pointed out that this promotional measure helped them to create awareness of their product. All the four companies were actively involved in promotional activities in the district on tomato crop (Table 4.17).

5.4.2.2 Cabbage

Belagavi district has more potential for cabbage seed business as a result all the four companies conducted all the eight promotional measures in the district. Seminis seeds and Mahyco seeds companies considered, displaying the banners, posters and distributing the calendars create more awareness among both farmers and dealers. Seminis seeds alone conducted 43.48 and 47.62 per cent of the farmers meetings and jeep campaigns performed in the district during the study period (Table 4.18).

5.4.2.3 Green chilli

A total of 8,500 posters and 230 banners were displayed in the district for chilli seed promotion and 40 per cent of calendars were distributed by Seminis seeds alone, thinking that this would create more awareness among dealers. Similarly, 42.86 per cent of dealers meetings were conducted by Tanindo seeds company. Syngenta did not hold any dealers meetings or distribute calendars as promotional activities in the district during the study period (Table 4.19).

5.4.2.4 Brinjal

The vegetable seed companies were not vigorously involved in promotional activities for the brinjal seeds in the district because the net worth from the brinjal seeds was much lesser than the other vegetable seeds during the study period and because of this reason the Rasi seeds did not conduct any promotional activities. Likewise, in the case of field demonstration none of the companies were involved in this promotional activity. However, Mahyco seeds was the only company which was actively involved in conducting the promotional activities for its product (Table 4.20).

5.4.3 Product promotion measures of vegetable seed companies in Hassan district

5.4.3.1 Tomato

It was observed from table 4.21, that all the seed companies have actively engaged in promotional activities of tomato seeds in the district during the study period (2015-16). However, all the four vegetable seed companies conducted one dealers meeting each, which shows that all the companies considered dealers meeting as important strategy for creating awareness among dealers. Likewise, farmer meetings were organised to create the awareness among the farmers. Similar results were found as Deepthi (2013) where, Mahyco seeds company used more number of posters and calendars for product promotion and all the companies opined that field days create awareness among the farmers and dealers as they directly get to know about the products in Hassan district of Kartaka during her study period.

5.4.3.2 Cabbage

Syngenta had conducted 36.36 per cent of farmers meetings in the district with respect to cabbage seed promotion (Table 4.22) and it considered the strategy as most important promotional measures to reach the farmers. Likewise, Seminis seeds considered distribution of calendars as most important approach to create more awareness about the product among the dealers. However, Mahyco seeds did not conducted field demonstration and dealers meeting which suggests the company did not consider the strategies to be capable of creating more awareness among farmers and dealers in the district during the study period.

5.4.3.3 Green chilli

The chilli market in the Hassan district was dominated by East-West seeds company which considered conducting field days (62.50 %) was the most important promotional measure to reach farmers. In the case of Seminis seeds, taking up the field demonstration (57.14 %) was perceived as most effective measure to make awareness among farmers and dealers. All the companies were aggressively involved in the promotional measures in the district during the study period (Table 4.23).

5.4.3.4 Brinjal

Mahyco seeds company was actively engaged in brinjal seed promotional activities with a coverage of 52.63, 52.08 and 100.00 per cent of field days, poster display and field demonstrations in the district conducted to reach the farmers. Likewise, Rasi seeds distributed 86.21 per cent of the total calendars distributed in the district to give awareness of product during the study period (Table 4.24).

5.4.4 Product promotion measures of vegetable seed companies in Kolar district

5.4.4.1 Tomato

All the four companies had actively employed all the eight promotional measures to reach farmers and dealers in the district. In that, US Agri seeds considered distributing calendars (57.14 %) to be effective measure to give awareness among dealers, whereas, Indo-American company had taken 40.00 per cent of dealers meetings which is considered to be effective action. Likewise, Syngenta taken up 61.22 per cent of field demonstration to reach farmers but did not distributed any calendar, as Syngenta did not consider calendar distribution as effective measure to reach dealers in the district (Table 4.25).

5.4.4.2 Cabbage

Even though Nunhems seeds company was leading (85.71 % of market share), all the four companies were actively involved in promotional activities. Nunhems seeds and Mahyco seeds has considered dealers meeting as effective measure to reach dealers and they had considered 33.33 per cent of dealers meeting each. Likewise, Nunhems seeds and Rasi seeds considered displaying banners created better awareness among farmers and took 37.50 per cent banner display by each company. The results indicated that all the companies had taken all eight promotional measures to reach dealers and farmers in the district during the study period (Table 4.26).

5.4.4.3 Green chilli

All the four companies adopted all the eight measures to reach farmers and dealers in district during the study period (Table 4.27). East-West seeds considered farmers meeting (40.32 %) as best measure to reach farmers, whereas, Namdhari seeds considered jeep campaigns (54.05 %). Similarly, Namdhari seeds considered dealers meeting (50.00 %) as the measure which creates better awareness among dealers, while, US Agri seeds considered distributing calendars (33.33 %). However, Kalash seeds did not considered dealers meetings as effective measure to reach dealers so it did not conduct any dealers meeting in the district during the study period

5.4.4.4 Brinjal

Vegetable seed companies did not involve aggressively in promotional activities of brinjal seeds in the district during the study period (Table 4.28) for the reasons already known. Similarly, Rasi seeds did not take any promotional activities for brinjal crop because the turnover from brinjal seeds was much lower. Meanwhile, Mahyco seeds had taken all the promotional measure and conducted 71.43 and 66.67 per cent of field days and dealers meetings as effective measures to reach farmers and dealers. Likewise, Ankur seeds considered farmers meeting (46.15 %) as best measure to reach farmers. Similarly, East-West considered field demonstration (75.00 %) and jeep campaigns (62.50 %) as effective measure to reach farmers in the district.

5.4.5 Overall performance of different vegetable seed companies in Haveri district

5.4.5.1 Tomato

In the case of push-pull index, Rasi seeds and Bio seeds had shown more pull volume. Even though Bio seeds hybrid “Bio-90” was not best hybrid but the awareness among farmers was high. While, US Agri seeds and Mahyco seeds depicted high push volume among dealers and nurserymen, because both these companies have better appropriating schemes (Table 4.29) than Rasi seeds. US Agri seeds maintained its dealers on the basis of weekly payments. Hence, US Agri seeds had less reach to its dealers and nurserymen as compared to its close competitors. Distribution width and distribution depth of Rasi seeds were foremost which entail that Rasi seeds had additional number of distributors and highest sales volume. The company had released a hybrid “Shivam” which had high acceptance level in Haveri market because of its good keeping quality. Overall the performance of Rasi seeds was upmost followed by Mahyco seeds, Bio seeds and US Agri seeds. Similar result was found in the findings of Singh and Gautam (2010), wherein they observed that overall performance of Nancee was foremost for tomato seed business in the Udham Singh Nagar of Uttarakhand.

5.4.5.2 Cabbage

It was evident from the results that the product quality, dealer width, distribution depth and pull volume of Seminis seeds were prime because of the hybrid “Saint” which had uniform sized attractive head with good keeping quality which resulted in high acceptance level in the district. Hence, Seminis seeds has better reach to its dealers and nurserymen as compared to its close competitors. Promptness in delivery of Mahyco seeds was foremost because the production and packing centre is located within the district. The market acceptance of Seminis seeds was highest, which leads to over confidence among the company employees which led to hindrance in time period dealing. Likewise, Mahyco seeds’s sales officer has shifted to another company which led to less cordial nature with dealers and nurserymen during the study period. Distribution width of Ankur seeds and Mahyco seeds was highest because this company had more distributors in the district. Whereas, Ankur seeds procured seeds from different states which caused delay in seed availability due to transportation delay. Seminies and Ankur seeds employed agriculture graduates as sales officers which confirmed better workforce and once in a year account settlement arrangement had led to easy clearance of accounts among dealers and nurserymen. The overall performance of Seminis seeds was the highest followed by Mahyco seeds, Ankur seeds and Welcome seeds (Table 4.30).

