Chapter I - Introduction

CHAPTER I

INTRODUCTION

Agriculture sector in India, big and diverse, provides food and fibre to the country's large population and employs nearly 70 per cent of the population. Even after concerted industrialisation in the last 5 decades, agriculture continues to be significant sector of the economy providing more than one-fourth of the national income, providing employment to the major section of the population, providing raw material to industries that account for 50 per cent of the income generated in the manufacturing sector and providing more than one-fifth of the export earnings. The factors that have been strengthening our agricultue sector include extensive land and water resources, significant public investments in agricultural research and development, extension, infrastructure and government support in input subsidies and output prices.

India has achieved self sufficiency in foodgrain production and has reduced its dependence on imports. The country has been emphasising on increasing its exports, for increased exports help it to pay for the increased imports of oil, machinery and other raw materials. Agricultural products like tea, sugar, tobacco, spices, etc. constitute the main items of exports of India. Broadly, 50 per cent of our exports are agricultural goods and another 20 per cent of the export value comes from agro-based products. Traditionally, developing countries like India have been exporters of food stuffs and raw materials. As the economic development proceded, the raw material export declined because of increase in their domestic demand to meet the requirements of the growing domestic industry. With the fast growing population, the surplus of foodgrains available for exports also dwindled. Consequently, a developing country like India is required to find commodities

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for exports in that it has core competence for production and market for its products. Basing on this argument, India having the largest area under cotton in the world can become a leader in cotton supplies if it improves its productivity.

India is the third largest cotton producer in the world after China and the United States. Although it has the largest acreage under the crop, accounting for more than one fourth of the world cotton area, its output accounts only for 10 – 15 per cent of the world total due to low productivity. Cotton production plays an important role in the national economy by providing employment to more than seven million farmers[1] and raw materials for the domestic textile industry comprising of 1510 spinning mills, 278 composite mills and more than 800 spinning units in the small sector. The textile industry provides employment to 25.5 lakh of people and accounts for 4 per cent of the gross domestic product. Although trade in raw cotton is relatively less significant in the economy, trade in cotton textile items contributes one third of the export earnings. In terms of total mill consumption of fibres, natural and man-made, India ranks the third largest textile manufacturing economy in the world, next to China and the US. Over three-fourths of all fibres consumed in the country industrially is cotton and nearly all this cotton is grown in India.

1.1. The Cotton Crop

Cotton differs from other field crops in that it is an oil crop, which is grown for its fibre, an outgrowth from the seed epidermis. Fibres develop as elongations of surface cells in the seed coat. Cottonseed constitutes 65 per cent of the seed cotton by weight and contains about 17 per cent oil

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[1] Cotton is cultivated in 9.3 million hectares and on an average, 200 man days are utilised in cultivation of one hectare area of cotton in one season.

and 24 per cent protein. The oil, which is *semi* unsaturated, is used for cooking, soap making and other purposes. During oil extraction, the rest of the seed embryo is converted into protein rich oil cake, a valuable stock feed. Normal cottonseed contains a pigment known as gossypol, which is toxic to non-ruminant animals, rendering cotton seed cake edible for ruminants only. However, with careful processing, high quality protein rich cottonseed flour can be produced which is sufficiently low in free gossypol to make it suitable for human consumption.

Cultivated cottons fall into three main groups based on fibre properties. Group I is the Egyptian, American Egyptian or Pima and Sea Island Extra Long Staple *Gossypium barbadense* Cottons. The fibre is long and fine with a staple length in excess of 32 mm and a micronaire value (thickness) below 4.0. Group II consists of the American and African Upland Medium Staple *Gossypium hirsutum* cottons. The staple length is about 25 to 30 mm and micronaire value range from 3.8 to 5.0. These two groups, known as New World Cottons, account for 8.0 per cent and 90.0 per cent of world cotton production, respectively. Group III contains two Asiatic species or Old World Short Staple cotton, *Gossypium arboreum* and *Gossypium herbaceum*, the former being the most widely grown. The lint of these species is short and coarse with a staple length less than 25 mm and a micronaire value in excess of 6.0.

