AN ANALYSIS OF FARMERS' PREFERENCE FOR HYBRID AND Bt COTTON WITH REFERENCE TO DHARMAPURI DISTRICT

Thesis submitted in part fulfillment of the requirements of the award of the degree of **MASTER OF BUSINESS MANAGEMENT** to the Tamil Nadu Agricultural University, Coimbatore – 641 003

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CERTIFICATE

This is to certify that the thesis entitled **"AN ANALYSIS OF FARMERS' PREFERENCE FOR HYBRID AND Bt COTTON WITH REFERENCE TO DHARMAPURI DISTRICT "** submitted in part fulfillment of the requirements for the degree of **MASTER OF BUSINESS MANAGEMENT** to the Tamil Nadu Agricultural University, Coimbatore is a record of bonafide research work carried out by **MR. K. SIVAKUMAR** under my supervision and guidance and that no part of this thesis has been submitted for the award of any other degree, diploma, fellowship or other similar titles and that work has not been published in part or full in any scientific or popular journal or magazine.

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DATE 8th FEB 2003 :

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OF

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ABSTRACT

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AN ANALYSIS OF FARMERS' PREFERENCE FOR HYBRID AND Bt COTTON WITH REFERENCE TO DHARMAPURI DISTRICT

By

K. SIVAKUMAR

Degree : Master of Business Management

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2002

Cotton production in India is at crossroads for the past few years. Till recently it was hybrids which were at the focus but the era of genetically modified Bt cotton has arrived, so case firm which is about to commercially launch Bt cotton has decided to undertake the present study. The study was undertaken with the overall objective of evaluating the farmer's preference for Bt cotton and product features (traits) for Hybrid cotton.

Dharmapuri District in Tamil Nadu was selected purposively and four taluks in Dharmapuri District were randomly selected. In order to fulfill the objectives, 200 farmers from 20 villages and 40 dealers were selected at random and enquired.

It was found that 42 per cent of the sample farmers in the district were in middle age group. Nearly 63.0 per cent of the sample farmers had experience of less than 10 years in cotton farming. Cotton was the major crop which, accounted for 53.7 per cent of the total cropped area of the sample farmers.

MCU-5, Varalaxmi and DCH-32 were known and cultivated by all sample farmers in the study area. Dealers were found to be the major source of purchase for hybrid cotton seeds by the sample farmers followed by private company. High price of the hybrid seeds was the major problem faced by the farmers in purchasing hybrid seeds.

Higher pest incidence of American bollworm followed by Pink boll worm and Spotted boll worm were the major pest of cotton as reported by more than 50 per cent of sample farmers. All the sample farmers in the study area had used Rogar, Endosulphon and Monocrotophos. Majority of the farmers go for upto eight rounds of spraying (40.5 per cent) and up to 10 rounds of spraying (30.5 per cent).

Resistance to pest and disease was the preferred product feature followed by yield of the crop and duration of the hybrid. Majority of the farmers in Dharmapuri taluk preferred hybrids with a yield of about 4-5 quintals / acre. High seed cost was the major constraint faced by sample farmers in cultivation of hybrid cotton.

Most of them were unaware (59 per cent) and only 44 per cent of the sample farmers were aware about Bt cotton. Dealers were ranked as the prime source of information on Bt cotton. Majority of the sample farmers expected high yield (76 per cent) followed by reduction in seed price (75 per cent) on Bt cotton. Dealers' influence (94 per cent) was reported as a major reason for willingness to cultivate Bt cotton followed by boll worm resistance (78 per cent). Higher price of seed was the major reason for farmers not willing to cultivate Bt cotton.

Majority (60 per cent) of the sample dealers were in middle age group. Reduction of the cost of seed was ranked as the best promotional activity followed by field demonstration. Major constraints in marketing of hybrid cotton seeds, high pest and disease attack (95.0 per cent) and failure of dominant variety. Average yield was ranked as the first reason for preferring long staple cotton followed by more outturn and good market price.

All the sample dealers were aware about Bt cotton. Major source of information about the Bt cotton seeds was company person. About 88 per cent of dealers wanted the case firm to reduce the price of Bt cotton seed, while 75.0 per cent reported that more advertisement will improve the sales of Bt cotton seed in future.

Among the variables selected to assess their influence on willingness to cultivate Bt cotton by farmers, experience and land holding size were significantly influencing their willingness. As experience plays an important role in farming, farmers could be convinced about the advantages of Bt cotton through peer group farmers. Besides farmers with larger land area are willing to allocate more area for the Bt cotton if they convince about the advantage and profitability of Bt cotton.

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(K. SIVAKUMAR)

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INTRODUCTION

CHAPTER I

INTRODUCTION

Cotton has been a premier agricultural crop of India playing a pivotal role in the national economy in both rural and urban sector. It contributed about 65 per cent of the raw material for textile industry and also one – third of total foreign exchange earning of India amounting to nearly $ 11.00 billion. Cotton sustains huge employment in the rural and urban sector and plays a key role in economic and trade activities within the country.

Cotton being an indiscriminate and relatively long duration crop, with extended squaring, flowering and fruiting stages had been a paradise for wide range of insect pests. About 50 per cent of the pesticides in our country, amounting to 16 billion rupees was sprayed on cotton for controlling various pests. Expenditure in bollworm control alone was amounted to Rs. 11 billion.

Being a cash crop, farmers were highly sensitive to pest incidence and resorted to indiscriminate and excessive application of recommended and non recommended pesticides which in turn led to the elimination of beneficial parasites and predators. Indiscriminate use of synthetic pyrethroids led to whitefly resurgence in many parts of the country. In the Southern State of Andhra Pradesh many cotton farmers committed suicide due to crop failure and losses and it had become regular feature.

The hybrids beginning with "Hybrid 4" in 1970 followed by a galaxy of them in tetraploid and diploid cottons, brought lots of changes in the cotton scenario of the country by causing a quantum jump in yield (Agarwal, 1985). A large core of improved varieties and hybrids gifted with high yield potential, early maturity, better fiber quality and tolerance to key pests and diseases have been developed during the last five decades.

Integrated pest management is the best tool to minimize the risks and problems for various pests and diseases. It is a recommended practice for cotton farmers throughout the world. Alongwith conventional pesticides, bio pesticides, neem formulations and low toxic high effective molecules are recommended for use .Organic cotton cultivation attempts to eliminate total use of harmful pesticides.

Bio Technology to Overcome Constraints in Cotton Production

Plant biotechnology had become a source of agricultural innovation, providing new solutions to age-old problems. Genetically modified plants (or organisms) or GM crops or GMOs were developed with emphasis on resistance to pest and diseases.

Soil bacterium, *Bacillus thuringiensis berliner* had been identified to possess a great potential for use as a biopesticide.Molecular potency of *Bacillus thuringiensis* (Bt) toxins was higher than other chemical pesticides, viz., 300 times higher than synthetic pyrethroids, 8, 00,000 times stronger than organophosphates (Feitelson *et al.*, 1992). The advancement in genetic engineering and molecular biology in the early eighties led to the cloning of Bt crystal protein (cry) gene for the first time in 1981 (Schnepf and Whiteley, 1981).

With the advent of modern biotechnology, it became possible to transfer the Bt toxin gene to plants. These plants were able to synthesise the toxin by themselves. Over 50 Cry proteins, which form the Bt toxin, had been identified and 410 Bt-related patents have been issued over the last decade or so in Western countries.

The U.S. Agrichemical giant, Monsanto introduced the Cry1Ac gene into the cotton variety, Coker 312. Then, by crossing this strain with elite cotton varieties, it created hybrids, which carried the Bt gene.

Global Scenario

Globally 39.9 m hectares were under cultivation of transgenic crops in 1999 of which nearly 72 per cent were in USA. In terms of distribution by traits, 71 per cent of this area was under genetically engineered crops expressing alien genes for herbicide tolerance (James, 1999). About 22 per cent of the area was under insect resistant transgenic crops - primarily corn and cotton that expressed the □-endotoxin Coding genes of the soil bacterium *Bacillus thuringiensis*. Since the first release in 1996, there had been an increase in area under transgenic Bt crops from about one million hectare to 11.8 m hectares in 1999 testifies the economic advantage (besides a substantially lower application of synthetic pesticides) that farmers had experienced. Nevertheless, commercial cultivation of Bt crops was limited to the mainland USA (excluding Hawaii) and Southern parts of Australia and China.

The size of the transgenic crop seeds market had expanded to US $3.044 billion over a period of 5 years i.e. from 1995 to 2000. The market was estimated to grow to $ eight billion in 2005 and $ 25 billion by 2010.

Indian seed industry is undergoing a period of rapid change, due to economic liberalization and enactment of the New Seed Policy (1988). This lifted restrictions on import of foreign germplasm by private sector, enabling larger seed producers, particularly those with foreign collaborations, to have access for seed from international sources.

During 2002, Genetic Engineering Approval Committee cleared the commercial cultivation of Bt transgenic cotton with Cry 1 (Ac) gene all over the country. Over the past few years transgenic cotton had attracted the attention of researchers and farming community in view of the high positive reports emulating from USA, China, Australia and other countries where Bt cotton was under commercial cultivation.

The entry of country into transgenic era can be presumed as a positive step looking for producing quality cotton at relatively low cost so as to make Indian cotton highly competitive in international market. At present, private seed industry has taken a lead in releasing transgenic cotton hybrid. Presently only one company (Mahyco-Monsanto) has been permitted for the sale of cotton hybrids in India.

Problem Focus

Cotton production in India is at crossroads for the past few years. Till recently it was hybrids which was at the focus but the era of genetically modified Bt cotton has arrived. There was lot of hue and cry regarding the commercialisation of Bt cotton in India since Genetic Engineering Approval Committee (GEAC) had approved the use of Bt cotton seeds. It is high time that seed companies must have preliminary information on the awareness and acceptance, preference of farmers etc., so as to come up with suitable marketing mix for increasing the sales of Bt cotton seeds. In this context the case firm which is about to commercially launch Bt cotton has decided to undertake the present study.

Objectives

The overall objective of the study was to evaluate the farmer's preference for Bt cotton and product features (traits) for Hybrid cotton. The specific objectives are:

i. to examine the farmers awareness and preference for cultivating Bt cotton;

ii. to identify the product features preferred by farmers with respect to hybrid cotton;

iii. to identify the factors influencing choice of long staple cotton; and

iv. to identify the constraints in cultivating cotton

Scope of the study

The outcome of this study would help the case firm to get an idea about the awareness and preference of farmers regarding Bt cotton and this will enable the case firm to formulate strategies to increase the awareness. This study would be helpful to identify the product features preferred and constraints faced by the farmers during cultivation of hybrid cotton and dealers while marketing the same. The study will enlighten the case firm regarding the scale of operation it can go for in the study area and finally to formulate an ideal marketing strategy to market Bt cotton seeds.

Limitation of the Study

Since the study area is limited to Dharmapuri district, extending the findings to other areas need to be done with caution. This study is based on primary data collected from sample farmers and the dealers by survey method. As many of the farmers have not maintained proper records about farming operations, they furnished the required information from their memory and experience. The collected data was subjected to recall bias. However every effort was taken to minimize the bias by including questions that would facilitate cross checking. Hence, the findings of the study may be considered appropriate for the situation prevailing in the study area and extra care should be taken while generalizing the results.

ORGANIZATION OF THE THESIS

The thesis is organized in to six chapters as under:

Chapter I : **Introduction:** It covers the information such as objectives, scope and limitation of the study.

Chapter II : **Concepts and Review:** It encompasses discussion on concepts used in the present study and the results of the earlier studies by other workers.

Chapter III : **Design of the Study:** It specifies the sampling design, method of data collection and tools used in to conduct research and analysis of data.

Chapter IV : **Description of Study Area:** The general and agricultural characteristic features of the study area are described in this chapter.

Chapter V : **Results and Discussion:** The results of the analysis are presented and discussed to draw inferences with respect to the objectives of the study.

Chapter VI : **Summary and Conclusions:** The summary of the results of the study is presented to draw specific conclusions and suggestions to help the case firm to launch their products based on farmers' preferences.

CONCEPTS AND REVIEW

CHAPTER II

CONCEPTS AND REVIEW

A comprehensive knowledge about the concepts related to the research problem would help to have a better understanding of the research problem. Various fundamental concepts like Bio-technology, Bt Cotton, Genetically modified crops, Cotton, Cotton seed, Cotton boll, Cotton fuzz, Hybrid, Dealer, Awareness, Integrated Pest Management, Market, Marketing, Seed Marketing, Seed enterprises, Seed Industry, Product, Hybrid Seed Industry, Buying behaviour and brand preference are reviewed and an attempt is also made to conceptualize them for the present study.

Biotechnology

Gibbs (1983) defined biotechnology as "the use of living organisms in systems or processes for the manufacture of useful products; it may involve algae, bacteria, fungi, yeast, cells of higher plants and animals or sub-systems of any of these or isolated components from living matter".

According to Bu'lock (1987) biotechnology comprises the "controlled and deliberate application of simple biological agents – living or dead, cells or cell components – in technically useful operations, either of productive manufacture or as service operation."

Dan Verakis (1998) referred that the proponents of biotechnology claim that it will transform agriculture, giving us the ability to 'design' crop plants to produce increased yields, even in difficult conditions, with farm less reliance on chemical inputs. Their vision is of genetically modified crops as a clean and sustainable solution to the problem of food security for the world's growing population in the 21st century.

According to British Biotechnologies (1999) "The application of biological organisms, systems or processes" constitutes biotechnology.

According to European Federation of Biotechnology (1999) biotechnology is "the integrated use of biochemistry, microbiology and engineering sciences in order to achieve technological application of the capabilities of micro-organisms, cultured tissues/cells and parts thereof."

According to U.S. National Science Foundation (1999) biotechnology consists of "the controlled use of biological agents, such as, micro-organisms or cellular components, for beneficial use."

Genetically Modified Crops

According to Boriaug (1997), agrochemical companies maintain that GM crops will play a big role in sustainable agriculture by increasing yields, reducing the need to expand the area of cultivated land and at the same time reducing the need for herbicides and pesticides.

James (1998) defined transgenic crop or GM crop is the plant modified at gene level with genetic transformation techniques, where the exotic or foreign gene is tailored into the crop genome that expresses the insert".

Bt Cotton

According to Prakash (1997), the development of insect resistant crop varieties has been the most successful application of agricultural biotechnology research so far. The Bt transgenic crops derive their resistance from the insecticidal gene of the bacterium, *Bacillus thuringiensis*.

Reuter's news service (2001) referred the transgenic Bt cotton which contains the bacterium *Bacillus thuringiensis* protein and is resistant to corn borers, bollworms and other pests that damage cotton plants. Pesticide poisoning had also been reduced significantly.

According to Singh (2001) Cotton seeds are modified genetically to contain a common bacterium, Bt (*Bacillus thuringiensis*) that is potent enough to resist one of the most dreaded pests of cotton: the bollworm.

According to Dale *et al.* (2002) Bt is a naturally occurring ubiquitous soil bacterium that produces a toxin lethal to certain insects.

According to Shiva (2002) Bt cotton is genetically engineered cotton, which contains genes taken from a soil bacterium (*Bacillus thuringienssi*) to produce toxins in the plant. It has promoter genes to create high-doses of the toxin, which are released in all parts of the plant during the entire life span of the crop.

Bt-cotton hybrid seeds when planted grow like any other normal cotton hybrid, but are tolerant to bollworm attack and this tolerance to bollworm attack is from within the plant as mentioned in the Monsanto leaflet.

Cotton

According to Francis (1956) Cotton (gossipium) is a stable fibre, usually 3/4–2 ½" in long, surrounding the seeds of various species of Gossypium cotton is the major textile fibre and is also an important source of cellulose, which constitutes 88-96 per cent of the fibre.

Cotton Seed

According to Somani (1987), Cotton seed is the bye-product of the cotton ginning industry; seed of cotton, with remnants of unginned lint and thick coat of short fibers (fuzz) rich in carbohydrates, proteins and vitamins; used extensively as cattle feed, and for extraction of oil.

Cotton Boll

According to Gurdeep (1987), Fruit of cotton plant is termed as boll

Cotton Fuzz

Unicellular epidermal layer of cotton seed coat composed of cellulose.

Hybrid

According to Douglas (1980) hybrid seed means first generation seed of a cross, produced by controlling the pollination of and by combining (i) two or more inbred lines, (ii) one inbred or a single cross with an open pollinated variety, and (iii) two varieties or species except open pollinated varieties of maize. The second generation or subsequent generation from such crosses, would not be regarded as hybrids.

According to Somani (1987) a plant resulting from a cross between parents those are genetically unlike.

According to Gurdeep (1987) the offspring of parents of different species, varieties or breeds of plants or animals. They may be fertile or sterile. The likelihood of sterility is increased with the greater difference between the genotypes of the parents, due to the increased chance of imperfect chromosome pairing.

According to Dale *et al.* (2002) Hybrid – is the interbreeding of two genetically distinct varieties of plant to form offspring. Hybrid plants (F_1 hybrids) frequently are more vigorous than their parents and are valued in Horticulture.

Dealers

Fertilizer dealer was defined by Pandey and Sunita Vivek (1983) as a person or institution carrying on the business of selling fertilizers either wholesale (or) retail.

According to Agarwal and Jalan (1986), the farmers purchased inputs more often from private dealers (retailers) and co-operative societies than government agencies.

According to Kulshreshtha (1986), the term dealer included the wholesalers, retailers, distributors, stockists or any other designation by which a distribution intermediary was known.

Daniel and Darden (1987) defined dealer as a businesser who would sell product to the ultimate consumer.

Nirmalkumar *et al.* (1989) also expressed that the private agencies played more efficient role as compared to the government and cooperative sector agencies in helping farmers for plant protection.

Rameshbabu (1990) remarked that the term dealer included all the firms carrying on business of selling fertilizers, wholesaler-cum-retailer, private retailers and retail co-operative societies selling fertilizers to farmers.

Kotler (1994) defined a dealer as a firm that bought and re-sold merchandise at either retail or wholesale level.

In this study dealer is considered as the one who carry on business of selling both Hybrid and Varietal seeds. Dealer may be a wholesaler, retailer, wholesaler-cum retailer or retail co-operative societies.

Awareness

Rogers and Shoemaker (1971) defined awareness as a function or a stage of decision process when the individual is exposed to an innovative existence and gains some understanding of how it functions.

Venugopal and Perumal (1991) defined awareness as the things known to an individual presented as cognitive domain. It is a pre-requisite for adoption of innovation as this would enable the farmers to completely understand the aspects behind a technology and also its relative advantage.

According to Supe (1994) awareness is the first stage of innovation decision process wherein the individual is exposed to an idea but lacks detailed information about it.