5.4.5.3 Green chilli

According to results in table 4.31, it is evident that Beejo Sheetal had maximum pull volume, product quality, distribution depth and dealers depth in the district because of hybrid “BSS 414”, which had characteristics like more number of fruit bearing habits, tolerance to chilli leaf curl virus and could be used as both green and red chilli in the study area. Product display of Seminis seeds and Mahyco seeds confirmed chilli images, which had more acceptances in the district and might be attractive to dealers and nurserymen. The dealers width of Beejo Sheetal and Seminis seeds were highest and it suggested that these two companies have better reach to their dealers and nurserymen. Sungro seeds failed in provide better schemes like foreign trips and gold schemes like Beejo Sheetal and Seminis seeds, it also affected its push volume during the study period. Mahyco seeds had less

dealers width possibly because the selection of dealers was based on the payment habits. Whereas, production and packing centre of Mahyco seeds is located in the district which might led to better transportation facility. The Beejo Sheetal and Mahyco seeds have more number of distributors which helped them to build more distribution width. Hence, the overall performance of Beejo Sheetal was foremost followed by Seminies seeds, Sungro seeds and Mahyco seeds.

5.4.5.4 Brinjal

The findings suggested that the Beejo Sheetal and East-West seeds companies had high push volume whereas Rasi seeds had more pull volume because the hybrid “Dhruva” had good quality, hence it was more accepted in the district, which induced the fsrmers to pull seeds from dealers and nurserymen in the district. In the case of promptness in delivery, Rasi seeds and Mahyco seeds were foremost, their popular brinjal hybrids were majorly accepted in Haveri, Dharwad and Davangere markets. At the same time these hybrid seeds are available in these district distributors which helped for easy accessibility. The shortage of supply with Haveri district distributors were made good by the distributors of Dharwad and Davengere districts. Dealer width of Mahyco seeds was less as compared to its competitors, which means Mahyco seeds has less reach to its dealers and nurserymen as compared to its close competitors. All the competitors depicted equal distribution width in the district. In case of distribution depth, Rasi seeds out-performed all its competitors. Overall, if could be concluded that Rasi seeds was a leader followed by Mahyco seeds, Beejo Sheetal and East-West seeds company (Table 4.32).

5.4.6 Overall performance of different vegetable seed companies in Belagavi district

5.4.6.1 Tomato

It was observed from the results in table 4.33, that the product quality and dealers width of Sungro seeds was foremost, because the Sungro seeds hybrid “S-85” had high keeping quality, firmness in fruits, uniformity in fruits and less prove to disease and pest attack. Rasi seeds and Sungro seeds provided better appropriating schemes like visits to capital city and company production plants to dealers and nurserymen which formed interest to push the product in the district and other two close competitors were found to have lesser push-pull index. In the case of payment habits, time period of dealing and promptness in delivery of US Agri seeds was prime because the US Agri sseeds clears the account once a year, the company employee meets the dealers and nurserymen well in advance of sowing season and make agreement of delivery time and quantity which helped them in promptness in delivery as well. Overall, Sungro seeds had highest performance, followed by US Agri, Rasi seeds and Syngenta in the district with respect to tomato seed marketing.

5.4.6.2 Cabbage

Seminis seeds demonstrated highest performance in terms of product quality, account settlement, payment habits, promptness in delivery, dealers width, dealers depth and distribution depth (Table 4.34). The company had come up with a hybrid, “Saint” which had good keeping quality, suitable sized head for family consumption and if there is no market rate for cabbage then farmers can keep the cabbage for more than a week in the field without harvest. Seminis seeds had more pull volume as compared to other close competitors. The product display of Tokita seeds portrayed least score because the heads were not attractive in nature. Seminis seeds gave more importance to

display of product image of cabbage heads which look attractive and thought of family sized cabbage heads. The workforce and payment habits of Tokita seeds gained very low score because the company sales officer was not an agricultural graduate and payment were to be done on the weekly basis to the work force which so it created difficulties among dealers and nurserymen. It may be concluded that overall performance of Seminis seeds was upmost, followed by Welcome seeds, Mahyco seeds and Tokita seeds during study period in the district.

5.4.6.3 Green chilli

It was evident from the table 4.35 that the account settlement, promptness in delivery, product quality and distribution depth were higher for Tandindo seeds company. The Tandindo hybrid “Siri” had high yielding ability with maximum fruit length and uniform size. Because of this reason, traders in the market preferred this hybrid and it was only in this district the company had awareness among dealers and nurserymen. The Nangwoo bio seeds sales officer is working from past twelve years in the same company and he had good contact with the dealers and nurserymen which made better dealer’s width of Nangwoo seeds better than its competitors in the district. In contrast to this, Nangwoo seeds had less problem solving scores in the district because he was the only company employee in the entire district which inhibited him in attending problems. Tandindo seeds had better market acceptance in the district because of its appropriate schemes like gold schemes, local and foreign trips to distributors and nurserymen which helped in improving push volume and quality product helped them in increasing pull volume. Thus, the overall performance of Tanindo seeds was foremost, the followed by Seminies seeds, Syngenta and Nangwoo bio seeds over the period of study.

5.4.6.4 Brinjal

The product quality of Mahyco seeds was better because of its hybrid “Super-10”, which had has attractive colour, shape and good keeping quality, it had more branching ability which leds to more numbers of fruits and had less vegetative growth. Because of this reason the dealers width, dealers depth, distributors width and distributors depth were also better. These factors also made impact on push-pull index and induced Mahyco seeds to attain higher achievement, followed by other competitors (Table 4.36). It is interesting to note that the dealer’s width was same across Mahyco seeds, Seminis seeds and Rasi seeds, whereas East-West seeds company selected dealers and nurserymen based on the good account settlement ability within the season end. In case of distribution depth, Mahyco seeds gained highest score, followed by Mahyco seeds, Seminis seeds and Rasi seeds. Overall, performance of Mahyco seeds was foremost, followed by Seminis seeds, Rasi seeds and East-West seeds in the district during the study period.

5.4.7 Overall performance of different vegetable seed companies Hassan district

5.4.7.1 Tomato

Clausa seeds company deals with the dealers and nurserymen on weekly basis to discuss about the product requirement and they do account settlement on yearly basis which enabled dealers and nurserymen to clear the account after entire season sales. It also helped in promptness in delivery as well. Maximum numbers of Clausa seeds company employees were located in Hassan district which made them to attend to every problem in the district and provided good coordination

with dealers and nurserymen. The product quality and distribution depth of Clausa seeds was foremost because the hybrid “Alankara” had good keeping quality and was suitable for export. The Clausa seeds company employees had good contact with the vendors in the markets so they bid higher prices for the tomatoes of the company. As a result, Alankara had high acceptance level in the market and for this reason the pull volume, dealer’s width and distribution width of Clausa seeds was high. Hence, the overall performance of Clausa seeds was prime, followed by Syngenta, Seminis seeds and Bio seeds (Table 4.37).