Giram and Sawarkar (1996) defined awareness as the type of social component which increases the consciousness among the people and generate confidence in the individual to face the problems contemplatively.

Thanulingam (1996) defined awareness as the ability of consumer to recall more or less currently the various aspects of consumer movement and consumer rights and the respondents' clarity of understanding of the selected aspects.

In this study by awareness it is meant the knowledge of farmers and dealers with regard to Bt cotton.

Integrated Pest Management (IPM)

According to FAO (1988), it referred to a pest management practice adopted in the context of the associated environment and the population dynamics of the pest species; it utilizes all suitable techniques and methods in a compatible manner as far as possible and maintains the pest population at levels below those causing economically unacceptable damage or loss.

Indulkare (1990) refers IPM to a farming system, which considers any and all combination of various techniques for the management of pest problems, such as those caused by weeds, insects, diseases, and rodent within the context of the farming system.

According to Manjunath (2000) 'IPM' as a slogan may be new, but the concept and practice is deep-rooted in India and dates back to Vedic times.

According to Kakkar (2001), it referred judicious use of natural control, monitoring of pest population, biopesticides and use of selective insecticides that eliminate the pests and save parasite, followed by the use of other insecticides, will help manage pest population below economic injury level.

Gopal (2002) reported that IPM and insect resistance management package for Bt Cotton ought to be simpler as these varieties are already capable of fending off certain pests and only the other pests need to be targeted. But, as a cotton scientist admitted, IPM approach is not without its problems. IPM use over large areas has often proved difficult.

Getting farmers to accept and adhere to an insect resistance management scheme, instead of going by their instinct, is also not easy. The day to success will lie in educating and convincing farmers all over the country.

Market

According to Tousley (1962) Market referred to a place (or) the actual forces that result in the exchange of goods from one hand to other.

Acharya and Agarwal (1987) referred market as a social institution which performs activities and provides facilities for exchanging commodities between buyers and sellers.

Philip Kotler (2001), referred that a market consists of all the potential customers sharing a particular need or want and might be willing and able to engage in exchange to satisfy that need or want.

For the present study market is considered as a set of potential and actual buyers of cotton seeds and whoever able to engage in exchange with sellers of cotton seeds.

Marketing

According to Bell, (1966) marketing is a management task of strategically planning, directing and controlling the application of entrepreneurial effort to profit making process that would provide consumer satisfaction-a task which involves integration of all business activities, including manufacturing, finance and sales in a fixed system of action.

Law, *et al.* (1971) described marketing as a comprehensive term which included those processes involved in converting a raw product into a valuable commodity. It might be a change of place, form, time and appearance.

According to American Marketing Association (1974), marketing referred to the performance of business activities that directed the flow of goods and services from the producer to the ultimate consumer or user.

Patel and Prabharan (1980) reported that the focus of all the marketing activities was to satisfy the consumers. A thorough understanding of consumer awareness and preference is essential in the modern marketing. This help in identifying different market segments. Further, this will also help a firm to a more active role in anticipating consumer needs and wants in shaping their desires and aspirations and solving many of the consumers' day to day problems in purchase.

Kotler (1994) defined marketing as a social and managerial process by which individuals and groups obtain what they need and want through creating and exchanging products and value with others.

For this study marketing is considered as performance of all those activities that direct the flow of seeds from the manufacturing firms, either, through intermediaries or directly to the intermediaries and final consumers.

Seed Marketing

The private dealers play a vital role in seed marketing of various crops particularly vegetables. The use of improved and hybrid seeds by farmers depends on a large extent to dealers efficiency, their services, experience and credit and other facilities extended by them.

According to Subir Sen and Nabinananda Ahosh (1999), Seed Marketing covers all activities involved in the flow of seeds from production to consumption, i.e. from the first multiplication stage of the source / basic seed material upto the distribution of the converted and product, multiplied to adequate quantity to the farmers. Organized marketing of seed would aim at providing the farmers with adequate quantity of high quality seed of the best varieties so that, he may fully exploit the results of research on crop improvement and cultivation.

For the present study, seed marketing define as the performance of activities for making Bt cotton seed and other hybrids available to farmers for sowing.

Hybrid Seed Industry

According to Ramasurdaran and Venugopalan (1999) the cotton hybrid seed industry is one which requires some kind of regulation as its mushrooming and the pricing is purely arbitrary in nature. The corporate venture in cotton seed production through "Contract farming" and seed village is popular in central India. Properly channeled, India may be in a position to export Cotton hybrid seeds since it is pioneer in hybrid seed production. The development of male sterility based hybrids will drastically cut down the cost of seed production. Competition is expected to bring down the seed prices in domestic market.

Seed Enterprise

Douglas (1980) defined seed enterprise as any organization involved in seed growing either directly or through contracts with others, drying, processing, storage and marketing. It may be a private or government organization.

other marketing elements. Products to be sold on a self-service basis must be carefully packaged and labeled to attract the customer at the point of purchase. And, normally, branding increases price rigidity. At the same time, however, well-known brands are most likely to have their prices cut to attract customers to the seller's establishment.

According to Singh (1997) product features are those presented to a customer when promoting the product. Functional features are the quantitative or qualitative aspects of a product that either are non-existent in competing product or exist to a lesser extent. Tangential features are those that do not directly relate to the product's performance but that in some way distinguish a product from equally performing competing products.

Marketing Strategy

Rachman (1980) defined marketing strategy; as the plan for meeting marketing objectives that included specifications of target market and design of mix of elements that would satisfy target customers' needs.

Bagozzi (1986) considered marketing strategy as to how an organization chose to allocate its resources to meet the consumer needs and achieved a competitive advantage. This was done primarily through product design, development and management, larger market selection, product positioning and management communication, pricing and distribution.

According to Cannon (1986) marketing strategy should show the overall direction that the firm would adopt to achieve its purpose or objective. A clear and communicable strategy statement can play a major part in facilitating the evaluation and play a major part in facilitating the evaluation of tactics.

Nair Paul and George (1986) defined marketing strategy as the scheme whereby a firm's resource and advantages are managed in order to surprise and surpass competitions or to exploit opportunities.

Baker (1987) described strategy as the direction; the organization will propose within its closest environment and guides the allocation of resources.

According to Stanton (1988), marketing strategy is broad, basic plan of action by which an organization intends to reach one or more goals.

Kotler (1989) defined marketing strategy as the broad principles by which the business unit expects to achieve its marketing objectives in target market. It consists of basic decisions on total marketing expenditure, marketing mix and marketing allocation.

For the present study, the different activities planned and implemented by the case firm to achieve its goals or objectives are considered as the marketing strategies of the firm.

Buying Behaviour

Mehta (1974) observed that buying behaviour involved those activities like search of alternatives, evaluation of alternatives, choice decision and post purchase feelings and reactions.

Walters (1974) defined buying behaviour as the process wherein individuals, decide on whether, what, when, where, how and from whom to purchase goods and services.

According to Rao and Singh, (1986) buyers not only looked for what a product could do for them but also for what they meant.

Iyer (1990) indicated that consumer's decisions in buying play a key role in the success or failure of products. The level of involvement on the part of the customers depicts their interest and distaste for the demand of the particular product.

For the present study buying behaviour refers to the factors which influence the farmers in purchase of seeds, considering individuals decision of whether, what, when, where, how and from whom to purchase goods and services.

Brand Preference

In a study on factors influencing consumer decision making process toward biscuits, it was found that quality and taste were considered as prime reasons for buying a particular brand of biscuit. Low price and easy availability were the other reasons considered for buying a particular brand.

Tauseef and Inderjeet (1983) analysed the factors that influenced the preference of a particular brand of fertilizer and found that the purchase of fertilizers were not influenced by the price of fertilizer. The farmers' purchase preference was based on easy availability of fertilizer, good quality of fertilizer, good packaging of the fertilizer and its good effect on soil structure.

Gupta and Singh (1989) found that durability and brand image were two major reasons for preferring a particular brand of television by consumers. These were followed by family linking after sales service, price and guarantee/warrantee on the product. The other reasons for brand preference were attractiveness, advertisement and size of the screen.

Ramasamy and Chandrasekharan (1990) identified the factors influencing the purchase of cotton seeds and buying behaviour of farmers. The purchasing decision of farmers were influenced by the distance travelled by the farmer to purchase cotton seeds, source of purchase, varietals performance, seed quality, source of information, about supply of cotton by different agencies and brand preference. Dealers with a credit sale facility, availability of seed at lower prices and premises located nearer to the farmer's locality attracted the farmers.

Senthilvelan (1995) observed that effective control of pests by quality pesticides and credit availability used the factors that influenced farmers in pesticide purchase.

Review of Related Past Studies

Integrated Pest Management

According to FAO (1988), it refers to a pest management practice adopted in the context of the associated environment and the population dynamics of the pest species; it utilizes all suitable techniques and methods in a compatible manner as far as possible and maintains the pest population at levels below those causing economically unacceptable damage or loss.

According to Hara *et al.* (1990) a study on an IPM programme in anthuriam growing areas in east Hawaii country has showed that there was reduced pesticides application without reduction in production and marketability. In the three farms selected *viz.*, Hilo, Parhoa and Kurtistoven, the funcgicide applications. There was also no significant increase in thrips, mites, or anthracnose injuries nor did the total cost for treatment and pest damage increase. Their study concluded by indicating that the IPM concept implemented on a floricultural crop can reduce pesticides application and increase profitability.

Indulkare (1990) refers IPM to a farming system, which considers any and all combination of various techniques for the management of pest problems, such as those caused by weeds, insects, diseases, and rodent within the context of the farming system.

Fernandez – Corejo (1997) examined the impact of IPM on pesticides use, toxicity and other environmental characteristic yields and farm profits for grape growers United States. Results showed that IPM adopters applied significantly less insecticides and fungicides those non-adopters among grape producers in six States, accounting for most of the US production. Both the average toxicity and environmental impact quotient (EIQ) decreased slightly with adoption of IPM, but remained for adopters and non-adopters of IPM for diseases. The effect of IPM adoption on yields and variables profits was positive but only significant for the case of IPM for diseases, i.e., the adoption of IPM for disease, increases yields and profits significantly.

Gopal (2002) reported that IPM and insect resistance management package for Bt Cotton ought to be simpler as these varieties are already capable of fending off certain pests and only the other pests need to be targeted. But, as a cotton scientist admitted, this approach is not without its problems. IPM use over large areas has often proved difficult, he says. Getting farmers to accept and adhere to an insect resistance management scheme, instead of going by their instinct, is also not easy. The day to success will lie in educating and convincing farmers all over the country.

Constraints in Pesticide Usage

Kahlon and Grewal (1965) reported that the cultivators were not fully satisfied with merits of plant protection practices, they believed that insecticides were too costly

and they lacked the technical know how for carrying out control measures. Untimely and inadequate quantities of pesticides available and the co-operatives also inhibited the pesticide usage.

According to Savele (1966) the reason regarding the non-adoption of insecticides by farmers were deficit in supply of insecticides and appliances, high cost of pesticides and lack of guidance for using it.

Singh *et al.* (1973) referred that the price of farm inputs adversely affected the level of their utilization on one hand and the level of farm productivity on the other. The use of modern farm inputs like fertilizers, irrigation and pesticides by farmers were curtailed due to exorbidant rise in the price of these inputs.

Hiranand *et al.* (1981) found out the reasons for non-adoption of pesticides. The pest and diseases occurring on different crops were very well known to farmers and they fully realized the great loss they suffered. Yet they did not adopt the plant protection recommendations. A very few of them know of the recommendations stood out as the most important reason. High cost of pesticides was stated to equally an important reason.

Agarwal and Jalan (1986) stated that farmers had to face numerous problems in the purchase of pesticides at a nominal price, when most needed in desired quantity and quality. The farmers were also dissatisfied with the steps taken by government agencies in handling cost free pesticides.

Singh and Singh (1986) stated that the untimely supply and high supply cost, inadequate quantity, malpractices and difficult procedures were the problems encountered by the farmers in purchasing from co-operatives.

Gangawane (1987) in his study on rational pesticide use indicated that pesticide education is poor and farmers tend to use maximum doses of pesticides in order to eradicate the pest which creates residual problems.

Srivastava and Patel (1988) reported that farmers get substandard quality of product from local formulators. Non-availability of credit, shorter credit period and farmers illiteracy which leads to cheating by dealers are some other problems in pesticide usage.

According to Kairon (2000) cotton cultivation involves the intense use of chemical inputs, primarily insecticides. Pesticides worth Rs. 300-500 crores (35 per cent of the total insecticides used on cotton) are used annually only on the management of the American cotton bollworm. The overall reliance and indiscriminate use of insecticides has led to the problem of accumulation of harmful residues,, resurgence of pests, resistance to insecticides and non toxicity to non-target organisms. The frequent insecticide induced disturbances of the eco system have brought about changes in the pest status vis-à-vis the balance through natural control.

Brand Preference

In a study on factors influencing consumer decision making process toward biscuits, it was found that quality and taste were considered as prime reasons for buying a particular brand of biscuit. Low price and easy availability were the other reasons considered for buying a particular brand.

Tauseef and Inderjeet (1983) analysed the factors that influenced the preference of a particular brand of fertilizer and they found that the farmers were not influenced by the price of fertilizer. The farmers' purchase preference was based on easy availability of fertilizer, good quality of fertilizer, good packaging of the fertilizer and its good effect on soil structure.

Gupta and Singh (1989) found that durability and brand image were two major reasons for preferring a particular brand of television by consumers. These were followed by family linking after sales service, price and guarantee/warrantee on the product. The other reasons for brand preference were attractiveness, advertisement and size of the screen.

Ramaswamy and Chandrasekharan (1990) identified the factors influencing the purchase of cotton seeds and buying behaviour of farmers. The purchasing decision of farmers were influenced by the distance traveled by the farmer to purchase cotton seeds, source of purchase, varietal performance, seed quality, source of information, about supply of cotton by different agencies and brand preference. Dealers with a credit sale facility, availability of seed at lower prices and premises located nearer to the farmer's locality attracted the farmers.

Senthivelan (1995) observed that effective control of pests by quality and credit availability as the factors that influenced farmers in pesticide purchase.

Factor Influence

Hundal and Sandhu (1987) reported that reasonable price was a major basic factor that influenced the brand preference for television sets.

Sivakumar (1987) anlaysed the factors influencing the farmers to purchase a particular brand by scoring each factor in a four point continuous scale. He found that the quality of the preferred brand, advertisement and price of the brand had significant contribution in influencing the farmer to purchase a particular brand.

According to Venkateshwarlu (1987) In a study on factors influencing consumer decision making process towards biscuits, it was found that quality and taste were considered as prime reasons for buying a particular brand of biscuit. Low price and easy availability were the other reasons considered for buying a particular brand.

Namasivayam (1988) observed that the socio-economic factors such as age, education and income influenced consumer preferences. The study also indicated that uneducated persons preferred the media Television and Cinema for soap advertisement. Similarly, the influence of income on advertisement media was studied and it was found that low income group people (below Rs. 1000 per month) preferred cinema as a medium.

Rakila and Padmanaban (1995) pointed out that, the various factors influencing the quantity of pesticides used are dealer recommendation, intensity of pests and diseases, stage of crop growth, type of pests, department recommendations and peer group influence. They concluded that private dealers are able to influence the pesticide use pattern of the farmers to a great extent.

Senthilvelan (1995) ranked better result, followed by quality and credit availability as the major factors that influenced farmers in pesticide purchase next to them, economy, dealers-influence, promotional efforts and sales personnel's influence stood in that order.

Ramesh (1998) reported that 'high yield' is the major reason for cultivating hybrids by the cotton growers. Other reasons *viz.*, timely and easy availability of seeds, reasonable price for kapas and resistance to pest and diseases were not found to be of much significance.

Kannan (2000) reported that factors that mainly influenced the farmers to choose a brand of pesticide were the dealers' recommendation followed by the fellow farmers using, product efficacy and Agricultural Officers' recommendation in that order.

Awareness

Rajasekaran (1991) in his study on farmers buying behaviour of herbicides, concluded that the awareness about herbicide and herbicide technology among the sample farmers were very high.

Shekar (1994) reported that 92 per cent of farmers were aware of pesticides. Among the farmers who were aware, 58 per cent used pesticides while 34 percent had not used pesticides. 8 per cent of farmers were not aware of pesticides.

Dayalane (1999) in his study on the acceptance and market potential for 'Karate' (Insecticide) in Thanjavur district, observed that majority of farmers (81.00 per cent) could immediately recall about Karate, 4.00 per cent could recall with minimum aid, 2.00 per cent could recall with maximum aid while 13.00 per cent of farmers were unaware about Karate.

Hybrid Cotton

According to Ajay Singh (1988) in India, hybrid seeds occupy only 36 per cent of the area under cotton cultivation, out of which Southern zone accounts for 61 per cent. During last few years, hybrid cultivation in the north zone has increased but the area is not more than few thousand hectares in south zone.

GM Crops

According to Ecologist (1996) analysis of the portfolio of commercial GM research shows that the focus is on crops and crop characteristics which will bring the quickest profits: increased sales of herbicides, for example, easier food marketing.

According to Ussuf *et al.* (2001) the technology for developing insect-resistant transgenic plants is expanding very rapidly. Such plants have the potential to become a part of the integrated pest management systems in future. With the development of several transgenic plants expressing Bt toxin it emerged that codon usage of Bt is far from optimal for expression in plants. It is shown that Bt can promote the evolution of resistance if allowed to exert consistent selection pressure on the target insects.

Seed Industry

According to Chopra *et al.*, (1995) is the Indian seed 30 per cent ii attributable to the public sector (state seed companies), 40 per cent to large private companies and 30 per cent to small seed companies This shows a significant shift within the private sector in favour of larger companies.

Agrawal (1996) there are several recent and discrete legislative changes which have promoted the growth of the private sector. In 1986, the provision of private companies with breeder seed from public sector developed self pollinated crop varieties; in 1988, New Seed Policy, liberalizing seed imports and encouraging foreign investment in the seed sector, and in 1991 relaxation of limitations on foreign equity participation, permitting foreign companies to hold controlling stakes in industrial enterprises.

According to estimates by Tiwari (1996), a total of 147 private sector seed companies are in India, which can broadly categorized according to whether they (1) develop, produce and market their own varieties and hybrids, (2) produce and market public sector varieties and hybrids, or (3) have no production capacity, concentrating solely upon marketing. Agrawal (1996) estimated that of the former category, 24 companies have entered collaboration with foreign companies. In addition, several multinational companies have opened subsidiaries in India.