5.4.7.2 Cabbage

It is evident from the table 4.38 that, the problem solving, workforce, transportation facility, time period of dealing, cordial nature, promptness in delivery, account settlement, product quality, dealers width, dealers depth and distribution depth of the Syngenta company was upmost. The company had employed agricultural graduates in the district who had created good relationship with the dealers, nurserymen and vendors in the market and had well structured plan for promoting company hybrid “Quisto” and this hybrid become only hybrid in the district and eliminate other competitors in the district. “Quisto” hybrid already has more acceptances at the farmer level as well. Even though Syngenta seeds had not provided any better schemes for cabbage seeds, still the acceptance of this company hybrid in the market was prime. Thus, it suggests that product quality is more important than the schemes provided by the companies. The overall performance of Synagta seeds was topmost, followed by Seminis seeds, Mahyco seeds and Nunhems seeds.

5.4.7.3 Green chilli

According to results in table 4.39, product display, appropriating schemes and distribution depth of East-West seeds company were foremost because the East-West company seeds come in metal box package which makes them appear more attractive, quality protected and prove to less damage during transit. The company also provided schemes like foreign trips for the dealers who sold the chilli seeds more than 10 kgs in a particular season. Similarity could be observed with Beejo Sheetal company as well. In case of distribution width, product quality and cordial nature, the Beejo Sheetal seeds were upmost. Its hybrid, “Sitara”, has high pungency with uniform pod size which made highest sale in the district and acceptance among the farmers and in the market. Beejo Sheetal is well developed company only in chilli seeds in the different districts of Karnataka state. The company focused not only on quality of product as well as focused on appropriate schemes too. The overall performance of Beejo Sheetal company was prime along with East-West seeds company, followed by Kalash seeds and Seminies seeds. This suggests that companies should please the dealers and nurserymen as well as farming community to perform well in the seed business.

5.4.7.4 Brinjal

The results clearly showed that product quality, push volume and distributors depth of Mahyco seeds were foremost (Table 4.40). The possible explanation is that, hybrid “MH-9” which had high yielding properties, long fruit length and this kind of brinjal fruits were more accepted in the market. In case of promptness in delivery, Mahyco seeds scored the least, because the company could not meet the required demand. It is quite obvious that, due to its high quality products the company had created a niche in the district which had induced greater demand which the company

could not meet. Dealer's width and dealers depth of Rasi seeds gained very less score because demand for Rasi seeds was less among all competitors. Even though product display of Mahyco seeds was not upto the mark but it out performed in providing quality product to farming community and appropriate schemes to its dealers and nurserymen. Overall, the performance of Mahyco seeds was upmost, followed by Golden seeds, Sungro seeds and Rasi seeds. The foregoing discussion suggests that, though the quality of the products is good, the performance of the company mainly depends on preference and behaviour of the market.

5.4.8 Overall performance of different vegetable seed companies in Kolar district

5.4.8.1 Tomato

US Agri seeds and Syngenta companies depicted highest score on product quality perhaps due to the fact that the hybrids of these two companies "US-400" and "Abhinav" were highly accepted in the market due to suitability of Kolar district climatic conditions, disease tolerance, high yielding and fruits were having better quality. With respect to push-pull index, Namdhari seeds had more push volume, whereas, Syngenta and US Agri seeds had more pull volume. In case of dealer's width, both US Agri seeds and Syngenta obtained same (highest) score due to high demand from the dealers. In case of distribution depth and dealers depth, US Agri seeds had gained highest score because US-400 is highly accepted by the farmers in all seasons. However, "Abhinav" hybrid was the only seed suitable for summer season because other hubrids could not with stand high temperature. Even though biggest tomato market "Madanpalli" is nearer to Kolar district, farmers could not produce preferred tomato varieties which were accepted in that market due to climatical conditions suitable for those particular hybrids. This suggested that climatic condition of the district also influence in the production of tomatoes. Overall, the highest score was gained by US Agri, followed by Syngenta, Indo-American seeds, and Namdhari seeds (Table 4.41).

5.4.8.2 Cabbage

It is revealed that in case of product quality, dealer's depth, dealer's width and distribution depth, Nunhems seeds company gained highest scores because its hybrid "Unnati" has good keeping quality and is suitable for export. With respect to push-pull index, Nunhems seeds got more pull volume due to "Unnati" hybrid cabbage, which is being exported from Kolar district to Kolkatta because the Kolkatta cabbage consumers prefer Kolar cabbage. So merchants bid higher prices to this cabbage than any other cabbage hybrids. Even though Seminis seeds provided better schemes and promptness in delivery, if could not succeed to grab the cabbage seed market in the district. Dealer's width of Mahyco seeds was the least because of low demand for its hybrid than its competitors. The distribution widths of all the companies were same which it shows that still they were existing in the market with the stiff competition from Nunhems seeds. The overall performance of Nunhems seeds was found to be highest, followed by Rasi seeds, Seminis seeds and Mahyco seeds, respectively (Table 4.42).

5.4.8.3 Green chilli

It could be observed from the results in table 4.43 that in the case of time period of dealing, account settlement, product quality, Namdhari seeds gained highest score on all the parameters because the Namdhari seeds company sells its product well in advance to sowing season and settles

the account once in a year. The hybrid of the company, “Namdhari seeds-1101” had very high acceptance in the market. In case of push-pull index, equal score gained by Namdhari seeds and US Agri. In case of dealer’s width, distribution width and dealers depth, all competitors gained equal scores. In case of distribution depth, Namdhari seeds and US Agri seeds gained an equal scores. Even though product displays, transportation facility, work force and cordial nature of all the companies performed equally and demonstrated differently in other parameters. Namdhai and US Agri seeds companies sales was found be not much different but in the case of product quality US Agri seeds stands lower compared to Namdhari seeds. So the performance of Namdhari seeds was foremost, followed by US Agri seeds, East-West seeds and Kalash seeds, respectively in the district.

5.4.8.4 Brinjal

It is observed in table 4.44 that in case of product quality, dealers depth and distribution depth Mahyco seeds as the foremost because of its hybrid “MH-11” which is high yielding, disease resistant and suitable for Kolar climatic condition. In case of push-pull index, East-West seeds had more push volume because the demand was less and company wanted the sales so they provided well appropriated schemes to dealers and nurserymen during the sowing seasons. With respect to dealer’s width, all competitors had gained equal scores. Similarly, in case of distribution width, all competitors seemed to be at par. Even though distribution depth of Mahyco seeds was highest, but in the case of transportation facility, work force, payment habits, time period of dealing, promptness in delivery and cordial nature of Ankur seeds was topmost compared to Mahyco seeds and the overall performance of brinjal market of Kolar district was in favours of Mahyco seeds which gained highest score, followed by Ankur seeds, Rasi seeds and East-West seeds, respectively. The discussions above demonstrated that company sales is not the only criteria in judging the performance of company in that particular district.

5.5 Factors influencing farmers in vegetable seed purchase

5.5.1 Relative importance of the factors considered in vegetable seed purchases in Haveri district

In the case of tomato seeds, the market price at the planting stage was considered the most important factor and least factor was neighbors opinion (Table 4.45). Most of the companies’ hybrids were high yielding in nature, if there is huge production and no market acceptance then the farmers produce will get lower price in the market, hence farmers opted price was the most important factor. Farmers were least bothered about availability of credit in the tomato seed selection. Similarly, in case of cabbage, the market price at the planting stage was considered the most important factor, followed by suitability of climate. Likewise, in the case of green chilli, the major factors considered were the suitability of soil, productivity and market price at the planting stage. Because chilli was introduced to Haveri distrct was almost 200 years back and farmers were cultivating chilli as one of the major crop in the district and farmers considered that due to regular cultivation of chilli in the same field made loss in fertility of soil. As a result farmers opted suitability of soil was major factor in selecting chilli seeds. In case of brinjal, the market price at the planting stage was considered as the most important and the least important factor was neighbors opinion. The similar findings were observed by Ramaswamy *et al.* (1990), while studying the behaviour of farmers in cotton seed purchases.