Kapur (2000) reported that India has around 150 companies engaged in production and marketing of seeds of different crops. Of these, only 15 to 20 are engaged in research and development activities. The recent acquisition of Proagro by Aventis Crop Science, Perry & Cargil by Monsanto and partial equity of Mahyco by Monsanto has opened a new chapter in the seed business. All these companies have bigger plans to invest money in R&D and provide the Indian farmer with quality products developed through conventional breeding and using new tools of biotechnology. Already Pro-agro and Monsanto are at advanced stage of developing and releasing genetically modified crops in the Indian environment.

According to Thiyagarajan (2001). Multinational companies have a characteristics sales strategy, typified by Cargill, preferring to emphasis 'quality' and consumer confidence, rather than competitive pricing. Thus, Cargill's hybrid sunflower seed retails for Rs. 350 per kg over three times the price of hybrid sunflower seed produced by a local company, Bhavani Seeds. Cargill justify this price on the basis of higher yield, consumer confidence and after sales back up services.

According to Thiyagarajan (2002) Indian seed industry is undergoing a period of rapid change, due to economic liberalization enactment of the New Seed Policy (1988). This lifted restrictions on import of foreign germplasm by private sector, enabling larger seed producers, particularly those with foreign collaborations, to have access for seed from international sources. Increasingly, the public and private sectors are being delineated in terms of the type of seed they each produce. The public sector focuses on the development and production of open pollinated varieties, which are less commercially exploitable than hybrid seeds. The private sector concentrates upon the latter and more remunerative crops like vegetables. Both the public and private sectors are engaged to increase hybrid seed usage among the farmers who are currently using open pollinated varieties.

Bt cotton

Gujar (2001) reported that Bt cotton appears to yield 20-40 per cent more than non-Bt cotton in field trials. The yield will depend upon the insect infestation levels and several other factors. Cost-benefit ratio will be the main criterion for the farmers to accept Bt cotton. Bt cotton is one of the best options for cotton farmers. Possibly, it will reduce environmental pollution by lowering the use of conventional insecticides. Let the users decide the fate of Bt cotton.

According to Venugopal (2001) results from the trials conducted over the years indicate that cotton hybrids containing the Bt gene provided significantly increased yield as compared to their non-Bt controls at each location tested. The data over all the years show that mean yield performance of all Bt hybrids was 29-40 per cent higher in comparison mean performance of all non-Bt controls.

According to Swaminathan (2002) bollworm has started developing resistance to Bt gene in Australia and China. The only viable alternative is to ban the use of pesticides on cotton. But this will not happen for two reasons. First, it requires a political will since the pesticides industry is a strong lobby. And secondly, agricultural scientists will resist because this will mean that they spend more time in the crop fields rather than in air-conditioned laboratories.

According to Gopal Raj (2002) Bt cotton farmers reduced pesticide use an average of 13 sprays per season. The savings in pesticide and spraying costs lowered their production costs by 28 per cent.

According to Mayee *et al.* (2002) the biotechnological application's direct benefits to farmers depends upon whether the end is oriented towards enhancement of inputs traits or output traits, the farmers is a potential ground for exploitation by the private and later where the customer's surplus will be more for the cotton cultivators, small remain in the public domain of research. Hence, there exists a case for strengthening the public research in the frontier areas to balance the interests and benefits in favour of farmers.

According Sahai (2002) "The Bt cotton technology may work with reasonable success in many countries but not in India. Its irrelevance to the country's small farmers is the crux of the issue,"

According to Mayee *et al.* (2002) the recent multi-location trials with GE cotton hybrids in our country show that it is superior to conventional hybrids in respect of reduced pesticide consumption and increasing seed cotton yield. Their economic superiority coupled with biological and environmental safety would offer an excellent opportunity to fit into the integrated pest management (IPM) system for the cotton cultivars with inherently excellent fibre properties.

DESIGN OF THE STUDY

CHAPTER III

DESIGN OF THE STUDY

Any meaningful research initiative should always be preceded by carefully prepared research design. A perfect research design is essential to evaluate systematically the problems and to find solutions for the same. It also helps in arriving at unbiased estimates of facts and figures.

In this chapter, a brief description of the research methodology adopted in selection of study area, selection of sample respondents, method of collection of data and the various tools of analysis used are presented and discussed

Selection of the Crop

The case firm is about to introduce Bt cotton. In this regard it wanted to know about the farmers' preference regarding the cultivation of hybrid and Bt cotton and hence this crop was purposively selected for this study.

Selection of the study area

Dharmapuri District was purposively selected because the case firm was interested in knowing the brand preference of hybrid cotton and Bt cotton seeds by cotton farmers in Dharmapuri district.

Area under cotton in different taluks of Dharmapuri district is presented in Table 1. In Dharmapuri District, maximum area under cotton was in Uthangarai taluk (5,665 hectares) during 2000-2001, followed by Harur (2,920 hectares), Dharmapuri taluk (1,368 hectares) and Palacode (1,271 hectares) during the same period.

Table.1 Area under Cotton in Difference Taluks of Dharmapuri District (in ha)

Taluk	2001-2002
Dharmapuri	1368
Palacode	1271
Penagaram	252
Harur	2920
Pappiredipatti	807
Uthangarai	5665
Krishnagiri	960
Poachampalli	725
Hosur	0
Denkonikottai	0
Total	**13970**

(iii) Sampling design

Multistage random sampling technique was used to select taluks, villages and sample respondents. Four taluks were selected at random. List of villages growing cotton in each taluk was obtained from the office of the Assistant Director of Agriculture. Five villages were selected at random in each taluk. For each village ten cotton farmers were selected at random. Thus a multistage simple random sampling procedure was followed and the ultimate sample size of 200 cotton farmers at the rate of 50 per taluks were selected. The selected villages and the number of farmers selected in each village are given in Table. 2

Dealers formed another group of respondents for the present study. Names and addresses of all the seed dealers were collected from the respective offices of Assistant Director of Agriculture and 40 dealers were selected at random.

Table 2. Selection of Respondents

S. No	Taluk	Villages	Number of Respondents
1.	Uthangarai	Karapattu	10
		Karavanur	10
		Kalavi	10
		Nochippatti	10
		Thathipalayam	10
2.	Harur	Theerthamalai	10
		Vedakattamaduvu	10
		Mondukulli	10
		Andiur	10
		Keel-Morapur	10
3.	Dharmapuri	Laligam	10
		Pulithikarai	10
		Narthampatti	10
		Venkatampatti	10
		Mathamangalan	10
4.	Palacode	Erulapatti	10
		Muthugoundankottai	10
		Pulikarai	10
		Kariamangalam	10
		Pogarahalli	10
Total Respondents			200
	Dealers		40
Total Sample size			240

(iv) Method of Data Collection

For collection of data two sets of questionnaires were prepared based on the objectives of the study, i.e., one for the sample farmers and another for seed dealers. The data required for the study were gathered by personal interview method, with the selected respondents.

The data collected from the sample cotton growers included the general particulars like age, education level, farming experience, awareness about different brands of hybrid cotton seeds, brand image, sources of information on hybrid cotton, factors influcencing brand preference of hybrid cotton seeds, reasons for cultivating long staple cotton, farmers' willingness towards cultivation of Bt cotton and problems faced in hybrid cotton cultivation etc.

Details on general particulars, product line dealt, details of sales, awareness about Bt cotton, promotion of hybrid cotton, suggestions to improve the sales of hybrid cotton seeds were collected from sample dealers.

As a prelude to the interview, the sample farmers and dealers were briefed about the scope and importance of this study, so as to get maximum possible realistic data.

The secondary data required for the study about cropping pattern, land use pattern, irrigation pattern, location of the study area, rainfall pattern and other related information were collected from District Statistical Office, Office of the Joint Director of Agriculture and District Collectorate.

Period of study

Field survey was conducted during the months of July-August, 2002. The data and information collected were related to the agricultural year 2001-2002.

Tools of Analysis

1. Conventional analysis

The percentage analysis was used to study the general characteristics like age, education, experience, size of holding, market share of different seed companies, brand awareness etc.

2. Garett's Ranking Technique

This technique was used to rank the sources of information on hybrid seeds, and problems faced by the farmers in cotton cultivation.

In the Garett's scoring technique, the respondents were asked to rank the factors or problems and these ranks were converted into per cent position by using the formula.

$$\text{Per cent position} = \frac{100\,(R_{ij} - 0.5)}{N_j}$$

Where

R_{ij} = Rank given to the i^{th} attribute by the j^{th} individual

N_j = Number of attributes ranked by the j^{th} individual

By referring to the Garett's table, the percent position estimated were converted into scores. Thus for each factor, the scores of the various respondents were added and the mean score was estimated. The means thus obtained for each of the attributes were arranged in a descending order. The attributes with the highest mean score was considered as the most important one and the others followed in order.

Markov Analysis

The structural change in market share was examined by using the Markov-chain approach. Central to markov chain analysis is the estimation of the transitional probability matrix P. The element P_{ij} of this matrix indicates the probability that variety or hybrid will switch from variety or hybrid i to variety or hybrid j with the passage of time. The diagonal P_{ij} measures the probability that the market share of a variety will be retained. Hence, an examination of the diagonal element indicates the loyalty of a variety to a particular variety market shares.

In the context of the current application, there are 6 variety and 10 hybrids. The average market share to a particular variety or Hybrid was considered to be a random variable which depends only on its past market share to that variety or hybrid and which can be denoted algebraically as,

$$E_{ij} = \sum_{n=1}^{i} E_{it-1} P_{ij} + e_{jt} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,

E_{jt} = Market share from variety or hybrid to jth variety of hybrid during the year t

E_{it-1} = Market share to ith variety or hybrid during the year t-1

P_{ij} = The probability that market share will shift from i^{th} variety or hybrid to j^{th} variety or hybrid

e_{jt} = The error term which is statistically independent of $E_{it} - 1$, and

r = The number of varieties or hybrids

The transitional probabilities P_{ij}, which can be arranged in a (c x r) matrix, have the following properties

$$\mathbf{O \leq Pij \leq 1} \quad \ldots\ldots (2)$$

$$\Sigma P_{ij} = 1 \text{ for all I} \quad \ldots\ldots (3)$$

Thus, the expected market shares of each variety or hybrids during period t were obtained by multiplying the quantity of varieties or hybrid marketed in the previous period (t-1) with the transition probability matrix.

The transition probability matrix is estimated in the linear programming (LP) frame work by a method referred to as minimization of Mean Absolute Deviation (MAD), the LP formulation is stated as

$$\mathbf{Min\ O'P^* + Ie} \quad \ldots\ldots (4)$$

Subjected to,

$$\mathbf{XP^* + V = Y}$$

$$\mathbf{GP^* = 1}$$

$$\mathbf{P^* \geq \emptyset}$$

Where,

P^* is a vector of the probabilities P_{ij}

O is a vector of Zeros

I is an appropriately dimensional vector of areas

e is the vector of absolute errors ($|\ U\ |$)

Y is the vector of market share to each variety or hybrids

X is a block diagonal matrix of lagged values of Y and

V is the vector of errors

G is a grouping matrix to add the row elements of P arranged in P*, to unity.

Probit model

In the present analysis a discrete dependant variable model of type PROBIT was used to analyse the willingness of the selected farmers to cultivate Bt cotton. If a farmer willing to cultivate Bt cotton, is assigned with value of '1' or '0' otherwise.

The various factors like age, education, experience in cotton cultivation and size of land holding were hypothesized to influence the decision to cultivate Bt cotton.

The model equation is

$$Y = \beta X_i + e_i$$

Where Y = 1, if a farmer willing to cultivate Bt cotton

= 0, otherwise

The 'X' is the vector of explanatory variables, 'ß' is the vector of parameters and 'e_i' follows standard normal density function with zero mean and constant variance.

The goodness of fit of the model was tested using count R^2 and log-likelihood ratio test.

The log-likelihood ratio test is given as

LLR= -2 (log 1 – log M)

The above function was estimated using MLE method with the help of LIMDEP 7 package.

The estimated ß coefficients were converted into probabilities using the standard normal density function. The following partial derivative formula was used to estimate the probabilities.

If $Ti = F(Wi)$ and $Wi = \beta Xi$

$$\frac{\partial Ti}{\partial Xi} = \frac{\partial F}{\partial W} \cdot \frac{\partial W}{\partial Xi}$$

$$= f(Wi)\,\beta$$

Where f (Wi) is the standard normal density function

Partial Budgeting

To measure the economic aspects of using Hybrid and Bt cotton, a partial budgeting analysis was done. This was done to find out whether using Hybrid and Bt cotton is economically feasible to a farmer or otherwise. Partial budgeting analysis, a rough form of "Marginal analysis", looks at the changes that will occur in cost and receipts as a result of a (marginal) change in the particular new activities. Following the definition given by Hedges (1963), the partial budget analysis was done using a blank form of partial budget given Norton and Muller (1994). The net incremental benefit due to the usage of Hybrid and Bt cotton was calculated using the following method;

Proposed change

1. Change in Yield
2. Changes in Human labour according to proposed change in yield
3. Changes in pesticide use
4. No changes in crop acreage are expected.

Assumption 1. No changes in crop acreage are expected.

A	B
ITEMS THAT REDUCED NET INCOME	**ITEMS THAT ADDED NET INCOME**
Reduced returns _____ Rs. _____ _____ Rs. _____ Added costs _____ Rs. _____ _____ Rs. _____	Added returns _____ Rs. _____ _____ Rs. _____ Reduced cost _____ Rs. _____ _____ Rs. _____
TOTAL REDUCED RETURNS AND ADDED COSTS (A) Rs._____	TOTAL ADDED RETURNS AND REDUCED COSTS (B) Rs._____

B minus A equals change in farm income Rs_____

DESCRIPTION OF THE STUDY AREA

CHAPTER IV

DESCRIPTION OF STUDY AREA

A basic understanding of the agro-climatic conditions of the study area relating to topography, soil type, climate, rainfall distribution, land utilization pattern, cropping pattern and season are essential for any study since it provides the background for analysis, interpretation and discussion of results and helps in drawing meaningful inferences based on the results of the study.

Location

The Dharmapuri District was bifurcated from the composite Salem District on 2nd October, 1965. Dharmapuri district is located between 11^0 46'13" to $12^0$53'23" of North latitude and $77^0$28'34" to 78^0 44'13". East longitude and above the mean sea level of 731 – 914 meters. The district with an area of 9,622 sq.km is bounded in North by Chittoor district of Andhra Pradesh and Kolar district of Karnataka state, in the south by Salem district, in East by North Arcot and South Arcot districts and in the West by Karnataka state. The district consists of ten taluks. The district map indicating the study area is depicted in Fig.1.

Dharmapuri district has extensive hill and rocky areas with undulating plains. It is one of districts having the more forest area in Tamil Nadu. The western side of the district is fully covered with hilly as well as forest area and the land is highly undulated. In the north eastern side of the district, Elagiri hill is located. It has an altitude of 600-1000 metres above MSL and it is in Bargur block. Hoeganakkal waterfall is located in the southern part of the district, in Pennagaram block.

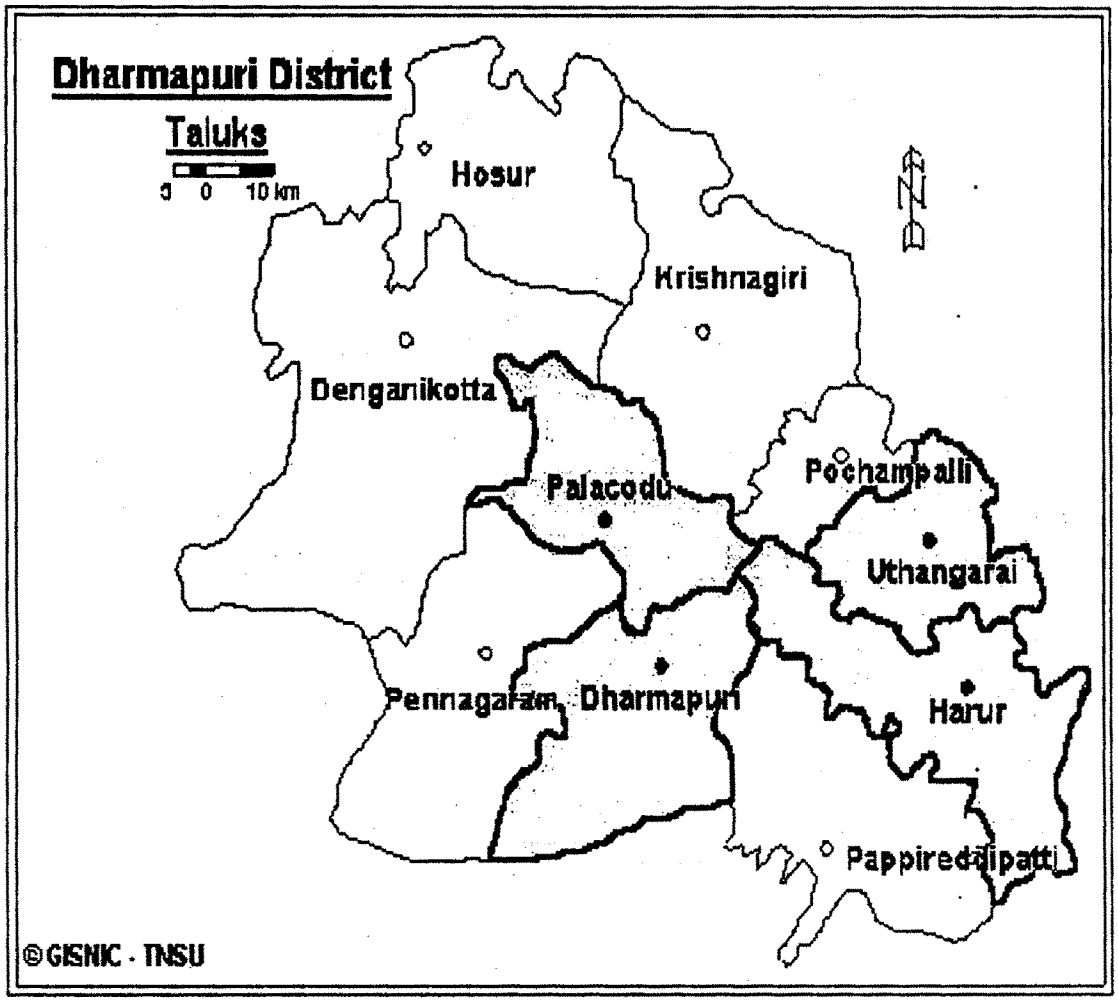

Figure.1

Maps Depicting the Selected Taluks of Dharmapuri district

The plains of the Dharmapuri district have been divided into three elevating stages. The lower elevation, below 150 m is seen in the southern part of district (Thoppur and Nallampalli areas). The mid elevation of 150m to 300m occupies the major area of the district. It covers Harur, Morappur, Pappireddipatti and Mathur blocks. The highly elevated plain in the district lying between 300 to 600 metres above MSL covers Pennagaram, Palacode and Hosur blocks. The district is mainly an undulating terrain in the middle, surrounded by hill ranges on the northern and north western sides by the Mysore plateau, on the east by Javvadi hill range and on the south by Chitteri and Shevaroy hill ranges. The district is cut by a net work of streams mainly flowing towards south east, mostly controlled by prominent shear zones.