5.5.2 Relative importance of the factors considered in vegetable seed purchases in Belagavi district

The availability of credit was considered as a major influencing factor in decisions of purchasing tomato seeds and least considered factor was germination percentage. Though, more than 10 hybrid companies are operating in the district in the tomato seed market, there is no stiff competition among the companies, hence farmers got option to select any available hybrid in the market. So availability of credit was considered as the major factor. In hybrid seeds, occurrence of germination problem was the least in tomato seeds. However, in the case of cabbage, suitability of soil considered as major factor. Similarly, in the case of green chilli, suitability of soil considered as major factor, followed by suitability of climate and productivity. Soil fertility and climatic condition would influence the perfect cabbage head formation, so farmers opinened this as major factor in the district. Similarly, chilli farmers have also considered suitability of soil would help in chilli pod formation and increases the yield in chilli crop. The major factors considered in the purchase of brinjal seeds were, the suitability of soil, market price at the time of planting and company promotional activities (Table 4.46). Belagavi market accept the attractive colour and good keeping quality of brinjal fruit and farmers consider soil as the major factor influencing in getting attractive colour and good keeping quality. Farmers also considered the prices of brinjal in the market, while making decision of purchasing seeds. Similar results were found in the findings of Ali (1992), who studied the factors influencing purchase decision for processed products. This study revealed that factors such as taste, family preference, price, good keeping quality, well known brand, colour and consistency were the important in the buying decisions of the consumers in that study area.

5.5.3 Relative importance of the factors considered in vegetable seed Purchases in Hassan district

In the case of tomato seeds purchasing decision, the market price at the planting stage was considered the most important factor, followed by suitability of soil and suitability of climate (Table 4.47). For cabbage, the market price at the planting stage was considered the most important factor. Similarly, in the case of green chilli, the major factor considered to be the market price at the planting stage. Seed market of tomato, cabbage and green chilli were not stiff as compared to brinjal market and farmers got more option to grow number of hybrids available in the market. They opted price as a major factor because almost all hybrids were high yielding but variation in the produce price based on the market acceptance parameters was the deciding factor to option for a particular hybrid. Whereas, suitability of soil was considered as the most important factor in purchasing decision of brinjal seeds. As a result brinjal was not grown in all parts of the district, based on the suitability of soil farmers go for cultivation of brinjal crop.

5.5.4 Relative importance of the factors considered in vegetable seed purchases in Kolar district

In tomato seeds purchasing decision, the major factors considered were the market price at the time of planting, suitability of soil, company promotion activities and climatic conditions. Similarly, in the case of cabbage, market price at the time of planting was considered as the major factor. Further, suitability of soil was considered the major factor in purchasing decision of green chilli seeds. Similarly, in the case of brinjal, the major factors considered were the market price at the time of planting, suitability of climate, company promotional activities and brand name (Table 4.48).

5.6 Problems faced by the dealers, nurserymen and distributors in the vegetable seed marketing

5.6.1 Haveri district

In the case of dealer's problems, competition with other dealers was considered the most important problem due to presence of more number of dealers which resulted in lower margins. Because of existence of many nurseries in the district, farmers were ordering the seedling according their convenience in sowing. As a result farmers were approaching nurserymen than dealers for seedling requirement in the crops. So competition with nurserymen was second major problem for the dealers in the district. Similarly, when it comes to nurserymen, poor credit recovery from farmers was considered as the major problem, because many farmers order the seedlings but do not collect the seedlings and do not pay the remaining credit when nurserymen had already sown. Likewise, in the case of distributors, the major problem was found to be the competition from product development personnel (PD), as a result PD received the same products price as distributors received (Table 4.49).

5.6.2 Belagavi district

With respect to dealer's problems in the district, competition with other dealers was considered the most severe problem due to presence of large number of dealers which results in stiff competition among the dealers which leads to lower margins, followed by competition with nurseries. Whereas, in the case of nurserymen, poor credit recovery from farmers was considered as the major problem, followed by difficulty in convincing the farmers about the new seeds because farmers were looking the price of the produce in the market and based on that they will go for decision making which makes nurserymen to difficulty in convince the farmers about new hybrid seeds arrived to the market. Similarly, the distributors indicated that the major problem was the competition from product development (PD) personnel, followed by low margin in the seed business (Table 4.50). The distributors were enjoying much more margins with respect to pesticides and fertilizers distribution and they expect the same in vegetable seed distribution also. But due to stiff competition in seed business, they were not getting required margins.

5.6.3 Hassan district

According to the dealers, low margins in seed business was considered as major problem because with respect to fertilizers and pesticide business dealers were receiving better margins which led to low interest in seed business, followed by competition with nurserymen. The vegetable seeds are available in 10 to 100 grams packets so the occurrence of storage problem would be low as a result it was considered as least important problem with respect to dealers. Likewise, in the case of nurserymen, unavailability of skilled labour was the major problem. Nursery needs scientific method of sowing, maintenance and in the germination stage seedlings are highly susceptible for pest and diseases attack. As a result nurserymen need skilled labours in the nursery. For the distributors, the major problem was competition from product development personnel (PD) and least important problem was convincing farmers about new hybrid seed because distributors deals with the dealers and nurserymen in the market rather than with the farmers (Table 4.51).

5.6.4 Kolar district

In case of dealers, low margins in seed business was considered as major problem because of the margin with respect to pesticide and fertilizer business gives them more margin as compared to vegetable seed business and lack of storage facilities was considered as least important problem. Likewise, in the case of nurseryman, the major problem was poor credit recovery from farmers and competition with product development was considered as least important problem. However, in case of distributors, credit recovery from dealers/nurseries was considered the most important problem, because respective companies pressurise distributors for repay the seeds amount quickly and many dealers and nurserymen like to settle the account once in a year, so it would be hectic for the distributors to convey the company and as well as dealers. Competition from product development personnel and low margins in seed business (Table 4.52) were also the important problems for distributors in seed business in the district.

6. SUMMARY AND CONCLUSIONS

Vegetable production is no exception to the rising trend in input use. The increasing awareness among the people regarding healthy diet and importance of vegetables has been responsible for augmentation of vegetable production in India over the years. This increase in vegetable production has been possible due to the expansion of irrigation facilities and wide use of other inputs like seeds, fertilizers, pesticides, *etc.* For example, vegetables alone consume 12.13 per cent of insecticides used in production systems in the country. Among these inputs, seeds play a vital role in production. The importance of seed as a carrier of known important characteristics for crop production was recognized since the earliest days of agriculture.

Karnataka occupies a prominent place in the Horticulture map of the country. Vegetable crops occupy an area of 445.6 (000') ha with a production 8250.3 (000') MT. The total income generated from the horticulture sector accounts for over 40 per cent of the total income derived from the combined agriculture sector (Horticultural crop statistics of Karnataka at a Glance 2013-14).

The major vegetables grown in the Karnataka state are potato, tomato, cabbage, capsicum, green chilli, dry chilli, beans, cauliflower, brinjal, carrot, radish, pumpkin, ridge guard *etc.* To satisfy the continuous demand for vegetable seeds by the farmers, several seed companies in the corporate sector are supplying seeds in the districts. Some of the important companies which supply seeds in the study area include national and multinational vegetable seed companies in the state. These seed companies supply seeds first to the distributors, who in turn employ the dealers through whom seeds reach the ultimate users *i.e.*, the farmers.

The present study has attempted to analyze the vegetable seed marketing in Haveri, Belagavi, Hassan and Kolar districts. The specific objectives of this study were:

1) To study the growth in area, production and productivity of vegetables and to estimate the vegetable seed requirement.
2) To study the structure of vegetable seed market in Karnataka.
3) To study the conduct and performance of the vegetable seed market in Karnataka.
4) To examine the factors influencing farmers purchasing behavior with respect to vegetable seeds.
5) To elicit the problems in vegetable seed marketing as perceived by distributor, dealers and nurseries.

6.1 Methodology

In Karnataka, Haveri, Belagavi, Hassan and Kolar districts are some of the major vegetable growing districts in the state. These districts exhibit distinctive features in terms of land use pattern, favourable climate, cropping pattern and agricultural practices. There are many dealers in these districts under private sectors to market the vegetable seeds. For the study, primary and secondary data were collected. Primary data were collected with the help of pre-tested and well structured schedules. Secondary information on important vegetables was collected from the District Horticulture Office (2005-06 to 2015-16), government of Karnata. Data were also collected from farmers, dealers, nurserymen and distributors and seed company personnel during the study period (2015-16) to elicit information for the study.

6.1.1 Analytical techniques

Compound growth rate analysis was used to study the growth in area, production and productivity of selected vegetables and ARIMA models were used to study demand of vegetable seeds for the next five years. Market structure of vegetables was studied by using Herfindle-Hirschman Index. Distribution network of different vegetable seed companies and its performances were analysed by using grid method considering certain parameters and weightage was given to each of the parameters. Tabular analysis was used to measure the product promotion strategies adopted by the firms for the selected vegetable seeds. Standardized index was used for factors influencing farmers' in vegetable seeds purchase decision. Rank based quotient was used to study the problems in vegetable seed business in the study area.

6.2 Findings of the study

1) All the crops in Haveri district had shown growth in area ranging from 6.46 to 10.78 per cent. Highest growth in area was observed in green chilli and lowest tomato. Similarly, production of selected crops in the district was grown within the range of 5.22 per cent to 13.07 and highest production growth was observed in green chilli. Significant productivity was observed in tomato and cabbage. Overall, production increased due to increase in area, not due to productivity enhancement in the selected vegetables.
2) Tomato, cabbage and brinjal growth rate in area showed positive growth and it ranged from 2.51 to 10.69 per cent in Belagavi district. Highest growth rate in area was observed in cabbage. Area was main source of growth in production of cabbage rather than the productivity in the district.
3) In Hassan district, tomato, green chilli and brinjal vegetables showed negative growth rate in area but the production growth rate of tomato depicted positive growth rate and it was influenced by productivity rather than the area. Similar findings were found in the Kolar district also.
4) Projected demand for all the selected vegetables in Haveri district revealed that increasing demand for the next five years and growth rate of demand will be from 1.66 to 5.35 per cent per annum. Highest growth in demand is predicted for green chilli in the district.
5) In the case of Belagavi district, projected seed demand for tomato, cabbage and brinjal would be ranging from 0.96 per cent to 4.12 per cent per annum and highest demand foreseen in cabbage. However, green chilli seed demand would same in the next five years.
6) In Hassan district, seed demand for tomato crop anticipated to show a decreasing growth, cabbage and brinjal seed demand would grow at the rate of 1.17 and 30.68 per cent per annum. Similarly, in Kolar district, cabbage seed demand would be increasing at the rate of 2.14 per cent per annum, respectively. Green chilli and brinjal seed demand would be decreasing in the coming years.
7) In Haveri district, HHI was 4,383.13 which indicated high degree of market concentration in tomato seed market. Rasi seeds have a hybrid "Shivum" which has good keeping quality, attractive colour, shape and size, higher yield and it was more accepted in the market. Because of this reason it was leader in the market.

8) HHI of cabbage seed market was 4,070.59, which signified high degree of market concentration in Haveri district. Seminis seeds hybrid got the highest market share in cabbage seeds as compared to other competitors and had the highest share of 61 per cent, followed by Ankur seeds, Mahyco seeds and Welcome seeds. Reason behind more area coverage of “Saint” hybrid of Seminis seeds could be its attractive head, uniformity in size and good keeping quality as compared to other hybrids in the district.
9) In Haveri district, market concentration in green chilli seed market was very high and Beejo Sheetal company had the majority of market share. HHI was 4,575.11 which suggested that it was very difficult for new firms to enter in the green chilli seed market. Beejo Sheetal hybrid, “BSS 414”, has more fruit bearing habit, tolerance to chilli leaf curl virus and also used as both green and dry chilli. Besides, it has good keeping quality, attractive colour and size, and higher pungency rate. Because of these reasons Beejo Sheetal company was leading in the district.
10) Around 73.53 per cent of the market share brinjal seed market was captured by Rasi seeds company in Haveri district. HHI was 5,692.19 which indicated high degree of market concentration in brinjal seed market. “Dhruva” hybrid of Rasi seeds stood at first position compared to other competitors hybrids such as Mahyco seeds’s “Super-10” and East-West seeds’s “Lalith”. “Dhruva” has more fruit bearing habit, attractive size, colour and good keeping quality than other hybrids in the district.
11) In Belagavi district, Sungro seeds and US Agri seedsseeds companies had the equal share in tomato seed market to the extent of 25.48 per cent each, followed by Rasi seeds and Syngenta companies. The Sungro and US Agri seedsSeeds hybrids are S-85 and US-800, which had high keeping qulity, firmness in fruits, uniform in size and prone less to disease and pest attack. HHI was 1,811.10 which indicated moderate concentration in the tomato seeds market in the district.
12) In the case of cabbage seed market in Belagavi district, Seminis seeds seed company had largest market share (76.92 %). Seminis seeds hybrid “Saint” was good keeping quality, one cabbage head was sufficient for entire and if there was no market rate for cabbage, then farmers could keep the cabbage for more than a week in the field without harvest. HHI was 6,028.94 which indicated very high degree of concentration in the cabbage seed market. It directly suggested that in cabbage seed market there was no stiff competition.
13) In green chilli seed market of Belagavi district, Tanindo seeds had the majority of market share (57.69 %). Tanindo seeds hybrid “Siri” was high yielding crop with maximum fruit length and uniform size, as a result traders in the market preferred this hybrid. HHI was 3,635.79 which depicted high degree of market concentration in green chilli seed market.
14) In case of brinjal seed market of Belagavi district, Mahyco seeds company had captured major share of the market to the extent of 49.32 per cent, followed by Seminis seeds. The Mahyco seeds hybrid “Super-10” had attractive colour, shape and good keeping quality, it had more branch which leads to more numbers of fruits and it had less vegetative growth. HHI was 3,121.28 which indicated high degree of concentration in the brinjal market.