The main rivers of Dharmapuri district are Pambar, Ponniyar and Chinnar rivers. The Cauvery flows along the south western boundary of the district. The altitude ranges from 380 to 1,396 metres above the MSL.

Demography

The populations of the district (2001 census), density of population/km^2, sex ratio, literate population, work participation rate are given in Table 3.

Table 3. Demographic details of Dharmapuri District

S. No	Particulars	Dharmapuri		
		Male	Female	Total
1	Total population	1,462,136 (51.60)	1,371,116 (48.40)	2,833,252 (100.0)
2	Density of Population (No. of persons per square km)	-	-	294
3	Sex ratio (No. of Females per 1000 males)	-	-	938

(Figures in parenthesis indicate percentage to the total population)

Source: Office of the Assistant Director of Statistics, Dharmapuri District.

The population of Dharmapuri district is 24.28 lakh with 51.5 per cent of males and 48.4 per cent of females. The sex ratio is 942 females per 1000 males which is less than the state average of 986. The density of population per square kilometer is 252. The rural population is 21,97,921 which constitutes 90.5 per cent of the total population. Literate population of the district is only 39.76 percent of which 48.02 per cent males are literates.

Administrative Set Up

The details of administrative taluks and blocks in Dharmapuri districts are given in Table 4. For administrative purpose, Dharmapuri district has been divided into ten taluks and eighteen blocks. There are 1,514 villages spread over these blocks.

Table 4. Administrative Taluks and Blocks in Dharmapuri Districts (2000-2001)

S. No	Dharmapuri	
	Taluks	Blocks
1.	Dharmapuri	Dharmapuri and Nallampalli
2.	Pennagaram	Pennagaram
3.	Uthangarai	Mathur and Uthangarai
4.	Harur	Harur
5.	Hosur	Hosur and Shoolagiri
6.	Palacode	Karimangalam and Palacode
7.	Denkanikottai	Keelamangalam and Thally
8.	Krishnagiri	Krishnagiri and Veppanapalli
9.	Pappireddipatti	Pappireddipatti and Morappur
10.	Pochampalli	Kaveripattinam and Bargur

Source: Office of the Assistant Director of Statistics, Dharmapuri

Soil Types

Different types of soils such as black or mixed loams, red ferrugious and gravel are found in the district. The black or red loam is very fertile due to its moisture absorbing character. Red and Sandy soil are seen in Hosur and Harur taluks. Considerable stretches of good loam and black soil are found in Dharmapuri and Krishnagiri taluks which are highly suited for raising cotton crop. In general the soil in the District is quite loose and fresh with its colour varying from red to dark brown. The soil has low nitrogen and phosphate content with marked variations between different taluks. The details of different types of soils are furnished in Table.5

Table 5. Soil Types in Dharmapuri District

S.No	Type of soil	Places in district
1.	Red loam	Hosur,Shoolagiri,Thally and Kelamangalam
2.	Lateritic soil	Almost in all Blocks
3.	Black soil	Dharmapuri and Krishnagiri Taluks
4.	Sandy coastal alluviam	Almost in all Blocks
5.	Red sandy soil	Hosur and Harur Taluks

Source: Asst. Director of Statistics, Dharmapuri.

Land Use Pattern

The total geographical area of Dharmapuri district was 9.64 lakh ha of which net sown area accounted for 41.48 per cent of the total geographical area. The area under forest accounted for 38.00 per cent which was above the area required under natural forest policy for environmental regulation. The area under current fallow and land put into non-agrl uses were less than six per cent of the total geographical area. Cropping intensity was found to be 121.46 per cent.

Table 6. Land Utilisation Pattern in Dharmapuri District (2000-2001) ('000 ha)

S. No	Particulars	Area	%
I	Total geographical area (TGA)	964.10	100.00
1.	Forest area	366.22	37.98
2.	Un cultivable Barren lands	43.85	4.54
3.	Land put into non-agricultural uses	51.04	5.29
4.	Cultivable fallow land	13.65	1.41
5.	Permanent pastures	13.62	1.41
6.	Miscellaneous trees not included in net sown area	7.76	0.80
7.	Current fallows	57.19	5.93
8.	Other fallows	10.57	1.09
9.	Net area sown	400.00	41.48
II	Area sown more than once	85.84	
III	Gross cropped area	485.84	
IV	Area Irrigated more than once	29.79	
V	Cropping Intensity	121.46	

(Figures in the parenthesis indicate percentage to total geographical area)
Source: Office of Joint Director of Agriculture, Dharmapuri.

Climate and Rainfall Distribution

The climate of the study area is moderate throughout the year. The temperature is maximum in the month of May (38.2^0C) and the mean temperature is minimum in the month of February (24^0 C). The details of seasonwise distribution of rainfall in the district is furnished in Table 7. The normal rainfall of Dharmapuri district is 1011.9 mm. The major portion of rainfall is received in the months of July, August, September and October. The rainfall is minimum in the months of January, February, March and April. The major portion of rainfall (49.9 percent) is received during South West monsoon period followed by North East monsoon (31.2 per cent). The actual rainfall in the district during 2000-01 was lower than the normal rainfall.

Table 7. Distribution of Rainfall in Dharmapuri District

Period	Average Rainfall (1991-2000) in mm	Rainfall - (2000-2001) in mm
1.South West Monsoon Period		
Total	466.0	456.8
		(50.0)
June 2000	64.9	10.6
July 2000	63.7	83.4
August 2000	131.7	55.4
September 2000	205.7	307.4
2. North East Monsoon		
Total	398.2	286.3
		(31.3)
October 2000	240.9	222.2
November 2000	112.8	43.2
December 2000	44.5	20.9
3. Winter-Period		
Total	6.5	0.0
		(0.0)
January 2001	1.8	0.0
February 2001	4.7	0.0
4. Hot Weather period		
Total	141.2	172.2
		(18.8)
March 2001	3.8	1.3
April 2001	55.8	133.5
May 2001	81.6	37.4
Grand Total	1011.9	915
		(100.0)

(Figures in the parentheses indicate percentage to the total)
Source: Office of Joint Director of Agriculture, Dharmapuri.

Irrigation Pattern

Cauvery and Southpennar are the two major rivers flowing through Dharmapuri district. Another source of irrigation is Southpennar starting from Chennakeshava hills. It is the major irrigation source for Dharmapuri district. There are about 10 dams in Dharmapuri district, which covers an area of about 17,837 hac. The data on source of irrigation in Dharmapuri district is presented in Table 8. The Mathur dam was

constructed across Southpennar for canal irrigation and it covers Southern parts of Krishnagiri, Kaveripattinam and Eachampadi taluks. In other parts of Dharmapuri district wells and tanks are the major source of irrigation contributing about 82 and 13 per cent of the total area irrigated in the district. Canals accounted for less than five percent. The availability of water in the wells is dependent on the rainfall since 82 per cent of the area is covered by wells.

Table 8. Sources of Irrigation in the Study Area

Source	Area Irrigated (Ha)	Percentage
Canals	7,354	4.68
Tanks	19,779	12.60
Wells	1,28,054	81.58
Other sources	1,773	1.12
Total	1,56,960	100.00

Source: Offices of Joint Director of Agriculture, Dharmapuri.

Cropping Pattern

The major crops grown in this district are pulses, ragi, paddy, cholam, fruits, vegetables, sugarcane and cotton. The details are presented in Table 9.

In Dharmapuri district, millets and other cereals were cultivated predominantly in an area of about 1.22 lakh hectare (32.7 per cent) followed by pulses with 0.98 lakh hectares (26.5 per cent). Area under paddy and groundnut each occupied 15 per cent of total cultivated area. Cash crops like sugarcane and cotton were raised in an area of 23,992 hectares (6.4 per cent) and 11,806 (3.2 percent) respectively. Thus millets and cereals, pulses, groundnut and paddy are the major crops grown in the district.

Table 9. Area and Production of Principal crops (2000-01)

Principal crops	Area in ('000 Ha)	Percentage	Production '000' (Tonnes)
Paddy	55912	15.0	227438
Millets and Other Cereals	122098	32.7	256269
Pulses	98932	26.5	71543
Sugarcane (Gur)	23992	6.4	220720
Groundnut	58347	15.6	94996
Gingelly	2625	0.7	3416
Cottton (BL)	11806	3.2	24358
Total	373712	100.0	

Source: Office of the Joint Director of Agriculture, Dharmapuri

Seasons

There are three distinct agricultural seasons in Dharmapuri district.

1. Samba – May, June to September, October
2. Navarai – November, December to March, April
3. Summer – March, April to June

It is also conventional to mention samba season as Kalavathi, which is the first season, Navarai season as Kodai which is the second season.

INFRASTRUCTURAL FACILITIES

1. Credit Institutions

a. Dharmapuri District Central Co-Operative Bank Ltd.,

The Dharmapuri District Central Co-operataive Bank is functioning in this District for the past 34 years from 14-4-1967. The D.D.C.C.B was registered on 31-10-1966 and started functioning on 17-11-1966. This bank was brought under the control of Reserve Bank of India on 14-12-1966.

b. Crop loan scheme

This bank is providing crop loans to Primary Agricultural Credit Banks. Short-term credit is given upto 12 months for financing seasonal operations. While medium term loans are given for a period ranging from 1 to 3 years for purchase of bullocks, animals, pumpsets and repairing of wells. The details of crop loan provided to cotton for the past three years are presented in Table 10. Crop loan scheme for cotton is provided through this bank. During 2000-2001, a total amount of Rs. 6,320 was given as crop loan for cotton hybrids of which Rs. 3,500 was given as cash and Rs. 2820 as kind. Crop loan are being given for cotton crop by the cooperative bank. Total amount of loan/unit area is increased by taking into account the escalation in cost of various inputs.

Table10. Crop Loan Scheme for Cotton

Year	Crop	Cash	Inputs (Kind)			Total amount
			Fertilizer	Pesticides	Seed	
2000-2001	**Cotton(Hybrid)**	**3500**	**1300**	**1200**	**320**	**6320**
	Cotton (Winter)	2325	950	500	225	4000
	Cotton (Summer)	1850	625	350	175	3000
2001-2002	**Cotton(Hybrid)**	**3850**	**1430**	**1320**	**350**	**6950**
	Cotton (Winter)	2560	1045	550	250	4405
	Cotton (Summer)	2035	690	385	195	3305
2002-2003	**Cotton(Hybrid)**	**4235**	**1570**	**1450**	**380**	**7635**
	Cotton (Winter)	2790	1140	600	270	4800
	Cotton(Summer)	2215	750	420	215	3600

Source: Dharmapuri district central co-operative bank ltd.

2. Marketing Institution

The facilities for disposal of farm products are sufficient enough and the farmers usually do not find any difficulty in disposal of their produce. Weekly shandies are conducted in Kaveripattinam, Krishnagiri, Dharmapuri, Vellichandai, Palacode, Morandhalli and Karimangalam areas. Vegetables are mostly sent to Bangalore, Salem and Madras markets. The storage capacity of state warehouse (as on 1.4.1996) is 9700 tonnes & private warehouses are 300 tonnes. Two types of marketing institution available are regulated markets and farmers' markets. There are about 15 regulated markets and 3 farmers' market in the district. Regulated markets and co-operative marketing societies formed major marketing avenue for cotton. Some times farmers sell cotton directly to the spinning mills. There are about 17 spinning mills in the district registered under District Industry Centre.

3. Roads

This district is well connected with other districts and States by both rails and roads. The Salem and Bangalore broadgauge line and Chennai – Coimbatore broadgauge lines are passing through the District for about 192.4 km. National high ways connecting the Karnataka also passing through the district.

The district is having a total network about 5,748 kms. Surfaced made and unsurfaced. About 1,098 villages are connected by all weather roads throughout the District. National Highways (NH-7) connecting Kanniyakumari and Kashmir (NH-46) Chennai Bangalore, and (NH-66) Pondichery-Bangalore passes through the District.

4. Communication

The District has a well developed network of Postal and Telegraph Offices numbering about 562 and 79 telephone exchanges.

5. Power

The Electricity Board has provided energy to install 80,838 electric pumpsets in all the 18 blocks of the District as on 31-3-1999.

6. Tourist Places

Hoegenakkal and Theerthamalai are two important tourist places of Dharmapuri district.

Agricultural Research Station

The Regional Research Station, Paiyur was established by Tamil Nadu Agricultural University in the year 1973 with the main mandate of developing scientific innovations for increasing agricultural production in red soil rainfed areas of Dharmapuri – Salem region, the north western district of Tamil Nadu. The station is located on Bangalore – Salem road, 108 km from Bangalore and has an area of 18.5 ha in extent. An additional area of 20 ha is being acquired for strengthening the research activities of the station. The research station will undertake the research pertaining to the crop being cultivated in the district.

DESCRIPTION OF CASE FIRM

Maharashtra Hybrid Seeds Company Limited., popularly known in India and overseas by its acronym, "MAHYCO", was one of the few organisations that ushered the "Green Revolution" in India, 30 years ago.

Established in 1964 as a seed-producing company, MAHYO has been actively engaged in research since 1966. It produce seed through its won endeavours and that of it associates, spread across most parts of India Marketing is done through a wide network of offices and over 2000 distributors and dealer who reach the farmer in the remotest corner of the country.

Mahyco is a pioneer and leader in the Indian Seed Industry and is India's largest private sector seed company. Since its inception it has been engaged in plant genetic research and production of quality hybrid seed for the farming community of India.

Currently, engaged in the research, production, processing and marketing of approximately 200 hybrids in 30 crop species including cereals, oilseeds, fibre and vegetables. Mahyco is now all set to launch products developed through the process of biotechnology. It has made a break through in the development of hybrids in rice and wheat. This will go a long way in addressing the need of feeding the growing world population.

INFRASTRUCTURE

More than 10,00,000 grower farmers, 29 production centre, a million quintals of seed processing capacity at 14 processing plants and more than 25000 quintals of

dehumidified storage for sensitive seed material are highlights of Mahyco's truly huge infrastructure. The production and the processing network is supported by a well developed all India marketing network consisting of more than 5000 sales outlets.

MAHYCO'S TECHNOLOGICAL BREAK THROUGH IN COTTON

Cytoplasmic and genetic male sterility in both, the American and Desi varieties, have been used by MAHYCO on a commercial scale. Genetic purity has increased from 90 per cent to 98 per cent. Thus, in the process, seed production was made easier. On the other hand, greater crop uniformity was achieved and the yield-level elevated. Fibre-quality also improved in terms of staple length, strength and fineness.

"QUALITY ASSURANCE" IS OUR MOTTO

To ensure that quality is assured at every stage, we subject each seed-lot to several tests, such as physical, physiological, genetic, seed-health, etc., apart from stringent field-inspections.

RESULTS AND DISCUSSION

CHAPTER V

RESULTS AND DISCUSSIONS

The data collected from the sample respondents were subjected to statistical analysis and the results are presented and discussed in this chapter in the light of the objectives set fourth. The results are discussed under the following heads:

1. General Characteristics of Farmers
2. Cotton Area
3. Awareness and Preference of Cotton variety and Hybrid
4. Plant Protection
5. Product features
6. Constraints in Cultivation of Cotton
7. Bt cotton
8. Study on Dealers
9. Partial Budgeting
10. Markov Analysis
11. Probit Model

1. GENERAL CHARACTERISTICS OF THE SAMPLE FARMERS

The general characteristics of the sample farmers such as age, education and farming experience have a significant bearing on the preference and use of seeds. Therefore, the details of the same were analysed and the results are presented in Tables 11 to 16.

1.1 Age

The selected farmers were classified into three groups as young (less than 35 years), middle (35-45 years) and old (more than 45 years) and the details are presented in Table 1. It could be observed from Table 1 that 42 per cent of the sample farmers in the district were in middle age group, followed by young and old age groups which accounted for 33 and 25 per cent respectively.

Among taluk wise it could be observed that Dharmapuri (50 per cent) and Palacode (42.0 per cent) taluks were dominated by middle age group but Harur (36.0 per cent) and Uthangarai (42.0 per cent) were dominated by young and old age groups respectively.

Table.11 Age of Farmers **(n=200)**

S. No	Age (Years)	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1.	Less than 35	18 (36.0)	14 (28.0)	19 (38.0)	15 (30.0)	66 (33.0)
2.	35-45	17 (34.0)	21 (42.0)	25 (50.0)	21 (42.0)	84 (42.0)
3.	Above 45	15 (30.0)	15 (30.0)	6 (12.0)	14 (28.0)	50 (25.0)
	Total	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in parenthesis indicate percentage to total)

1.2 Educational status

It could be seen from Table 12 that, 41.5 per cent of the sample farmers in the district had education upto elementary level followed by farmers with high school (19.0 per cent) and higher secondary education (18.5 per cent). However, about 16 per cent of farmers were found to be illiterates.

Table 12. Educational status of the sample farmers (n=200)

S. No	Educational status	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1.	Illiterate	12	2	3	14	31
		(24.0)	(4.0)	(6.0)	(28.0)	(15.5)
2.	Elementary level	17	25	22	19	83
		(34.0)	(50.0)	(44.0)	(38.0)	(41.5)
3.	High School	6	13	13	6	38
		(12.0)	(26.0)	(26.0)	(12.0)	(19.0)
4.	Higher Secondary	12	8	9	8	37
		(24.0)	(16.0)	(18.0)	(16.0)	(18.5)
5.	Collegiate	3	2	3	3	11
		(6.0)	(4.0)	(6.0)	(6.0)	(5.5)
	Total	**50**	**50**	**50**	**50**	**200**
		(100.0)	**(100.0)**	**(100.0)**	**(100.0)**	**(100.0)**

(Figures in parenthesis indicate percentage to total)

In all the taluks majority of the sample farmers had undergone elementary level education. Thus literacy level may not be a major constraint for understanding and adoption of new technologies.

1.3 Farming Experience

The number of years of experience in cotton cultivation may have an important bearing on the preference of a particular brand. Therefore, number of years of experience of sample farmers in cotton cultivation was examined and the results are presented in Table 13.