15) In Hassan district, Clausa seeds company had the majority of market share of 41.67 per cent. Harfindal Index of 2,366.48 implied a moderate degree of market concentration in tomato seeds market in the district. Clausa seeds tomato hybrid “Alankara” enjoyed higher market acceptance, possibly due to its higher keeping quality and merchants from Hassan market were selling this hybrid to Mumbai and Channai markets.
16) In the case of cabbage in Hassan district, Syngenta company was found to have a major market share of the cabbage seed market (40.85 %), followed by Seminis seeds and Mahyco seeds companies in the district. HHI of 2,899.72 indicated high degree of concentration in the cabbage seed market. Syngenta hybrid “Quisto” had more market acceptance because the head of the cabbage was small and more suitable for nuclear family and high yield with uniform head size.
17) In green chilli seeds market of Hassan district, East–West company had market share of 55.12 per cent followed by Seminis seeds (22.44 %). HHI was 3,762.76 which depicted high degree of concentration in the green chilli seed market in Hassan district.
18) In the case of brinjal seeds market of Hassan district, Mahyco seeds company was found to have a lion’s share of 95.97 per cent of brinjal seed market in the district. HHI of 9,217.65 signified high degree of concentration of brinjal seed market. The Mahyco seeds hybrid “MH-9” has higher yield and the fruit would be long and this type of brinjal had more acceptance by the merchants in the market. The fruits of other vegetable seed company’s hybrids were round in shape and were not accepted in Hassan market.
19) In Kolar district, US Agri seedsseeds had the major market share (61.35 %) in the tomato seed business in the district. HHI was 4,273.14 which indicated high degree of concentration of tomato seed market in the Kolar district. US Agri seedsseeds hybrid “US-400”, which was best suited for all the three seasons, disease tolerance, high yielding and fruits were had good keeping quality. The hybrid “Abhinav” which belong to Syngenta, was also disease tolerant, high yielding and had good keeping quality although it was suitable only for summer season.
20) In the case of cabbage seeds market in Kolar, Nunhems seeds had the major market share of 85.71 per cent during the study period. HHI of 7,4921.38 suggested the presence of high degree of market concentration. The Nunhems seeds hybrid “Unnati” had good keeping quality, was also exported to Kolkata market and it was suitable for both high temperature and cold conditions.
21) Namdhari seeds had the major market share of 38.60 per cent of green chilli seed market in the Kolar district over the study period. HHI was 3,105.83 which is indicative of high degree of concentration. It was found that the Namdhari seeds hybrid, “Namdhari seeds 1101” had good keeping quality, high yielding and its pod size was more preferred in Kolar market.
22) Mahyco seeds had the major market share of 54.55 per cent in brinjal seed market in the Kolar district and HHI was 3884.61 which showed high degree of concentration. Mahyco seeds “MH-11” hybrid which was high yielding, disease resistant, suitable to Kolar climatic conditions and the fruits with purple white shine in colours was the most preferred type of fruit in the market.

23) In Haveri district, in the case of tomato seeds, the Rasi seeds indicated that field days created more awareness among the farmers and they conducted 18 field days. Whereas Bio seeds opined that farmers meeting created more awareness among the farmers and conducted 140 farmers meetings. Rasi seeds opined that dealers meeting (10) and distributing calendars (250) created more interest among dealers to push the product.
24) In the case of cabbage seed market, Welcome seeds conducted more numbers of field days, field demonstrations and farmers meetings to reach the farmers. Seminis seeds focused on farmers meetings and display of banners. Mahyco seeds opined that jeep campaign (15) helped to reach more farmers. With the exception of Welcome seeds, all the three companies did not consider field demonstration as the best promotional measure for cabbage in the Haveri district.
25) In the case of green chilli seeds market of Haveri district, Sungro seeds did not consider the field demonstration, distribution of calendars and dealers meetings would create awareness about green chilli seeds in the district and Seminis seeds in the case of field demonstration. Beejo Sheetal and Mahyco seeds used all the eight promotional measures to reach farmers and dealers.
26) In the case of brinjal seeds market, Rasi seeds had conducted more numbers of dealers meetings as compared to other competitors to popularize the product among the dealers. Mahyco seeds focused on farmers meetings, display of banners and poster to create awareness among the farmers. In the case of field demonstration, Mahyco seeds and Rasi seeds companies did not consider this strategy as best promotional measure to reach farmers and dealers in Haveri district.
27) In Belagavi district for tomato seeds, Syngenta did not consider distribution of calendars and dealers meetings would result in more awareness among dealers. US Agri seedsseeds also considers the same in the case of distribution of calendars in the district during the study period. Sungro had conducted the highest number of farmers meetings (54.05 %). All the four companies were actively involved in promotional activities in the district on tomato crop.
28) Belagavi district had more potential for cabbage seed business as a result all the four companies conducted all the eight promotional measures in the district. Seminis seeds and Mahyco seeds companies considered displaying of banners, posters and distributing the calendars created more awareness among both farmers and dealers. Seminis seeds alone conducted 43.48 and 47.62 per cent of the farmers meetings and jeep campaigns performed in the district, respectively.
29) For green chilli seed promotion in Belagavi district, a total of 8,500 posters and 230 banners were displayed in the district for chilli seed promotion and 40 per cent of calendars were distributed by Seminis seeds. 86 per cent of dealers meetings were conducted by Tanindo seeds seed company. Syngenta did not hold any dealers meetings or distribute calendars as promotional activities in the district.

30) The vegetable seed companies were not vigorously involved in promotional activities for the brinjal seeds in the Belagavi district because the net worth from the brinjal seeds was much lesser than the other selected vegetable seeds.
31) In Hassan district for tomato seeds, all the four vegetable seed companies conducted one dealers meeting each, which showed that all the companies considered dealers meeting as important strategy for creating awareness among dealers. Farmer meetings were organised by all the four companies to create the awareness among the farmers.
32) For cabbage seed promotion in Hassan district, Syngenta had conducted 36.36 per cent of farmers meetings in the district. It considered the strategy as most important promotional measure to reach the farmers.
33) The chilli market in the Hassan district was dominated by East-West seeds company which considered conducting field days (62.50 %) was the most important promotional measure to reach farmers. For Seminis seeds, field demonstration (57.14 %) was perceived as most effective measure to make awareness among farmers and dealers. All the companies were aggressively involved in the promotional measures in the district.
34) In Hassan district for brinjal seed promotion, Mahyco seeds company was actively engaged with a coverage of 52.63, 52.08 and 100.00 per cents of field days, poster display and field demonstrations in the district conducted to reach the farmers. Rasi seeds distributed 86.21 per cent of the total calendars distributed in the district to give awareness of the product.
35) In Kolar district, all the four companies had actively employed all the eight promotional measures to reach farmers and dealers in the district for tomato seed marketing. In that, US Agri seedsconsidered distributing calendars (57.14 %), Indo-American company had taken 40.00 per cent of dealers meetings and Syngenta taken up 61.22 per cent of field demonstration to reach farmers.
36) In Kolar district, all the four companies were actively involved in promotional activities for cabbage seed marketing. Nunhems seeds and Mahyco seeds had considered dealers meeting as effective measure to reach dealers and they had conducted 33.33 per cent of dealers meeting each. Nunhems seeds and Rasi seeds considered displaying banners created better awareness among farmers and took 37.50 per cent banner display by each company.
37) In green chilli seed market of Kolar district, all the four companies adopted all the eight measures to reach farmers and dealers in district during the study period. East-West seeds considered farmers meeting (40.32 %), Namdhari seeds jeep campaigns (54.05 %) and US Agri seedsseeds distributing calendars (33.33 %) were effective measures to reach dealers and farmers. Kalash seeds did not consider dealers meetings was a effective measure to reach dealers so it did not conduct any dealers meeting in the district during the study period.
38) For brinjal seed promotion in Kolar district, vegetable seed companies did not involve aggressively in promotional activities of brinjal seeds in the district. Rasi seeds had not taken any promotional activities for brinjal crop because the turnover from brinjal seeds was much lower. Mahyco seeds had taken all the promotional measure and conducted 71.43 and 66.67 per cent of field days and dealers meetings as effective measures to reach farmers and dealers.