Table13. Experience in Cotton Cultivation among Sample Farmers (n=200)

S. No	Experience (years)	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1	Less than 10 years	32 (64.0)	28 (56.0)	36 (72.0)	30 (60.0)	126 (63.0)
2	11-20 years	13 (26.0)	14 (28.0)	9 (18.0)	7 (14.0)	43 (21.5)
3	21-30 years	5 (10.0)	6 (12.0)	4 (8.0)	10 (20.0)	25 (12.5)
4	More than 30 years	0 (0.0)	2 (4.0)	1 (2.0)	3 (6.0)	6 (3.0)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in parenthesis indicate percentage to total)

It could be seen from Table.13 that nearly 63.0 per cent of the sample farmers had experience of less than 10 years followed by farmers with 11-20 years (21.5 per cent) and 21-30 years (12.5 per cent). Only 3.0 per cent of sample farmers had an experience of more than 30 years. Experience of farmers in farming would have significant bearing in identification of pests and diseases and use of pesticides. If experience could help them to understand the benefits of modern technology, then that would contribute to a progressive farming and use of more hybrids.

1.4 Occupational Status

The occupational status of the farmers influences the family income, cultivation of crops etc., hence the details on the same for the sample are furnished in Table 14.

Table 14. Occupational Status of the Sample Farmers **(n=200)**

S. No	Occupational status	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1.	Labours	8	10	12	5	35
		(16.0)	(20.0)	(24.0)	(10.0)	(17.5)
2.	Farmers	31	24	28	35	118
		(62.0)	(48.0)	(56.0)	(70.0)	(59.0)
3.	Private Jobs	6	5	1	2	14
		(12.0)	(10.0)	(2.0)	(4.0)	(7.0)
4.	Government Jobs	3	2	2	3	10
		(6.0)	(4.0)	(4.0)	(6.0)	(5.0)
5.	Business	2	9	7	5	23
		(4.0)	(18.0)	(14.0)	(10.0)	(11.5)
	Total	**50**	**50**	**50**	**50**	**200**
		(100.0)	**(100.0)**	**(100.0)**	**(100.0)**	**(100.0)**

(Figures in parenthesis indicate percentage to total)

The results revealed that 59 per cent of the farmers were doing agriculture alone followed by labours (17.5 per cent) and business (11.5 per cent). Similar trend could be observed in taluks where majority of sample farmers had agriculture as their main occupation. Since agriculture was the major occupation for majority of farmers they would show keen interest in generating income out of it.

1.5 Contact with mass media by sample farmers

Mass media plays an important role in disseminating information to various horizons. It will be helpful for the firm if they know about farmers' preferred media, so that they can formulate strategies for advertising their products effectively. Farmers contact with various mass media was analysed and the results are presented in Table.15

Table15. Contact with Mass Media by Sample Farmers (n=200)

S. No	Mass Media	Daily	Frequently	Occasionally	No	Overall
1	Radio	60	44	34	62	**200**
		(30.0)	(22.0)	(17.0)	(31.0)	**(100.0)**
2	Television	80	68	30	22	**200**
		(40.0)	(34.0)	(15.0)	(11.0)	**(100.0)**
3	Newspapers	70	44	29	57	**200**
		(35.0)	(22.0)	(14.5)	(28.5)	**(100.0)**
4	Magazines	1	27	51	121	**200**
		(0.5)	(13.5)	(25.5)	(60.5)	**(100.0)**

(Figures in parenthesis indicate percentage to total)

It is evident from Table 15 that 40 per cent of farmers watched television daily while 35 per cent of farmers read newspapers daily and 30 per cent listened to radio everyday. About 31 per cent of farmers had no contact with radio, but majority of farmers (60 per cent) had no contact with magazines. So the choice of mass media must be in the following order; television, newspaper and media considering the cost of advertisement in these mass media.

1.6 Cropping pattern of sample farmers

Knowledge on the cropping pattern of the sample farms would be of great help in analyzing and understanding the potential demand for hybrid seeds and the details on the same is furnished in Table 16.

Table.16 Cropping Pattern of the Sample Farmers

S. No	Crop	Area (in acres)	Percentage
1.	Paddy	24.5	2.28
2.	Sorghum	35.0	3.26
3.	Ragi	12.0	1.11
4.	Cumbu	15.5	1.44
5.	Red gram	49.5	4.61
6.	Gingely	105.5	9.84
7.	Groundnut	42.5	3.96
8.	Tapioca	31.5	2.93
9.	Sugarcane	5.0	0.46
10.	Cotton	575.5	53.7
11.	Coconut	18.0	1.67
12.	Tomato	19.5	1.81
13.	Bhendi	11.5	1.07
14.	Beans	5.0	0.46
15.	Flowers	48.5	4.52
16.	Minor millets	72.5	6.76
Total		**1071.5**	**100.0**

It could be observed from Table 16 that cotton was the major crop which, accounted for 53.7 per cent of the total cropped area of the sample farmers. Gingelly, minor millets, red grams and flowers were the other crops that occupied 9.84, 6.76 and 4.57 per cent and 4.52 per cent of the total cropped area respectively.

2. Cotton Area

The area under cotton in sample farms and the reasons for increasing or decreasing in area under cotton are presented in this section.

2.1 Area under cotton in sample farmers

Allocation of area for cultivation of cotton by the sample farmers would help to understand the demand for cotton seeds in the study area, hence the same was analysed and presented in Table 17.

Table.17 Area under Cotton in sample farmers **(n=200)**

S. No	Area under cotton (in acre)	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1	< 3	28 (56.0)	21 (42.0)	31 (62.0)	25 (50.0)	105 (52.5)
2	3-6	15 (30.0)	24 (48.0)	17 (34.0)	20 (40.0)	76 (38.0)
3	7-10	3 (6.0)	3 (6.0)	2 (4.0)	4 (8.0)	12 (6.0)
4	>10	4 (8.0)	2 (4.0)	0 (0.0)	1 (2.0)	7 (3.5)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in parenthesis indicate percentage to total)

It could be observed from Table 17 that majority of the farmers (52.5 per cent) were cultivating cotton in less than three acres followed by 38 per cent of farmers allocating about 3.0 to 6.0 acres for cultivating cotton.

The trend in cultivation of cotton in taluks was almost found to be similar with majority of farmers cultivating cotton in less than three acres except in Uthangarai taluk where majority of farmers were cultivating cotton in 3.0 to 6.0 acres. Among the taluks, farmers cultivating cotton is more than 10 acres was found to be high in Harur taluk.

2.2 Reasons for increase and maintaining the same area

Over the years, farmers had either cultivated cotton in the same area or may increase the area. Farmers were asked about reasons for increase or maintaining the same area under cotton. The data was analysed using Garrett's ranking technique and the results are presented in Table 18.

Table 18. Reasons for Increase or Maintain Same Area under Cotton (n=62)

S. No	Reasons	Mean Score	Rank
1.	Suitable for cotton cultivation	62.5	I
2.	Average yield	53.2	II
3.	Average price	45.0	III
4.	Less water requirement	38.5	IV

It could be observed from Table 18 that suitability of land for cotton cultivation (mean score of 62.5) was ranked first by sample farmers followed by average yield (mean score of 53.2), average price (mean score of 45.0) and less water requirement (mean score of 38.5) as reasons for increasing or maintaining the same area under cotton. It indicates that farmers were satisfied with the yield of cotton and the price for the same.

2.3 Reasons for Decrease in Area under Cotton

Over the years, in 138 sample farmers the area under cotton had declined. Farmers were asked about reasons for decrease in the area under cotton and the same were analyzed. The results are presented in Table 19.

Table 19. Reasons for Decrease in Area under Cotton (n=138)

S. No	Reasons	Mean Score	Rank
1.	Low market price	61.2	I
2.	Failure of dominant varieties	58.3	II
3.	Drought condition	49.0	III
4.	More pest and disease attack	45.3	IV
5.	Less profit	36.2	V

Low market price was ranked as the most important reasons followed by failure of dominant varieties (mean score of 58.3). Due to less market price farmers shifted to minor millets etc and hence there was reduction in area. Drought condition (mean score of 49.0), more pests and disease attack (mean score of 45.3) and less profit (mean score of 36.2) ranked third, fourth and fifth respectively.

3.0 Awareness and Preference of Cotton Variety and Hybrid

This section deals with the farmers awareness and preference regarding different cotton varieties and hybrids, reasons for preferring a particular variety or hybrid, source of information and factors influencing the preference.

3.1 Brand awareness and preference of the sample farmers

The extent of awareness about the existence of different varieties and hybrids and those cultivated by the farmers were collected. The details are presented in Table 20.

Table 20. Cotton Varieties / Hybrids Known and Cultivated by Farmers

S. No	Variety/hybrid	Known by farmers		Cultivated by farmers	
		Numbers	Percentage	Numbers	Percentage
1.	MCU-5	**200**	**100.0**	**200**	**100.0**
2.	Varalaxmi	**200**	**100.0**	**200**	**100.0**
3.	DCH-32	**200**	**100.0**	**200**	**100.0**
4.	LRA 5166	185	92.5	160	80.0
5.	MCU-10	150	75.0	110	55.0
6.	RCH-2	145	72.5	104	52.0
7.	Suvin	125	62.5	45	22.5
8.	Banni	123	61.5	95	47.5
9.	Sanjeev	90	45.0	25	12.5
10.	Vijayalaxmi	83	41.5	52	26.0
11.	Savitha	50	25.0	25	12.5
12.	Bhrama	30	15.0	16	8.0
13.	RCH-20	25	12.5	10	5.0
14.	RCH-35	24	12.0	5	2.5
15.	Jaganath	15	7.5	3	1.5
16.	SPCH-1	13	6.5	3	1.5
17.	Kasinath	10	5.0	3	1.5

MCU-5, Varalaxmi and DCH-32 varieties were known and cultivated (during 2001-02 or in the past) by all sample farmers in the study area. The reasons for cultivating these varieties were, of high yield, good market price and their suitability to the study area. About 93 per cent of sample farmers were aware of LRA 5166 followed by 75 per cent of farmers aware of MCU-10 and 73 per cent of farmers aware of RCH-2. Among the varieties cultivated by sample farmers LRA 5166, MCU-10 and RCH-2 were cultivated by 80 per cent, 55 per cent and 52.5 per cent, respectively. Suvin was known to 62.5 per cent of sample farmers but only 12.5 per cent cultivated it due to low yield. Banni was also popular among 62 per cent of farmers and cultivated by 48 per cent of farmers.

3.2 Source of Information

Agricultural information reaches farmers through various sources such as mass media, State Agricultural Departments, peer groups and dealers etc. The data on source of information on cotton varieties and hybrids was analysed and the results are presented in Tables 21 and 22.

Table 21. Source of Information on Cotton Variety **(n=200)**

S. No	Source of Information	Mean Score	Rank
1.	Agricultural department	64.3	I
2.	Peer groups	59.5	II
3.	Dealers	51.4	III
4.	Mass Media	45.2	IV
5.	Company persons	29.4	V

Agricultural department was found to be the foremost source for the selection of varieties. It reflected the effective extension work undertaken by the department. Peer groups and dealers were ranked second and third as the source of information. The role of company staff was observed to be very less in disseminating agricultural information relevant for farmers.

Table 22. Source of Information on Cotton Hybrid **(n=200)**

S. No	Source of Information	Mean Score	Rank
1.	Dealers	70.2	I
2.	Company persons	63.4	II
3.	Peer groups	44.2	III
4.	Mass Media	40.6	IV
5.	Agricultural departments	31.5	V

Dealers were ranked as the primary source of information on cotton hybrids followed by company persons and peer groups. It could be inferred that dealers acted as major source of dissemination of the needed information regarding hybrid cotton cultivation. Most of the companies were promoting their hybrids by meeting the farmers individually, conducting demonstrations etc., hence farmers become aware about different hybrids.

3.3 Source of Purchase

The source of purchase of hybrid cotton by the sample farmers was analyzed and the results are presented in Table 23.

Table 23. Source of Purchase of Hybrid Cotton Seeds **(n=200)**

S. No	Source of purchase	Mean Score	Rank
1.	Dealers	67.0	I
2.	Private company	56.0	II
3.	Agricultural department	26.5	III

From Table 13 it could be noted that dealers were found to be the major source of purchase of hybrid cotton seeds by the sample farmers followed by private company (mean score of 56.0). This could be plausible since most of the seed firms were selling their seeds through dealers.

3.4 Problems in Purchasing Hybrids

Farmers were asked about problems faced in purchasing hybrid cotton seeds and the same were analyzed using Garrett' ranking technique. The results are presented in Table 24.

Table 24. Problem Faced by Farmers in Purchasing Hybrid (n=200)

S.No	Problems	Mean Score	Rank
1	High price	67.0	I
2	No credit sales	56.5	II
3	Shops situated in longer distance	44.0	III
4	Non-availability of preferred hybrids	32.5	IV

It could be observed from Table 24 that high price (mean score of 67.0) of the hybrid seeds was the major problem faced by the farmers. The costs of the varieties were less by 40-60 per cent when compared to the cost of hybrids. Absence of credit sales (mean score of 56.5) and shops situated in longer distance (mean score of 44.0) were ranked second and third problems, respectively. As most of the seed firms gave very less repayment period dealers were unwilling to provide credit.

3.5 Preference regarding Hybrid Cotton

A farmer's brand preference is mainly influenced by his perception, beliefs and attitudes. Therefore, the extent of brand preference by the sample farmers was analyzed and the results are presented in Table 25.

Table 25. Reasons for Preferring Hybrid Cotton **(n=200)**

S. No	Reasons	Mean Score	Rank
1.	High yield	65.2	I
2.	Dealers influence	63.4	II
3.	Sales persons influence	47.2	III
4.	As a new attempt	42.6	IV
5.	Credit availability	31.5	V

It could be inferred from Table 25, that overall, high yield (65.2 per cent) and dealers influence (mean score of 63.4) were ranked first and second reason for preferring hybrid cotton followed by sales persons influence (mean score of 47.2) and new attempt (mean score of 42.6). Thus high yield and dealers influence were found to be the influencing factors for preference of hybrid cotton.

3.6 Reasons for preferring Cotton Variety

Farmers were asked to rank the reasons for preferring a cotton variety and the same was analysed using Garett's ranking technique. The results are presented in Table 26.

It could be observed from Table 26 that, neighbours cultivating same variety (mean score of 76.03) was ranked as first reason for preference of a variety followed by easy availability (mean score of 61.73) and less number of spray (mean score of 53.40). Demonstration effect of their neighbours and also easy availability of seeds, determined the farmers preference of cotton variety.

Table 26. Reasons for Preferring Cotton Variety **(n=200)**

S. No	Reasons	Mean Score	Rank
1.	Neighbours cultivating same	76.03	I
2.	Easy availability	61.73	II
3.	Less number of spray	53.40	III
4.	Suitable to soil	45.98	IV
5.	Reasonable price of seed	39.30	V
6.	Failure of crop is less	23.46	VI

3.7 Reasons for cultivating long staple cotton

Reasons for cultivation of long staple cotton as reported by the farmers are presented in Table 27.

Table 27. Reasons for Cultivating Long Staple Cotton

S. No	Reasons	Harur		Uthangarai		Dharmapuri		Palacode		Overall	
		No	%	No	%	No	%	No	%	No	%
1.	Relatively good market price	35	70.0	38	76.0	29	58.0	32	64.0	134	67.0
2.	Average yield	25	50.0	31	62.0	41	82.0	21	42.0	118	59.0
3.	Quality of cotton	41	82.0	20	40.0	24	48.0	36	72.0	121	60.5
4.	Resistant to pest and disease	32	64.0	16	32.0	25	50.0	33	66.0	106	53.0
5.	Nighbours cultivating same	28	56.0	26	52.0	31	62.0	22	44.0	107	53.5
Total		50	100	50	100	50	100	50	100	200	100.

From Table 27, it could be observed that relatively good market price (67.0 per cent) was reported as the main reason for cultivating long staple cotton followed by quality of cotton (lint length, ginning percentage and colour of the cotton) and average yield were

reported as reasons for cultivating long staple cotton. Other reasons were resistance to pest and diseases and nieghbours cultivating same. Thus good market price, reasonably assured yield, quality and resistance to pests and diseases were the major reasons for raising long staple cotton.

3.8 Factors Influencing to Cultivate Long Staple Cotton

Many factors influenced the farmers to go for a new or improved technology or to purchase a particular product or brand. Given the background, the study aims at knowing and ranking the factors that influenced the farmers to cultivate long staple cotton and help in arriving meaningful conclusions.

Table 28. Factors influencing cultivation of long staple cotton

S. No	Reasons	Harur		Uthangarai		Dharmapuri		Palacode		Overall	
		No	%	No	%	No	%	No	%	No	%
1.	Dealers influence	34	68.0	34	68.0	33	66.0	32	64.0	133	**66.5**
2.	Seed availability	38	**76.0**	29	58.0	34	**68.0**	24	48.0	125	62.5
3.	Peer group	26	52.0	32	64.0	29	58.0	38	**76.0**	125	62.5
4.	Traditionally cultivation	31	62.0	36	**72.0**	27	54.0	24	48.0	118	59.0
5.	Suitable to soil	26	52.0	24	48.0	31	62.0	24	48.0	105	52.5
Total		**50**	**100**	**50**	**100**	**50**	**100**	**50**	**100**	**200**	**100**

The Table 28 shows that, dealers were the most influencing factor for the cultivation of long staple cotton (66.5 per cent), followed by peer groups and seed availability (62.5 per cent). Other factors were traditional cultivation of long staple cotton (59.0 per cent) and suitability to soil conditions (52.5 per cent).

The trend observed in different taluks varies from the general trend. It could be observed from the table that in Harur (76.0 per cent) and Dharmapuri (68.0 per cent) taluks seed availability was the major factor that influenced cultivation of long staple cotton. In Uthangarai and Palacode taluks the major factors that influenced cultivation of long staple cotton were traditional cultivation (72.0 per cent) and peer group (76.0 per cent).

4.0 Plant Protection

In this section major pest and disease in sample area, chemical control of pest and disease, number of spraying and cost of spraying were discussed under different headings and are presented below.

4.1 Major Pest Incidences in Sample Area

Various pests that attacked cotton crop of the sample farmers in the study area are presented in Table 29.

Table 29. Major Pests Incidence in Cotton **(n=200)**

S. No	Major pest	Number of farmers	Percentage
1.	American boll worm	189	94.5
2.	Pink boll worm	157	78.5
3.	Spotted boll worm	111	55.5
4.	Thrips	90	45.0
5.	White fly	91	45.5
6.	Leaf hopper	65	32.5
7.	Aphids	62	31.0
8.	Stem weevil	52	26.0

It is evident from Table 29, that incidence of American boll worm (94.5 per cent) followed by pink boll worm (78.5 per cent), spotted boll worm (55.5 per cent) were the major pests attacking cotton as reported by more than 50 per cent of sample farmers. Other pests affecting cotton crops were thrips, leaf hopper, aphids and stem weevil, whose incidence was found to be less compared to boll-worms.

4.2 Major Disease Incidence

Various disease incidence in cotton crop of the sample farmers in the study area were collected and presented in Table 30.