39) In Haveri district for tomato seed market, push-pull index of Rasi seeds and Bioseeds had shown more pull volume. Distribution width and distribution depth of Rasi seeds were due to additional number of distributors and highest sales volume. Overall, the performance of Rasi seeds was upmost followed by Mahyco seeds, Bio seeds and US Agri seedsseeds.
40) In Haveri district for cabbage seeds, the product quality, dealer width, distribution depth and pull volume of Seminis seeds were prime. Promptness in delivery of Mahyco seeds was foremost because the production and packing centre is located within the district. Seminies and Ankur seeds employed agriculture graduates as sales officers who confirmed better workforce. The overall performance of Seminis seeds was the highest followed by Mahyco seeds, Ankur seeds and Welcome seeds.
41) In green chilli seed market of Haveri district, Beejo Sheetal had maximum pull volume, product quality, distribution depth and dealers depth in the district. Sungro seeds failed in providing better schemes like foreign trips and gold schemes like Beejo Sheetal and Seminies. Mahyco seeds had less dealers width possibly because the selection of dealers was based on the payment habits. Overall performance of Beejo Sheetal was foremost followed by Seminies, Sungro seeds and Mahyco seeds.
42) In brinjal seed market of Haveri district, for promptness in delivery, Rasi seeds and Mahyco seeds were foremost, their popular brinjal hybrids were majorly accepted in Haveri, Dharwad and Davangere markets. At the same time these hybrid seeds are available with the distributors in the district which helped for easy accessibility. The shortage of supply with Haveri district distributors were made good by the distributors of Dharwad and Davengere districts. Overall, it could be concluded that Rasi seeds was a leader followed by Mahyco seeds, Beejo Sheetal and East-West seeds company.
43) In Belagavi district for tomato seeds, the product quality and dealers width of SunAgro seeds was foremost. Rasi seeds and Sungro seeds provided better appropriating schemes like visits to capital city and company production plants to dealers and nurserymen which formed interest to push the product in the district. Overall, Sungro seeds had highest performance, followed by US Agri, Rasi seeds and Syngenta seeds in the district with respect to tomato seed marketing.
44) In cabbage seeds market of Belagavi district, the product display of Tokita seeds seed portrayed least score because heads were not not attractive in nature. Seminies seeds gave more importance to display of product image of cabbage heads which look attractive and thought of family sized cabbage heads. Overall performance of Seminies seeds was upmost, followed by Welcome seeds, Mahyco seeds and Tokita seeds during study period in the district.
45) In green chilli seed market of Belagavi district, account settlement, promptness in delivery, product quality and distribution depth were higher for Tandindo seeds company. The Nangwoo bio seeds sales officer is working from past twelve years in the same company and he had good contact with the dealers and nurserymen which made better dealer's width of Nangwoo seeds. The overall performance of Tanindo seeds was foremost, followed by Seminies, Syngenta and Nangwoo bio seeds over the period of study.

46) In brinjal seed market of Belagavi district, the product quality of Mahyco seeds was better than other competitor's hybrids. It is interesting to note that the dealer's width was same across Mahyco seeds, Seminis seeds and Rasi seeds, whereas East-West seeds company selected dealers and nurserymen based on the good account settlement ability within the season end which led decrease in dealers width. Overall, performance of Mahyco seeds was foremost, followed by Seminies seeds, Rasi seeds and East-West seeds in the district during the study period.
47) In Hassan district for tomato seeds, Clausa seeds company dealt with the dealers and nurserymen on weekly basis to discuss about the product requirement and they do account settlement on yearly basis which enabled dealers and nurserymen to clear the account with ease after entire season sales. It also helped in promptness in delivery as well. Maximum numbers of Clausa seeds company employees were located in Hassan district which made them to attend to every problem in the district and provided good coordination with dealers and nurserymen. Hence, the overall performance of Clausa seeds was prime, followed by Syngenta, Seminies and Bio seeds.
48) In Hassan for cabbage seeds, problem solving, workforce, transportation facility, time period of dealing, coordial nature, promptness in delivery, account settlement, product quality, dealers width, dealers depth and distribution depth of the Syngenta company was upmost. The company had employed agricultural graduates in the district who had created good relationship with the dealers, nurserymen and vendors in the market. The overall performance of Synagta seeds was topmost, followed by Seminies seeds, Mahyco seeds and Nunhems seeds.
49) For green chilli seeds in Hassan district, product display, appropriating schemes and distribution depth of East-West seeds company were foremost due to seeds come in metal box package which makes them appear more attractive, quality protected and prone to less damage during transit. The overall performance of Beejo Sheetal company was prime along with East-West seeds company, followed by Kalash seeds and Seminies.
50) In Hassan district for brinjal seeds, product quality, push volume and distributors depth of Mahyco seeds were foremost. Overall, the performance of Mahyco seeds was upmost, followed by Golden seeds, Sungro seeds and Rasi seeds. It suggests that, though the qualities of the products are good, the performance of the company mainly depends on preference and behaviour of the market.
51) In Kolar district for tomato seeds, US Agri seedsand Syngenta companies depicted highest score on product quality perhaps due to the fact that the hybrids of these two companies "US-400" and "Abhinav" were highly accepted in the market due to suitability of them for Kolar district climatic conditions, disease tolerance, high yielding and fruits were having better quality. Overall, the highest score was gained by US Agri, followed by Syngenta, Indo-American seeds and Namdhari seeds.
52) For cabbage seeds in Kolar district, for product quality, dealer's depth, dealer's width and distribution depth, Nunhems seeds company gained highest scores because its hybrid "Unnati" has good keeping quality and is suitable for export. So, merchants bid higher prices to this cabbage than any other cabbage hybrids. The overall performance of Nunhems seeds was found to be highest, followed by Rasi seeds, Seminies and Mahyco seeds, respectively.

53) For green chilli seeds in Kolar market, for time period of dealing, account settlement, product quality, Namdhari seeds gained highest score on all the parameters because Namdhari seeds company sells its products well in advance to sowing season and settles the account once in a year. The performance of Namdhari seeds was foremost, followed by US Agri, East-West seeds and Kalash seeds, respectively in the district.

54) In Kolar district for brinjal seeds, product quality, dealers depth and distribution depth of Mahyco seeds as the foremost because of its hybrid "MH-11" which is high yielding, disease resistant and suitable for Kolar climatic conditions. The overall performance of Mahyco seeds which gained highest score, followed by Ankur seeds, Rasi seeds and East-West seeds, respectively.

55) In Haveri district, In the case of tomato, cabbage and brinjal seeds, the market price at the planting stage was considered as the most important factor and least factor was neighbors opinion. In the case of green chilli, the major factors considered were the suitability of soil, productivity and market price at the planting stage.

56) In Belagavi district, the availability of credits was considered as a major influencing factor in decisions of purchasing tomato seeds and least considerable factor was germination percentage. In the case of cabbage, green chilli and brinjal, suitability of soil considered as the major factor.