Table 30. Major Disease Incidence in Cotton **(n=200)**

S. No	Major Disease	Number of farmers	Percentage
1.	Leaf spot	165	82.5
2.	Root rot	152	76.0
3.	Boll rot	95	47.5
4.	Fusarium & Verticillium wilt	75	37.5

Leaf spot and root rot were the major diseases prevalent in cotton cultivation in the study area as reported by more than 75 per cent of farmers.

4.3 Major Micronutrient Deficiencies in Cotton

Major micronutrient deficiencies observed by sample farmers in the study area was obtained and they are presented in Table.31

Table 31. Major Micronutrient Deficiencies in Cotton **(n=200)**

S. No	Micronutrient	Number of farmers	Percentage
1.	Red leaf	162	81.0
2.	Boll shedding	107	53.5

It could be observed from Table 31, that 81.0 per cent of farmers reported red leaf as the major deficiency in cotton while 53.5 per cent of farmers reported boll shedding. Red leaf was caused due to magnesium deficiency, which lead to shedding of leaves and boll shedding was caused due to boron deficiency.

4.4 Chemical Control

Various chemicals used for controlling pest and diseases in cotton by the sample farmers were collected and presented in Table.32

Table 32. Chemicals Used for Cotton Pest and Disease by Sample Farmers (n=200)

S. No	Chemicals	Number of farmers	Percentage
1.	Rogar	200	100.0
2.	Endosulphon	200	100.0
3.	Monocrotophos	200	100.0
4.	Karate	125	62.5
5.	Cypermethrin	65	32.5
6.	Fenvalerate	50	25.0
7.	Prophonophos	35	17.5
8.	Fluvalinate	25	12.5
9.	Alphomethrine	20	10.0
10.	Polythrine	15	7.5

It could be observed from Table 32, that all the sample farmers (100 per cent) in the study area had used Rogar, Endosulphon and Monocrotophos while 62.5 per cent of farmers had used Karate for controlling sucking pests and Boll worm complex.

4.5 Average Number of Spraying

Farmers were asked about the number of sprayings normally followed by them for cotton crop and the details are presented in Table 33.

Table 33. Average Number of Sprayings done by Sample Farmers (n=200)

S. No	Average Number of Spray	Harur	Uthangarai	Dharmapuri	Palacode	Overall
Winter						
1	>8	**18 (36.0)**	15 (30.0)	**21 (42.0)**	**27 (54.0)**	81 (40.5)
2	8-10	11 (22.0)	**21 (42.0)**	18 (36.0)	11 (22.0)	61 (30.5)
3	11-13	15 (30.0)	10 (20.0)	6 (12.0)	9 (18.0)	40 (20.0)
4	>13	6 (12.0)	4 (8.0)	5 (10.0)	3. (6.0)	18 (9.0)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**
Summer						
1	>6	17 (34.0)	**28 (56.0)**	**32 (64.0)**	**29 (58.0)**	106 (53.0)
2	6-8	**25 (50.0)**	18 (36.0)	14 (28.0)	13 (26.0)	70 (35.0)
3	9-11	6 (12.0)	4 (8.0)	4 (8.0)	6 (12.0)	20 (10.0)
4	>11	2 (4.0)	0 (0.0)	0 (0.0)	2 (4.0)	4 (2.0)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in the parenthesis indicate percentage to the total)

It is evident from Table 33 that majority of the farmers go for upto eight rounds of spraying (40.5 per cent) and upto 10 rounds of spraying (30.5 per cent) in the winter season. Only very few farmers go for more than 10 rounds of spray. Similar trend was noticed in all the taluks. In summer, majority of the farmers applied less than six sprays followed by farmers applying 6-8 spray (35.0 per cent) and 9-11 sprays (10.0 per cent) for cotton. Only two per cent of the farmers sprayed more than 11 times. In Uthangarai taluk farmers sprayed around 6-8 rounds, whereas in other taluks less than six rounds of spraying was taken up by sample farmers. The wide variations in sprays during different seasons were attributed to the variation in intensity of pest and diseases between seasons.

4.6 Spraying Cost

Amount spent by the farmers for spraying various chemicals in the study area were obtained and analyzed. The results are presented in Table 34.

Table 34. Average Cost per Spray incurred by Farmers (n=200)

S. No	Average Cost Per Spray (Rs)	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1	>150	15 (30.0)	20 (40.0)	10 (20.0)	13 (26.0)	58 (29.0)
2	150-180	20 (40.0)	8 (16.0)	15 (30.0)	17 (34.0)	60 (30.0)
3	181-200	10 (20.0)	14 (28.0)	18 (36.0)	12 (24.0)	54 (27.0)
4	>200	5 (10.0)	8 (16.0)	7 (14.0)	8 (16.0)	28 (14.0)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in the parenthesis indicate percentage to the total)

About 60 per cent of farmers spent less than Rs. 180 per spray followed by 27 per cent of farmers spending about Rs.181-200 per spray. Only 14 per cent of the farmers were spending more than Rs. 200 per spray. This might be due to heavy incidence of pest and diseases.

5.0 Product Features

In this section the product features, product preference and other attributes related to the products are dealt under different headings and are presented below.

5.1 Product Feature Preferred by Farmers

A study on product features preferred would help to design products and highlight their special feature of products.

In this study, several product features were listed and the respondents were asked to give their order of preference for different features that influenced them to prefer particular brand for purchase. By using Garett's Ranking technique, the mean scores were arrived for each factor and their order of influence was found out. The results are presented in Table 35.

Table 35. Product Features Preferred by Farmers Regarding Hybrid Cotton

S. No	Product feature	Mean Score	Rank
1.	Resistant to pest and disease	72.5	I
2.	Yield of the crop	66.5	II
3.	Duration of the hybrid	58.4	III
4.	Boll size	51.2	IV
5.	Sowing seasons	42.8	V
6.	Type of irrigation	32.4	VI
7.	Plant Height	25.9	VII

It could be observed from Table 35, that resistance to pest and disease was ranked first (mean score of 72.5) followed by yield of the crop (mean score of 66.5) and duration of the hybrid. It is obvious that preference was towards reduction of cost of pesticides which formed the major cost component.

5.2 Farmers' expectation regarding yield

Farmers prefer a particular hybrid after assessing their yield performance. The farmers' expectations about the yield of hybrid cotton was analysed and the results are presented in Table.36

Table 36. Farmers' Preference Regarding Yield of Hybrid Cotton (n=200)

S. No	Yield of cotton (quintals per acre)	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1.	4-5	24 (48.0)	22 (44.0)	31 **(62.0)**	13 (26.0)	90 (45.0)
2.	6-7	18 (36.0)	23 (46.0)	15 (30.0)	31 **(62.0)**	87 (43.5)
3.	>7	8 **(16.0)**	5 (10.0)	4 (8.0)	6 (12.0)	23 (11.5)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in parenthesis indicate percentage to total)

It could be observed from Table.36 that majority of farmers (89 per cent) expected 4-7 quintals of cotton / acre. Majority of the farmers in Dharmapuri taluk preferred hybrids with a yield of about 4-5 quintals while farmers in Palacode taluk preferred a yield of 6-7 quintals / acre. Majority of farmers were getting low yield, so they felt that it would be sufficient if they got an yield of 4-7 quintals / acre.

5.3 Farmers' preference regarding season of the hybrid cotton

Some farmers preferred to cultivate hybrids during particular season only, hence their preference was observed and the same is presented in Table.37

Table 37. Farmers' Preference regarding Season of the Hybrid Cotton (n=200)

S. No	Season	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1.	Summer	19 (38.0)	15 (30.0)	18 (36.0)	22 (44.0)	74 (37.0)
2.	Winter	31 (62.0)	35 (70.0)	32 (64.0)	28 (56.0)	126 (63.0)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in parenthesis indicate percentage to total)

It is evident from Table 37 that majority of the farmers preferred to cultivate hybrids during winter. Farmers preferred hybrids suitable to winter season mainly due to the fact that pest and disease incidence was less during summer.

5.4 Farmers' preference regarding duration of the crop

Farmers' preference regarding duration of the crop was analysed and presented in Table.38

Table 38. Farmers' Preference Regarding Duration of the Crop (n=200)

S. No	Duration	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1.	Medium	42 (84.0)	39 (78.0)	29 (58.0)	41 (82.0)	151 (75.5)
2.	Long	8 (16.0)	11 (22.0)	21 (42.0)	9 (18.0)	49 (24.5)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in parenthesis indicate percentage to total)

It could be observed from Table 38 that the medium duration hybrids was highly preferred by sample farmers in study area followed by long duration varieties.

5.5 Farmers' preference of Hybrids for Irrigation / Rainfed Condition

Farmers were asked about the preference of hybrids for irrigated / rainfed condition. The data was analyzed and the results are presented in Table 39.

Table 39. Farmers' Preference of Hybrids for Irrigation / Rainfed Condition

S. No	Particulars	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1.	Irrigated	42 (84.0)	33 (66.0)	32 (64.0)	38 (76.0)	145 (72.5)
2.	Rainfed	8 (16.0)	17 (34.0)	18 (36.0)	12 (24.0)	55 (27.5)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in parenthesis indicate percentage to total)

It is evident from Table 39 that majority of farmers (72.5 per cent) preferred hybrids that were suitable for irrigated conditions. It was due to available irrigation potential and higher yield.

5.6 Preference regarding quality of the product

Farmers' preference regarding the various quality related features of the product , was ranked and the results are presented in Table 40.

Table 40. Preference regarding Quality Features **(n=200)**

S. No	Preference	Mean Score	Rank
1.	Colour	69.5	I
2.	Lint length	42.8	II
3.	Dryness of cotton	37.6	III

It could be observed from Table 40 that colour was given prime importance followed by lint length and dryness of cotton as this preference reflects the products in the market

6.0 Constraints Experience by Cotton Farmers

In this section constraints faced by farmers during cultivation of Hybrid cotton and variety were discussed under different headings and presented below.

6.1 Problems Faced by Farmers

The constraints experienced by sample farmers during hybrid and variety cotton cultivation were studied and the details are presented in Tables 41 and 42.

Table 41. Constraints Experienced in Cultivation of Hybrid Cotton

S. No	Constraints	Mean Score	Rank
1.	High seed cost	72.3	I
2.	More water requirement	65.5	II
3.	High cost of cultivation	54.2	III
4.	More number of spray	50.3	IV
5.	Susceptible to pest and disease	48.9	V
6.	Poor quality of pesticides	42.4	VI
7.	Inferior quality seeds	36.8	VII
8.	Uncertainty in yield	27.6	VIII

It could be observed from Table 41 that high seed cost (mean score 72.3) was the major constraint faced by sample farmers during cultivation of hybrid cotton and was ranked first. More water requirement and high cost of cultivation were the other constraints and were ranked second and third, respectively. Other problems were requirement of more number of sprays, susceptibility to pest and diseases and poor quality of pesticides. This was mainly due to the fact that hybrids were mostly grown in winter season which resulted in heavy pest incidence and increase in application of chemicals leading to high cost of cultivation.

Table 42. Constraints Experienced during Cultivation of Variety Cotton.

S. No	Constraints	Mean Score	Rank
1.	Low yield	68.5	I
2.	Less market price	65.4	II
3.	Failure of crop	51.2	III
4.	Drought condition	41.0	IV
5.	Inferior quality seeds	38.7	V
6.	More pest and disease attack	35.2	VI

It could be observed from Table 42 that low yield and low market price were the major problems reported by farmers. Failure of crop, prevailing drought condition and inferior quality seeds were the other constraints ranked as third, fourth and fifth respectively.

7.0 Bt Cotton

In this section a detailed study regarding the perception and attitude of farmers towards Bt cotton are dealt under different headings and are presented below

7.1 Awareness about Bt cotton among sample farmers

The awareness of farmers regarding Bt cotton, was analyzed. The results of the same are presented in Table 43.

Table 43. Awareness about Bt cotton **(n=200)**

S. No	Awareness	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1	Yes	21 (42.0)	25 (50.0)	20 (40.0)	17 (34.0)	83 (41.5)
2	No	29 (58.0)	25 (50.0)	30 (60.0)	33 (66.0)	117 (58.5)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figure in the parenthesis indicate percentage to total)

From Table 43, it could be seen that most of them were not aware (58.5 per cent) and only 41.5 per cent of the sample farmers were aware about Bt cotton. The awareness was comparatively high in Uthangarai taluk. This could be possible since Bt cotton was introduced into cultivation belatedly through promotional activities undertaken by the seed firm.

7.2 Source of Information

Various sources of information for Bt cotton were identified and presented in Table 44.

Table 44. Source of Information about Bt Cotton **(n=83)**

S. No	Source of information	Mean Score	Rank
1.	Dealer	75	I
2.	Field trials	62	II
3.	Company personnels	48	III
4.	Peer group	37	IV
5.	Mass Media	26	V

It could be observed from Table.44, that dealers were ranked as the prime source of information about Bt cotton. The reason may be due to the fact that farmers often met the dealers for purchasing other inputs namely, fertilizers and pesticides. Field trials were ranked second in the order with a mean score of 62. The reason may be that farmers got a first hand knowledge by observing the crop on farm trials.

7.3 Farmers experience of Bt cotton trials

Seed companies normally take up trials to assess the performance in various field conditions before launching any new product commercially. Farmers were asked to state whether they had seen the trials in their area. The details are presented in Table 45.

Table 45. Experience of Bt cotton trials **(n=200)**

S. No	Have you seen the trials	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1	Yes	15 (30.0)	20 (40.0)	10 (20.0)	8 (16.0)	53 (26.5)
2	No	35 (70.0)	30 (60.0)	40 (80.0)	42 (84.0)	147 (73.5)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in parenthesis indicate percentage to total)

It could be observed from Table 45 that only 26.5 per cent of farmers in the study area had seen the trial plots. The reason for not observing the trial plots was because the Bt trials were conducted before acceptance by GEAC and also there were protests from the environmental agencies. Trials were conducted at few places and hence farmers hesitated to travel long distances

7.4 Farmers' Feed Back on Bt Cotton

Feed back is a basic component of self-regulating system. Feed back enables the system to correct for its own malfunctioning or for changes in the environment, and thus maintain a steady state. The farmers will adopt any new technology only after observing its performance in field conditions and hence their opinion about Bt cotton was collected and the details are presented in Table 46.

Table 46. Farmers' Opinion on Bt Cotton **(n=53)**

S. No	Opinion	Numbers	Percentage
1.	Less boll worm attack	52	98.11
2.	More yield	50	94.33
3.	Require less number of spray	42	79.24
4.	Germination percentage is more	40	75.47

It could be inferred from Table.46 that less boll worm attack was ranked first by the sample farmers. Since boll worm incidence was the major problem faced by farmers cultivating cotton and this was less in Bt cotton, hence it immediately attracted the attention of farmers. This advantage can be projected while promoting the product. Besides more yield was ranked second and this could improve the per unit returns and profitability.

7.5 Farmers Willingness to Cultivate Bt Cotton

Farmers' willingness to cultivate Bt cotton in future will help the firm to estimate the demand for seeds and to take necessary steps in popularizing the technology. Farmers willingness to cultivate Bt cotton during 2002-2003 was obtained and presented in Table 47.

Table 47. Farmers' Willingness to Cultivate Bt Cotton (n=200)

S. No	Willingness	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1	Yes	21 (42.0)	27 (54.0)	22 (44.0)	20 (40.0)	90 (45.0)
2	No	29 (58.0)	23 (46.0)	28 (56.0)	30 (60.0)	110 (55.0)
Total		**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**50 (100.0)**	**200 (100.0)**

(Figures in parenthesis indicate percentage to total)

It could be observed from Table 47, that 55 per cent of farmers in the study area were not willing to cultivate Bt cotton. A similar trend was seen in all the taluks.

7.6 Planned area allotment for Bt cotton

The area to be allotted for Bt cotton by the farmers who were willing to cultivate Bt cotton was analyzed and the results are presented in Table.48

Table 48. Planned Area Allotment for Bt Cotton (n=90)

S. No	Area allotment by farmers	Harur	Uthangarai	Dharmapuri	Palacode	Overall
1	<1 acre	6 (28.6)	9 (33.3)	7 (31.8)	5 (25.0)	27 (30.0)
2	1-2 acre	11 (52.4)	12 (44.4)	9 (40.9)	9 (45.0)	41 (45.6)
3	> 2 acre	4 (19)	6 (22.2)	6 (27.3)	6 (30.0)	22 (24.4)
Total		**21 (100.0)**	**27 (100.0)**	**22 (100.0)**	**20 (100.0)**	**90 (100.0)**

(Figures in parenthesis indicate percentage to total)

It is evident from Table 48 that about 70 per cent of farmers were planning to allocate more than one acre for cultivating Bt cotton while 30 per cent of farmers were willing to cultivate Bt cotton in less than one acre.

7.6 Farmers' Expectation

Knowledge on the expectations of sample growers regarding preference, plant traits and services for Bt cotton seeds will be useful for the seed firms in planning their marketing strategy and the details are presented in Table 49.

Table 49. Expectation of farmers from Bt cotton (n=90)

S. No	Farmers Expectation	Numbers	Percentage
1.	High yield	63	75.9
2.	Seed Price reduction	62	74.6
3.	Resistant to Pest	53	63.8
4.	Less number of sprays	52	62.6
5.	More number of trials	50	60.2
6.	Drought tolerant	22	26.5

Majority of the sample farmers expected high yield (75.9 per cent) followed by reduction in seed price (74.6 per cent), as they opined that the price was high. Resistance to pest (63.8 per cent), requirement of less number of sprays (62.6 per cent) and more number of trials (60.2 per cent) were expected by the sample farmers.

7.7 Reasons for Willingness and Unwillingness Regarding Cultivation of Bt Cotton

It is very essential for a company to know the feed back from the farmers level so that the company can reformulate their marketing strategy effectively and satisfy the farmers. Here an attempt was made to analyse the reasons for willingness or not willingness to cultivate Bt cotton. The results are presented in Tables 50 and 51.

Table 50. Reasons for willingness to cultivate Bt Cotton **(n=90)**

S. No	Reasons	Number	Percentage
1.	Dealers influence	85	94.4
2.	Boll worm resistance	70	77.7
3.	As a new attempt	65	72.2
4.	Failure of dominant variety	52	57.7

It could be inferred from Table 50, that dealers' influence (94.4 per cent) was reported as a major reason for willingness to cultivate Bt cotton followed by boll worm resistance (77.7 per cent), new attempt (72.2 per cent) and failure of dominant variety (57.7 per cent). Therefore, the case firm must take cognizance of these facts in formulating its marketing strategy in future.

Table 51. Reasons for Farmers Unwillingness to Cultivate Bt Cotton (n=110)

S. No	Reasons	Mean Score	Rank
1.	High price of seed	68.5	I
2.	After Peer group cultivation	54.0	II
3.	Need more trials	41.5	III
4.	Drought condition	36.0	IV

It could be observed from Table 51, that high price of seed was the major reason for farmers not willing to cultivate Bt cotton followed by after peer group cultivation (mean score of 54.0), need more trials (mean score of 41.5) and drought condition (mean score of 36.0).

Since most of farmers' had taken up any new technology only after peer groups started using them, they relied more on them and their attitude. So, the case firm had to take steps to satisfy and make the peer group to cultivate Bt cotton. Many of the farmers haven't been able to observe the trials, the firm has to put some more trials and demonstrations that were easily accessible to farmers.

8.0 STUDY ON DEALERS

The volume of transaction of seeds and adoption of promotional methods in a particular area largely depended upon the sales efforts of dealers in that area. Therefore the details of the same were gathered from selected sample of 40 dealers, analyzed and the results are discussed under the followed heads:

1. General Characteristics of Dealers
2. Hybrid Cotton
3. Bt Cotton
4. Dealers Satisfaction and Expectation

General Characteristics of Dealers

As the age, education and experience would influence the decision making of the dealers, the same were analysed and the results are presented in Tables 52.to 55.

8.1.1 Age

The selected dealers were classified into three groups as a) less than 35 years, b) 35-45 years and c) more than 45 years. It could be observed from Table 52 that, 60 per cent of the sample dealers were in middle age group, followed by the young age group category (22.5). Old age group accounted for only 17.5 per cent. The maximum age of the dealer was 65 years, while the minimum age was 28 years. Thus the major dealers were in category of middle age group.

Table 52. Age Group of Sample Dealers **(n=40)**

S. No	Age group	Number	Percentage
1.	<35 years	9	22.5
2.	35-45	24	60.0
3.	>45	7	17.5
Total		**40**	**100.0**

8.1.2 Education level

Based on the educational status of the dealers, they were classified into illiterates, primary, secondary, higher secondary and graduates. The details are presented in Table 53. Most of the sample dealers were graduate (35.0 per cent) followed by dealers with higher secondary education (30.0 per cent) and with high school (22.5 per cent).

Table 53. Educational Status of the Sample Dealers

S. No	Educational Status	Number	Percentage
1.	Illiterates	0	0.0
2.	Primary	5	12.5
3.	High School	9	22.5
4.	Higher Secondary	12	30.0
5.	Graduate	14	35.0
Total		**40**	**100.0**

8.1.3 Business experience of sample dealers

Business experience of dealers might influence their decision making process and is a major aspect to be considered as dealers happened to be a major source of information to farmers. Dealers were classified based on their experience as a) with less than 10 years, b) 10-20 years and c) above 20 years respectively. It could be observed from Table 54 that majority of the sample dealers were having experience between 10-20 years, who constituted 50 per cent. This was followed by dealers having an experience of more than 20 years (37.5 per cent), while dealers with less than 10 years experience constituted only 12.5 per cent.

Table 54. Experience in Dealership of the Sample Dealers

S. No	Experience in years	Number	Percentage
1.	<10 years	5	12.5
2.	10-20 years	20	50.0
3.	>20 years	15	37.5
Total		**40**	**100.0**

In the study area, it was observed that majority of the dealers were in the active age group and their educational status was appreciable with good experience. Hence cooperation and enthusiasm could be expected from the dealers by the seed firms for promoting their products.

8.1.4 Product line dealt by dealers

In general, dealers deal with marketing of different agricultural inputs like seeds, fertilizers, pesticides, fungicides, bio-products and implements. In this study an analysis was done to know product lines dealt by the sample dealers. The results are presented in Table 55.

Table 55. Product Line dealt by the selected Dealers

S. No	Items	Number	Percentage (n=40)
1.	Pesticides	40	100.0
2.	Fertilizers	40	100.0
3.	Seeds	40	100.0
4.	Bio inputs	21	52.5
5.	Implements	7	17.5

It is very clear from Table 55 that, all the sample dealers in the study area dealt with pesticides, fertilizers and seeds. About 52.5 per cent of dealers sold inputs such as Neem based pesticides and Bio-fertilizers. Besides, implements were dealt by 17.5 per cent of the

sample dealers only. Thus agro-chemicals, fertilizers and seeds were the major product lines dealt by the dealers besides bio inputs and implements.

8.2.0 Hybrid and Variety Cotton

In this section cotton variety and hybrid dealt by sample dealers, promotional strategies used for Hybrid Cotton Seeds, constraints in marketing of Hybrid cotton seeds and reasons for preferring long staple cotton were discussed and presented below.

8.2.1 Cotton Varieties and Hybrids Dealt by Sample Dealers

Brands preferred and sold by the dealers are the reflections of the farmers' preference. Therefore the brands preferred and sold by the dealers were analysed and discussed in this section. The details on different types of cotton seeds dealt by sample dealers are presented in Table 56.

Table 56. Cotton Varieties / Hybrids Dealt by Sample Dealers

S. No	Variety / Hybrids	Number of dealer	Percentage
	Variety		
1.	LRA 5166	**39**	**97.5**
2.	MCU-5	38	95.0
3.	Suvin	12	30.0
4.	MCU-10	4	10.0
5.	Savitha	1	2.5
	Hybrids		
1.	Varalaxmi	**32**	**80.0**
2.	RCH-2	**32**	**80.0**
3.	DCH-32	20	50.0
4.	Banni	18	45.0
5.	Vijayalaxmi	14	35.0
6.	RCH-20	8	20.0
7.	Sanju	7	17.5
8.	Bhrama	7	17.5
9.	RCH-35	5	12.5
10.	Kasinath	5	12.5
11.	Jaganath	4	10.0
12.	SPCH-1	4	10.0

It could be observed from Table 56, that majority (97.5 per cent) of sample dealers had dealt with the cotton variety LRA 5166 followed by 95 per cent of dealers dealting MCU-5 variety. Other varieties dealt by dealers in the study area are Suvin, MCU-10 and Savitha.

Majority of the dealers (80 per cent) sold Varalakshmi and RCH-2. Varalakshmi was sold mainly because it was traditionally cultivated and staple length was comparatively better than other hybrids. RCH- 2 was supported by good promotional activities by the producers and farmers were also satisfied with the performance of the same.

DCH-32 and Banni were dealt by 50 and 45 per cent of dealers, respectively. Other hybrids dealt by sample dealers were Vijayalakshmi, RCH-2, Sanjive and Brahma, respectively.

8.2.2 Promotional Strategies Used for Hybrid Cotton Seeds

The dealers were asked to give their order of preferences about the promotional methods used for hybrid cotton seeds. The same was analysed and the results are presented in Table 57.

Table 57. Methods Used to Promote Hybrid Cotton Seeds **(n=40)**

S. No	Promotion Methods	Mean Score	Rank
1.	Reducing the cost of seed	63.0	I
2.	Field Demonstration	55.5	II
3.	Field staff / Farm visit	53.0	III
4.	Own Influence	47.0	IV
5.	Provide credit	42.0	V
6.	Advertisement	40.0	VI

It could be observed from Table 57 that, reduction of the cost of seed (mean score 63.0) ranked first followed by field demonstration (mean score 55.5) and field staff/farm visit (mean score 53.0) ranked second and third respectively. Farmers felt that the hybrids were costlier when compared to varieties and hence they ranked this as important reasons.

8.2. 3 Constraints faced by dealers during marketing of hybrid cotton seeds

The hybrid cotton dealers were asked to rank problems faced in marketing of hybrid cotton seeds. The problems mentioned by the individual dealer were analyzed using conventional analysis and the details are furnished in Table 58.

Table 58. Constraints in Marketing of Hybrid Cotton Seeds **(n=40)**

S. No	Constraints	Number	Percentage
1.	More pest and disease	38	95.0
2.	Failure of Dominant crop	38	95.0
3.	Less market price	35	87.5
4.	Any problem farmer will ask dealer	30	75.0
5.	Low yield	29	72.5
6.	Drought	28	70.0
7.	Farmers following their own practice	25	62.5
8.	Low germination level	21	52.5

Among the major constraints in marketing of hybrid cotton seeds, high pest and disease attack (95.0 per cent) and failure of dominant variety (95.0 per cent) were reported as the major problems followed by less market price (87.5 per cent) and dealers being held responsible for all problems by farmers (75 per cent).

8.2.4 Suggestions to improve the sales of hybrid cotton seeds

Dealers were asked about their suggestions for improving sales of hybrid cotton. The same was analyzed and the results are presented in Table 59.

Table 59. Suggestion to Improve the Sales of Hybrid Cotton Seeds (n=40)

S. No	Suggestions	Number	Percentage
1.	More field staff should be recruited	36	90.0
2.	Farmers meetings and demonstrations	35	87.5
3.	Credit facility	32	80.0
4.	High yielding hybrids	26	65.0
5.	Introducing pest and disease resistant hybrids	25	62.5

It could be clearly seen that 36 out of 40 dealers i.e. 90.0 per cent wanted the firms to recruit more field staff followed by farmers meetings and demonstrations (87.5 per cent), credit facility (80.0 per cent), high yielding hybrids (65.0 per cent) and introducing pest and disease resistant hybrids (62.5 per cent). Dealers were the major factor for the sales of any brand, so the seed firms have to take appropriate decision to meet the dealers' recommendations.

8.2.6 Reasons for preferring long staple cotton

Dealers were asked to rank the reasons for preferring long staple cotton. It was analyzed and the results are presented in Table 60.

It could be observed from Table 60 that higher average yield (mean score of 55.5) as compared to other staple cotton was ranked as the first reason for preferring long

staple cotton followed by more outturn (mean score of 54.0) and good market price (mean score of 52.0).

Table 60. Reasons for Preferring Long Staple Cotton by Dealers (n=40)

S. No	Reasons	Mean Score	Rank
1.	Average yield	55.5	I
2.	More outturn (final output)	54.0	II
3.	Good market price	52.0	III
4.	Suitable to particular area	44.5	IV
5.	Traditionally cultivating	43.0	V

8.3 Bt Cotton

In this section awareness of Bt cotton, source of information, opinion regarding Bt cotton, future market of Bt cotton and promotional strategies for Bt cotton were discussed and presented below.

8.3.1 Awareness of Bt cotton

The awareness about Bt cotton by sample dealers was analyzed and the results are presented in Table 61.

Table 61. Awareness of Bt Cotton Among Sample Dealers (n=40)

S. No	Awareness	Number	Percentage
1.	Aware	40	100.0
2.	Not Aware	0	0.0
	Total	**40**	**100.0**

It could be evident from Table 61 that, all the sample dealers were aware about Bt cotton. This could be considered as a positive sign for seed firms to market the Bt cotton.

8.3.2 Source of Information on Bt cotton

The source of information for dealers about the Bt cotton was collected, analyzed and presented in Table 62.

Table 62. Source of Information on Bt cotton among sample dealers (n=40)

S. No	Source	Mean Score	Rank
1.	Company persons	62.5	I
2.	Field trials	45.5	II
3.	Mass media	42.0	III

Major source of information about Bt cotton seeds was company person (mean score of 62.5) followed by field trials (mean score of 45.5) and mass media (mean score of 42.0). Company persons usually meet the dealers individually and had explained to them about the Bt cotton and with the help of the dealers they had conducted field trials, meetings etc., in the study area.

8.3.3 Opinion regarding Bt cotton

As dealers were considered as the important source for spreading information about Bt cotton, their opinion about Bt cotton was analyzed and the results are presented in Table 63.

It could be observed from Table 63 that less pest incidence was reported by 85 per cent of the dealers, followed by satisfaction about the outcome of field trials (80.0 per cent). Dealers reported that pest incidence was comparatively less when compared with other cotton varieties and hence the crop required less rounds of pesticide application.

Table 63. Dealers' Opinion about Bt Cotton **(n=40)**

S. No	Opinion	Number	Percentage
1.	Less pest attack	34	85.0
2.	Satisfied with field trials	32	80.0
3.	Lack of technical guidance	28	70.0
4.	Good for present situation	27	67.5
5.	Higher Boll size and yield	25	62.5
6.	More Number of bolls / plant	20	50.0

On the whole, the failure of dominant varieties because of high pest incidence and less yield led to preference of Bt cotton. About 62 per cent of the dealers reported that boll size and yield was more, while 50 per cent of the dealers stated that more number of boll/plant was observed in Bt cotton plants. Thus more than 50 per cent of dealers opined that Bt cotton was a better substitute for existing varieties / hybrids in terms of less pest incidence, higher yield and its suitability to present situation.

8.3.4 Opinion Regarding Market for Bt Cotton

Dealers were asked about future market for Bt cotton seed and their responses are presented in Table 64.

Table 64. Dealers' Opinion regarding Future Market for Bt Cotton **(n=40)**

S. No	Opinion	Number	Percentage
1.	Good market	33	82.5
2.	Not good market	7	17.5
	Total	**40**	**100.0**

It could be observed from Table 64 that majority of the dealers reported that Bt cotton will have a good market in the future. Major constraint for marketing Bt cotton is controversies about Bt cotton and lack of technical know-how. So company has to take appropriate steps to over come these problems.

8.3.5 Promotional strategies for Bt cotton followed by dealers

The dealers were asked to give their preference about the promotional methods for Bt cotton. The details are presented in Table 65.

Table 65. Dealers Strategies to Promote Bt Cotton **(n=40)**

S. No	Strategies	Number	Percentage
1.	Dealers own influence	32	80.0
2.	More field trials	30	75.0
3.	Providing Credit facility	28	70.0
4.	Based on company strategies	25	62.5

Dealers used their own influence (80 per cent) followed by field trials (75 per cent), providing credit facility (70 per cent) and based on company strategies (62.5 per cent). Company should consider the views of the dealers while formulating their strategies.

8.4.0 Dealers Satisfaction Level and Expectation

In this section satisfaction level of dealers and expectation from companies regarding promotional strategies for Bt cotton were discussed and presented below.

8.4.1 Dealers satisfaction level regarding companies promotional activities

Dealers were asked about their satisfaction about case firms' promotional activities and their approaches. The level of satisfaction was categorized as highly satisfied, satisfied and moderately satisfied. The details are presented in Table 66.

Table 66. Dealers' Satisfaction Level about the Company **(n=40)**

S. No	Satisfaction level	Number	Percentage
1	Highly satisfied	8	20.0
2	Satisfied	15	37.5
3	Moderately satisfied	17	42.5
	Total	40	100.0

It could be observed from Table 66 that 37.5 per cent of the dealers alone were satisfied with company's promotional activities while 42.5 per cent were moderately satisfied. As majority of dealers were only moderately satisfied the reasons for the same have to be identified and steps have to be taken to increase the satisfaction level.

8.4.2 Dealers' expectation from company regarding sales promotion of Bt cotton

Dealers were asked about expectation regarding sales promotion of Bt cotton and the details are given in Table 67.

The results clearly indicated that 88 per cent of dealers wanted the firm to reduce the price of Bt cotton, while 75.0 per cent reported that more advertisement will improve the sales of Bt cotton. Extending credit facilities, provision of sample seeds and timely provision of neeessary technical guidance regarding Bt cotton were the expectations from more than 50 per cent of dealers.

Table 67. Dealers' Expectation from the Company on Sales Promotion of Bt Cotton

(n=40)

S. No	Expectation	Number	Percentage
1.	Reduce the price of Bt cotton seeds	35	87.5
2.	More Advertisement	30	75.0
3.	Credit facilities	24	60.0
4.	Provide Sample seeds	22	55.0
5.	Technical know-how	21	52.5
6.	Maintaining the Quality of seeds	17	42.5
7.	Farmers meeting and Campaign	15	37.5
8.	Training program for Dealers	15	37.5
9.	Trained field staff	8	20.0

9.0 Partial budgeting

It is essential to work out the cost and returns to find out whether the Hybrid and Bt cotton seeds had any effect on the income. The cost incurred for both the situations were worked out in four headings, namely Added cost, Reduced return, Reduced cost and Added Return. The added cost includes all the expenses incurred due to the use of Hybrid and Bt cotton. In the present study, it included the difference of the cost incurred on, preparatory cultivation, Seed, total manures, fertilizers and manuring. The reduced return did not include any amount since there was no reduction in the returns. The reduced cost included, the difference of the cost incurred on, irrigation, plant protection chemicals and labour cost. The added return included the difference in the yield due to the use of Hybrid and Bt cotton. The added cost and reduced return was combined to form, the component A and reduced cost and added return was combined to form, the component B. The change in income was arrived by subtracting A from B. The details are presented in Table 68.

Table 68. Partial Budgeting between Hybrid and Variety **(Rs/acre)**

S. No	Particulars	A		B	
		Added cost	Reduced return	Reduced cost	Added return
1.	Preparatory cultivation (Rs)	150	-	-	
2.	Seed and sowing cost (Rs)	425	-	-	
3.	Manures and manuring (Rs)	-	-	-	
4.	After cultivation cost (Rs)	-	-	-	
5.	Irrigation cost (Rs)	-	-	-	
6.	Plant protection chemicals cost (Rs)	900	-	-	
7.	Harvesting cost (Rs)	1500	-	-	
8.	Total Income	-	-	-	4500
9.	Grand Total	2975	-	-	4500

Net Change in Income (B-A) = 4500-2975

= 1525

The results of Partial Budgeting presented in Table 68 showed that additional income due to the usage of hybrid was Rs.1525 per acre. The gain was mainly due to increase in yield.

Table 69. Partial Budgeting between Bt and Non-Bt

S. No	Particulars	A		B	
		Added cost	Reduced return	Reduced cost	Added return
1.	Preparatory cultivation (Rs)	-	-	-	-
2.	Seed and sowing cost (Rs)	1075	-	-	-
3.	Manures and manuring (Rs)	-	-	-	-
4.	After cultivation cost (Rs)	150	-	-	-
5.	Irrigation cost (Rs)	200	-	-	-
6.	Plant protection chemicals cost (Rs)	-	-	1250	-
7.	Harvesting cost (Rs)	400	-	-	-
8.	Total Income	-	-	-	3200
9.	Grand Total	1825		1250	3200

Net Change in Income (B-A) = 4450-2125

= 2625

The results of Partial Budgeting presented in Table 69 showed that additional income due to the usage of Bt cotton was Rs.2625 per acre. The gain was mainly due to increase in yield and reduction of pesticide application.

10. Markov Analysis - Structural Changes in Cotton Seed Market

The proportion in the cotton seed market of dealer to different varieties over a period of time and the changing pattern of share were analysed by employing the first order Markov model. This was achieved by examining the gains and losses in the cotton

seed market by the major varieties and hybrids. The details of the market analysis for Varieties and Hybrid seed market is presented in Table 70 and 71.