57) In Hassan district, in the case of tomato, cabbage and green chilli seed's purchasing decision, the market price at the planting stage were considered as the most important factors. Whereas, suitability of soil was considered the most important factor in purchasing decision for brinjal seeds.

58) In Kolar district, in tomato, cabbage and brinjal seeds' purchasing decision, the major factor considered was the market price at the time of planting was major factor. Suitability of soil was considered as the major factor in purchasing decision in green chilli.

59) In Haveri and Belagavi districts, in the case of dealer's problems, competition with other dealers was considered as the most important problem due to presence of more number of dealers which results in lower margins. In the case of nurserymen, poor credit recovery from farmers was considered as major problem because farmers ordered the seedlings and did not collect the seedlings and did not pay the remaining credit when nurserymen had already sown. In the case of distributors, the major problem was found to be the competition from product development personnel (PD) personnel.

60) In Hassan district, according to the dealers, low margins in seed business was considered as major problem because with respect to fertilizers and pesticide business dealers were receiving better margins which lowered their interest in seed business. In the case of nurseryman, unavailability of skilled labour was the major problem since nursery needs some scientific method of sowing, maintenance and in the germination stage seedlings are highly susceptible for pest and diseases attack. For the distributors, the major problem was considered to be competition from product development personnel (PD) personnel.

61) In Kolar district, in case of dealers, low margins in seed business was considered as the major problem. In the case of nurseryman, the major problem was poor credit recovery from farmers and competition with product development personnel was considered as least problem. In case of distributor's problems, difficulty in credit recovery from dealers/nurseries was considered the most important problem due to company pressures distributors for reply the seeds amount and many dealers and nurserymen like to settle the account yearly once so it would be hectic for the distributors to convey the company and as well as dealers.

Conclusion

1) The results of study showed that in Haveri district, green chilli recorded the highest growth rate among all the selected vegetable crops. In Belagavi district, area, production and productivity growth rate of cabbage was leading and crop recorded a growth rate of more than 10.00 per cent per annum. In Hassan district, tomato had the highest growth rates in production and productivity among all the selected vegetables. In Kolar district, growth rate of vegetable crops indicated a declining trend in area for all the vegetables, except of cabbage. Generally it was found that production increased due to increase in area and not in productivity. Growth in productivity was found low due to variation in harvest time in tomato and brinjal crops at different growth stages and output is less in terminal harvesting stages. Therefore, it could be suggested that vegetable seed companies should develop seeds with which could have consistency in harvest across different stages. It was also found that some of the vegetable hybrids which have good market tended to have low yield compared to hybrids which had less market. Therefore, seed companies have to promote hybrids which have characteristics of both high yielding and high marketability. General good agriculture practices like stacking, timely weeding, etc may bring improvement in yield. Hence, GAP are to be promoted along with promotion of hybrids by respective companies.
2) Projected demand for all the selected vegetables in Haveri district indicated an increasing demand and growth rate ranges from 1.68 to 5.35 per cent. Highest growth was found in green chilli. In Belagavi district also seed demand would increase in tomato, cabbage and brinjal crops, whereas, in green chilli seed demand would be same in next five years. In Hassan district projected seeds demand for tomato crop showed decreasing growth, with the exception of cabbage seed which showed increasing growth in demand in coming years. Similarly, in Kolar district, cabbage seed demand would be increasing at the rate of 2.14 per cent per annum, respectively. Green chilli and brinjal seed demand would be decreasing in the coming years. Based on this results cabbage seeds producing companies in all districts can give target for increase in their seed production for future years. Likewise, tomato, cabbage and brinjal seeds producing companies can focus in Haveri and Belagavi districts. Kolar and Hassan districts are potential for vegetable production but it showing decreasing growth rate in demand for some selected vegetable. So it will be an opportunity for companies to conduct better research and grab the opportunity through good quality seeds production and facilitate better price for their product in the districts.

3) The study showed no stiff competition among the vegetable seed companies to sell their products as moderate to high degree of market concentration was noticed in vegetable seed distribution in all four districts across to all the four vegetable crops. This indicated the difficulties for new firms to enter in all these markets. Study suggested that vegetable seed companies should develop vegetable seeds based on the preferences given by particular market which are suitable for that particular district's climatic conditions. Firmness, colour and shape of the fruits are the major factors in the case of tomato and brinjal. Whereas, pod length, pungency and dual purpose use of pods in the case green chilli. In case of cabbage, suitability of a cabbage head for a nuclear family was considered as major factor. The seed production firms need to keep these things in mind while developing, breeding and marketing the seeds of these vegetables.
4) Companies used different promotional measures for increasing sales volume. Most of the companies focused more on tomato seed promotion and brinjal was least important among selected crops. The dealers meetings and appropriate schemes would create more interest among dealers to sell particular company seeds. Likewise, in the case of farmers, farmers meeting, field days, displaying posters and jeep campaigns would crates more awareness among the farmers. The field demonstration is not a perfect promotional activity because farmers will have to wait until a vegetable crop develops fruit and it arrive to market and get price.
5) The major factors which influenced the farmers in purchasing decision of different vegetable seeds for different crops in all the four districts were market price at the time of planting and suitability of soil. There is a need to develop a market mechanism to provide daily information of market prices for different hybrid in the market through mass media so that farmers will judge and go for better hybrid seed selection.
6) Distribution depth was considered as most important factor to study the performance of vegetable seed companies. Distribution width, dealer's depth and dealer's width were considered as important factors, but were given the lower scores as compared to distribution depth. Different companies indicated different kinds of performance in all four districts with respect to vegetable seed distribution. Study indicated that the company which hired agriculture graduates as sales officers and market development officers, it was easy for them to access market, better dealers and distributors width. Companies should make once a year account settlement strategy to promote their products in the market.
7) The dealers, nurserymen and distributors major problems were competition with other dealers, poor credit recovery from farmers and competition from product development (PD) personnel. If the companies focus only on distributors instead of creating product development (PD) personnel in the market then they can apply good marketing strategy without disturbing marketing flow of their products.

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STUDY OF MARKET STRUCTURE, CONDUCT AND PERFORMANCE OF VEGETABLE SEED BUSINESS IN KARNATAKA

STEPHAN RAJ SWAMIDAS 2016

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ABSTRACT

The study was carried out with three purposes and those were market structure, conduct and performance. The vegetables selected for the study were; tomato, cabbage, green chilli and brinjal. Multistage sampling technique was adopted for this study. CGR was calculated using the secondary data from 2004-05 to 2014-15. Study confirms that Haveri district recorded the highest growth rate in green chilli and cabbage in the case of Belagavi district. Hassan district had the highest growth in production of tomato crop. In Kolar district, all the selected vegetable crops indicated a declining trend in area. Herfindah index was used to know the market concentration and it showed that market were moderate to high degree of concentration in all the four districts. Which suggest that it is very difficult for new firms to enter in the selected vegetable seeds market in the study area. All the companies actively conducted the promotional activates in all districts for three vegetables crops except for brinjal because the turnover with respect to brinjal crop was relatively low as compared to other three crops. To know the market performance, sixteen parameters were devised during the study that ranged from product display to distributors depth. Each company was ranked on 1 to 5 scales. A comparison on individual parameter was done and the overall performance of each of the company was calculated with help of a grid. Standardized index was used to know the major factors which influenced the farmers in purchasing decision of different vegetable seeds and the most important factors were market price at the time of planting and suitability of soil. Study also indicated that competition with other dealers, poor credit recovery from farmers and competition from product development personnel were the major constraints with respect to dealers, nurserymen and distributors in vegetable seed distribution.