Varieties

It could be observed that none of the varieties selected for analysis could retain their market share. MCU-5 lost its share of 26, 22, 38 and 14 per cent to MCU-10, Savitha, Suvin and Others. But it could gain 100 per cent share from MCU-10, 42 per cent from LRA5166, and 67 per cent from Savitha. MCU-10 has lost its entire share to MCU-5. LRA5166 lost its share of 30 per cent to Savitha and 15 percent to other and gained 91 per cent from Others nothing. Savitha lost its share of nearly 33 per cent to Suvin. Suvin has lost its entire share to Others. Thus the analysis revealed that traders' market share is determined by varieties like MCU-5, LRA5166 and Other varieties. This result is also corroborated with conventional analysis of varieties grown by the selected sample farmers. Trader should lay emphasis on increasing the sale of the above varieties so as to increase their sales from varieties identified.

Hybrid

Among the hybrids Varalakshmi, DCH-32, RCH-2 and Banni could retain their share of 10, 21, 51 and 33 per cent respectively. Varalakshmi lost its share of 18 per cent to Brahma, 38 per cent to RCH-20, 14 per cent to Vijayalakshmi, 10 per cent to Jaganath and 11 per cent to Banni. However it gained entire share of Vijayalakshmi, 11 per cent of DCH-32 and 12 per cent of RCH-2. Even though RCH-20 retained nothing it could gain 38 per cent from Varalakshmi, 31 per cent from RCH-2 and as high as 67 per cent from Banni.

RCH-2 not only retained 50 per cent of its market share but also 40 per cent from Brahma and 66 per cent from RCH-20.

Banni could retain 33 per cent of its share and gained 11 per cent from Varalakshmi, 33 per cent from RCH-20 and 10 per cent from RCH-2. Thus the hybrid seed market of dealer is influenced by the sales level of hybrids like DCH-32, RCH-20, RCH-2, and Banni. Dealers should concentrate on these hybrids in future to enhance their market share in Hybrid.

Table 70. Transitional Probability matrix of Varietal Seed Market (1996 – 2001)

Variety	MCU-5	MCU-10	LRA5166	Savitha	Suvin	others
MCU-5	0	0.26104	0	0.21747	0.38155	0.14003
MCU-10	1	0	0	0	0	0
LRA5166	0.41489	0.13436	0	0.29876	0	0.15167
Savitha	0.67293	0	0	0	0.32707	0
Suvin	0	0	0	0	0	1
Others	0	0	0.90704	0	0	0

Table 71. Transitional Probability matrix of Hybrid Seed Market (1996-2001)

Hybrids	Varalakshmi	DCH-32	Bhrama	Sanjive	RCH-20	RCH-2	Vijayalakshmi	Jaganath	Kasinath	Banni
Varalakshmi	0.10041	0	0.17711	0	0.37632	0	0.14012	0.10027	0	0.10573
DCH-32	0.10695	0.2087	0	0	0	0	0.20009	0.31401	0.17008	0
Bhrama	0	0	0	0.1573	0	0.40719	0	0	0.43551	0
Sanjive	0	0	0	0	0	1	0	0	0	0
RCH-20	0	0	0	0	0	0.66272	0	0	0	0.33728
RCH-2	0.11501	0	0	0	0.30503	0.50112	0	0	0	0.10044
Vijayalakshmi	1	0	0	0	0	0	0	0	0	0
Jaganath	0	1	0	0	0	0	0	0	0	0
Kasinath	0	0	0	0	0	1	0	0	0	0
Banni	0	0	0	0	0.67029	0	0	0	0	0.32971

11. Probit Model

Results of the Probit Model analysis is presented in Table. 72.

Among the variables selected to assess their influence on willingness to cultivate Bt cotton by farmers, experience and land holding size were significantly influencing their willingness. As experience plays an important role in farming, farmers could be convinced about the advantages of Bt cotton through peer group farmers. Besides farmers with larger land area are willing to allocate more area for the Bt cotton if they convince about the advantage and profitability of Bt cotton.

Table 72. Maximum Likelihood estimates of farmers' willingness to cultivate Bt cotton Model

Variable	ß	$SE_ß$	Asymptotic t-Ratio	P (t)
Constant	0.859373	0.617381	1.39197	0.163933
Age	- 0.0308215	0.0206861	- 1.48996	0.136234
Education	- 0.0904377	0.129271	- 0.699599	0.484178
Experience	0.0399845***	0.029652	1.34846	0.177510
Land holding	0.0290373***	0.0365096	0.795376	0.426395
Number of Observation		200		
Log likelihood function		- 136.5082		
Restricted Log likelihood		- 138.1390		
Chi Squared		3.261645		
Degrees of freedom		4		
*** P =<0.01 (two tailed test)				

SUMMARY AND CONCLUSION

CHAPTER VI

SUMMARY AND CONCLUSION

This chapter deals with the summary of the research and its findings in a brief manner. The objectives of the research, methodology used, results obtained and the conclusions are dealt here. The objectives of the study are:

i. to examine the farmers' awareness and preference for cultivating Bt cotton;

ii. to identify the product features preferred by farmers with respect to hybrid cotton;

iii. to identify the factors influencing choice of long staple cotton; and

iv. to identify the constraints in cultivating cotton

Dharmapuri District was purposively selected because the case firm was interested in knowing the brand preference of hybrid cotton and Bt cotton seeds by cotton farmers in Dharmapuri district

Thus a multistage simple random sampling procedure was followed and the ultimate sample size of 200 cotton farmers at the rate of 50 per taluk was selected. Dealers formed another group of respondents for the present study. Names and addresses of all the seed dealers were collected from the respective offices of Assistant Director of Agriculture and 40 dealers were selected at random.

For collection of data two sets of pre-tested questionnaires were prepared based on the objectives of the study, i.e., one for the sample farmers and another for seed dealers. The data required for the study were gathered by personal interview method, with the selected respondents

General Characteristics of the Sample Farmers

It was found that 42 per cent of the sample farmers in the district were in middle age group, followed by young and old age groups which accounted for 33 and 25 per cent respectively. It could also be seen that, 41.5 per cent of the sample farmers in the district had education upto elementary school level followed by farmers with high school (19.0 per cent) and higher secondary education (18.5 per cent). However, about 16 per cent of farmers were found to be illiterates.

Nearly 63.0 per cent of the sample farmers had experience of less than 10 years in cotton farming followed by farmers with 11-20 years (21.5 per cent) and 21-30 years (12.5 per cent) of experience. The results also revealed that 59 per cent of the farmers were doing agriculture alone. About 17 percent of farmers also worked as agricultural lobours while 11 percent of them had other business.

It was evident that 40 per cent of farmers watched television daily while 35 per cent of farmers read newspapers daily and 30 per cent listened to radio everyday. About 31 per cent of farmers had no contact with radio, but majority of farmers (60 per cent) had no contact with magazines.

Cotton was the major crop which, accounted for 53.7 per cent of the total cropped area of the sample farmers. Gingelly, minor millets, red grams and flowers were the other crops that occupied 9.84, 6.76 and 4.57 per cent and 4.52 per cent of the cropped area respectively. Majority of the farmers (52.5 per cent) were cultivating cotton in less than three acres followed by 38 per cent of farmers allocating about 3.0 to 6.0 acres for cultivating cotton.

Suitability of land for cotton cultivation was ranked first by sample farmers followed by average yield, average price and less water requirement as reasons for increasing or maintaining the same area under cotton. Low market price was ranked as the most important reason followed by failure of dominant varieties for the decrease in area under cotton.

Awareness and Preference of Cotton Variety and Hybrid

MCU-5, Varalaxmi and DCH-32 varieties were known and cultivated (during 2001-02 or in the past) by all sample farmers in the study area. The reasons for cultivating these varieties were, of high yield, good market price and their suitability to the study area. About 93 per cent of sample farmers were aware of LRA 5166 followed by 75 per cent of farmers aware of MCU-10 and 73 per cent of farmers aware of RCH-2. Among the varieties cultivated by sample farmers LRA 5166, MCU-10 and RCH-2 were cultivated by 80 per cent, 55 per cent and 52.5 per cent, respectively. Suvin was known to 62.5 per cent of sample farmers but only 12.5 per cent cultivated it due to low yield. Banni was also popular among 62 per cent of farmers and cultivated by 48 per cent of farmers.

Agricultural department was found to be the foremost source for the selection of varieties. It reflected the effective extension work undertaken by the department. Peer groups and dealers were ranked second and third as the source of information. The role of company staff was observed to be very less in disseminating agricultural information relevant for farmers. Dealers were ranked as the primary source of information on cotton hybrids followed by company persons and peer groups.

Dealers were found to be the major source of purchase of hybrid cotton seeds by the sample farmers followed by private company.

High price of the hybrid seeds was the major problem faced by the farmers in purchasing hybrid seeds. The costs of the varieties were less by 40-60 per cent when compared to the cost of hybrids. Absence of credit sales and shops situated in longer distance were ranked second and third problems, respectively. Higher yield and dealers influence were ranked first and second reason for preferring hybrid cotton followed by sales persons influence.

Neighbours' cultivating same variety was ranked as first reason for preference of a variety followed by easy availability and less number of spray required.

Relatively good market price was reported as the main reason for cultivating long staple cotton followed by quality of cotton (lint length, ginning percentage and colour of the cotton) and average yield as other reasons for cultivating long staple cotton.

Plant Protection

Incidence of American bollworm followed by Pink boll worm and Spotted boll worm were the major pests attacking cotton as reported by more than 50 per cent of sample farmers. Other pest affecting cotton crops were thrips, leaf hopper, aphids and stem weevil, whose incidence was found to be less compared to bollworms.

Leaf spot and root rot were the major diseases prevalent in cotton cultivation in the study area as reported by more than 75 per cent of farmers.

Majority of farmers reported (81.0 percent) red leaf as the major deficiency symptoms observed in cotton while 53.5 per cent of farmers reported boll shedding. Red leaf was caused due to magnesium deficiency, which lead to shedding of leaves and boll shedding was caused due to boron deficiency.

All the sample farmers (100 per cent) in the study area had used Rogar, Endosulphon and Monocrotophos while 62.5 per cent of farmers had used Karate for controlling sucking pests and Boll worm complex.

Majority of the farmers go for upto eight rounds of spraying (40.5 per cent) and up to 10 rounds of spraying (30.5 per cent) in the winter season. Only very few farmers go for more than 10 rounds of spray. Most of the farmers applied less than six sprays followed by farmers applying 6-8 spray (35.0 per cent) and 9-11 sprays (10.0 per cent) for summer cotton. Only two per cent of the farmers sprayed more than 11 times. About 60 per cent of farmers spent less than Rs. 180 per spray followed by 27 per cent of farmers spending about Rs.181-200 per spray. Only 14 per cent of the farmers were spending more than Rs. 200 per spray.

Resistance to pest and disease was ranked as the most preferred product feature followed by yield of the crop and duration of the hybrid. It is obvious that preference was towards reduction of cost of pesticides which formed the major cost component. Majority of farmers (89 per cent) expected 4-7 quintals per acre yield. Majority of the farmers in Dharmapuri taluk preferred hybrids with a yield of about 4-5 quintals per acre. Whereas farmers in Palacode taluk expected a yield of 6-7 quintals per acre. Majority of the farmers preferred to cultivate hybrids during winter. Farmers preferred hybrids suitable to

winter season mainly due to the fact that pest and disease incidence was less during summer (boll formation period). Medium duration hybrids were highly preferred by sample farmers in study area followed by long duration varieties. Majority of farmers (72.5 per cent) preferred hybrids that were suitable for irrigated condition. It was due to available irrigation potential and higher yield. Colour was given prime importance followed by lint length and dryness of cotton as far as preference is concerned.

High seed cost was the major constraint faced by sample farmers during cultivation of hybrid cotton which ranked first. More water requirement and high cost of cultivation were the other constraints and were ranked second and third, respectively.

Low yield and low market price were the major problems reported by farmers in the case of variety cotton cultivation. Failure of crop, prevailing drought condition and inferior quality seeds were the other constraints ranked as third, fourth and fifth respectively.

Bt cotton

Most of them were not aware (58.5 per cent) about Bt cotton and only 41.5 per cent of the sample farmers were aware about Bt cotton. The awareness about Bt cotton was comparatively high in Uthangarai taluk. Dealers were ranked as the prime source of information on Bt cotton. The reason may be due to the fact that farmers often meet the dealers for purchasing other inputs namely, fertilizers and pesticides. Field trial was ranked second in the order. Only 26.5 per cent of farmers in the study area had seen the trial plots. Less boll worm attack was ranked as first factor that attracted them by the sample farmers. Since boll worm incidence was the major problem faced by farmers

Hybrid and Variety Cotton

Majority (97.5 per cent) of sample dealers had dealt with the cotton variety LRA 5166 followed by 95 per cent of dealers dealing MCU-5 variety. Other varieties dealt by dealers in the study area are Suvin, MCU-10 and Savitha. Majority of the dealers (80 per cent) sold Varalakshmi and RCH-2. Varalakshmi was sold in large quantity as it was traditionally cultivated and staple length was comparatively better than other hybrids.

Reduction of the cost of seed was ranked as the best promotional activity followed by field demonstration and farm visit by company staff, in that order.

Among the major constraints in marketing of hybrid cotton seeds, high pest and disease attack (95.0 per cent) and failure of dominant variety (95.0 per cent) were reported as the major problems followed by less market price (87.5 per cent) and dealers being held responsible for all problems by farmers (75 per cent).

It was found that 36 out of 40 dealers i.e., 90.0 per cent wanted the firms to recruit more field staff followed by farmers meetings and demonstrations (87.5 per cent), credit facility (80.0 per cent), high yielding hybrids (65.0 per cent) and introducing pest and disease resistant hybrids (62.5 per cent). Average yield was ranked as the first reason for preferring long staple cotton followed by more outturn and good market price respectively.

Bt Cotton

All the sample dealers were aware about Bt cotton. Major source of information about the Bt cotton seeds was company person (mean score of 62.5) followed by field trials (mean score of 45.5) and mass media (mean score of 42.0). Less pest incidence (85 per cent) followed by satisfaction about the outcome of field trials (80.0 per cent)

cultivating cotton and this was less in Bt cotton, hence it immediately attracted the attention of farmers. This advantage can be projected while promoting the product. Besides more yield was ranked second as this could improve the per unit returns and profitability. However 55 per cent of farmers in the study area were not willing to cultivate Bt cotton. A similar trend was seen in all the taluks. Among the farmers willing to cultivate Bt cotton 70 per cent were planning to allocate more than one acre for cultivating Bt cotton while 30 per cent of farmers were willing to cultivate Bt cotton in less than one acre.

Majority of the sample farmers expected high yield (75.9 per cent) followed by reduction in seed price (74.6 per cent), as they opined that the price was high. Resistance to pest (63.8 per cent), requirement of less number of sprays (62.6 per cent) and more number of trials (60.2 per cent) were expected by the sample farmers.

Dealers' influence (94.4 per cent) was reported as a major reason for willingness to cultivate Bt cotton followed by boll worm resistance (77.7 per cent), new attempt (72.2 per cent) and failure of dominant variety (57.7 per cent). High price of seed was the major reason for farmers not willing to cultivate Bt cotton.

Study on Dealers

General Characteristics of Dealers

Majority (60 per cent) of the sample dealers were in middle age group, followed by the young age group category (22.5). Old age group accounted for only 17.5 per cent. Most of the sample dealers were graduate (35.0 per cent) followed by dealers with higher secondary education (30.0 per cent) and with high school (22.5 per cent).

were the opinion of dealers about Bt cotton. Majority of the dealers reported that Bt cotton will have a good market in the future. About 38 per cent of the dealers alone were satisfied with company's promotional activities while 42.5 per cent were moderately satisfied. About 88 per cent of dealers wanted the firm to reduce the price of Bt cotton seed, while 75.0 per cent reported that more advertisement will improve the sales of Bt cotton seed. Extending credit facilities, provision of sample seeds and timely provision of necessary technical guidance regarding Bt cotton were the expectations from more than 50 per cent of dealers.

Partial Budgeting

On comparing variety and hybrid cotton, it was observed that as additional income of Rs.1525 per acre was obtained due to cultivate of hybrid cotton. The gain was mainly due to increase in yield. In case of Bt cotton additional income was Rs. 2625 per acre due to reduction of pesticide application.

Markov Analysis

Markov analysis results on market share of dealer on varieties are highly influenced by the sale of varieties like MCU-5, LRA5166 and other varieties. In the case of hybrid their market share influenced by hybrids likes DCH-32, RCH-20, RCH-2 and Banni. Hence the dealer should concentrate on these varieties and hybrid influence to enhance the market share.

Probit Model

Experience and size of land holding are the major factors for willingness to cultivate Bt cotton in future.

CONCLUSION AND STRATEGIES RECOMMENDED

1. All the sample farmers in the study area had known and cultivated both varieties and hybrids. The major constraints faced by farmers in cultivating hybrids were high price of seeds, more water requirement and high cost of cultivation. The case firm should take into consideration of these constraints while developing new hybrids.

2. Long staple cotton was preferred for its good market price and quality of cotton. The case firm can go for research to develop hybrids with these characters.

3. Majority of farmers were going for eight rounds of spraying and only very less per cent of farmers are going for 10 rounds of spraying. This shows that the there is tremendous scope for introducing Bt cotton as it reduces the number of sprays and thus results in reduction of cost of cultivation

4. Product features preferred by the sample farmers for hybrids were resistance to pests and diseases, more yield, with medium duration and suitable for winter season. Hence case firm have to take steps in introducing their hybrids with the above preferred product features of farmers.

5. Majority of farmers (58.5 per cent) were unaware of Bt cotton and hence the case firm had to go for more promotional activities namely more field trials, personal meetings by company personnels and organization of farmers meetings as the farmers have to be clearly explained about the cultivation practices of Bt cotton and its benefits.

6. Source of information for the farmers who aware of Bt cotton was dealers followed by field trials. About 45 per cent of sample farmers were willing to cultivate Bt cotton and among these 70 per cent were planning to allocate more than one acre. The major reason for willingness to cultivate Bt cotton was dealers influence followed by resistance to bollworm. So the case firm had to influence dealers as they are highly influential persons for decision making

7. About 26.5 per cent of farmers had visited the trial plots and reported that the bollworm incidence was found to be less. This showed efficiency of Bt cotton in field conditions which can be highlighted by the company. Besides more field trials are to be conducted by the case firm in nearby places which are easily accessible to farmers in order to convince the farmers.

8. The probit model analysis reveals that experience of farmers and land holding size were found to be influencing the willingness to cultivate Bt cotton by the selected farmers. Therefore the case firm should identify the people with good experience in cotton cultivation and also target large size land holding farmers who are willing to cultivate Bt cotton.

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