The seed fibres of true cottons consist of long, fine flattened and convoluted hairs called lint that can be easily detached from the seed and short, coarse hairs called fuzz or linters that are firmly attached to the seed. The

presence of seed fibres in linted cottons in both the old and new world species probably provided the main impetus for their domestication.

The invention of the spinning jenny by Arkwright in 1769 was the first major step in development of modern textile technology and paved the way for the industrial revolution in Europe. Development of New World cotton production was handicapped by the difficulty in separation of fibre from the seed. The invention of the saw cotton engine by El Whitney in 1795 in the US solved this problem and revolutionised cotton production. This was reflected in the increase of production from 683 million tonnes in 1790 to 45,550 million tones in 1815. The name "cotton engine" became abbreviated to "cotton gin", a name that has gained universal acceptance.

The higher yield and quality of New World cottons resulted in the gradual replacement of Old World cottons in the textile mills of England. The United States was the main producer of this cotton. In India, most cotton types grown, prior to 1914, were annual forms of *Gossypium arbroreum*. Over the next two decades, upland cotton, *Gossypium hirsutum* almost entirely replaced *Gossypium arboreum*[2]. Currently, *Gossypium arboreum* varieties account for 16.0 per cent of the Indian crop.

1.2. Geographical Spread – International

More than half (about 55 per cent) of the world cotton production occurs between 30° and 37° North Latitude where the USA and China (excluding

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[2] Literature also indicate that , in India, repeated failures of the cotton crop in recent times originated from the replacement of sturdy and pest resistant desi cotton varieties that were suitable to withstand the vagaries of the Indian climate and varied cultivation environment by less sturdy and less resistant varieties of American cotton. For instance, see Prasad, 1999.

Xingiang) are located. Uzbekistan and Xingiang in China are the major pro-
ducers north of this latitude with small quantities also produced in Greece,
Bulgaria, Rumania and Spain amounting to about 16 per cent of the world
total. Thus, about 71 per cent of world cotton is grown north of latitude 30°
north and these are ready for harvest before the first frost in October/No-
vember. Most of the balance crop is produced between 30° North and 30°
South latitude, with nearly 10 per cent falling in the Southern hemisphere
ripening in May to July and about a little over 20 per cent in the Northern
hemisphere, ripening from December to February. In the tropics, the pro-
duction period is determined by the water supply and the dry season for
ripening and harvesting. Outside the tropics, largely temperatures deter-
mine the period of cotton production. The wide range of conditions under
which cotton is grown spreads the supply through most of the year.

1.3. Indian cotton

India is the only country in the world that grows all four cultivated cotton
species. The area under cotton in the country could be divided into three
main cotton-growing zones. The Northern *Gossypium hirsutum* and
Gossypium arboreum zone comprising the states of Punjab, Rajasthan
and Haryana with 1.8 million hectares under cotton cultivation account for
19.6 per cent of the cotton area in the country. The Central *Gossypium
hirsutum*, *Gossypium arboreum* and *Gossypium herbaceum* zone cover-
ing the states of Gujarat, Madhya Pradesh and Maharashtra is the major
cotton cultivating region with 5.3 million hectares under cotton and ac-
count for 57.6 per cent of the total area. Thirdly, the Southern *Gossypium*

hirsutum, *Gossypium arboreum*, *Gossypium herbaceum* and *Gossypium barbadense* zone comprising the states of Andhra Pradesh, Karnataka and Tamil Nadu covers an area of 2.1 million hectares which account for the rest 22.8 per cent of the area.

1.4. Cotton production and consumption

During the early years after independence, domestic cotton production was deficient compared to mill consumption and the gap was filled by imports. Indian cotton experienced technological breakthrough in 1968-69 with the release of Hybrid-4 and MCU-5 varieties. During 1971-72, the production was 70 lakh bales[3] as against mill consumption of 63.6 lakh bales. The trend in consumption of cotton by textile mills largely depends on the production trend. The import of cotton has been negligible as compared to the total consumption in a year from the eighties. The mill consumption of cotton has increased from 71.2 lakh bales during 1981-82 to 143.2 lakh bales during 1997-98. Production of raw cotton varies from year to year depending upon rainfall and weather conditions. In recent years, the demand for cotton from mills has increased significantly due to the expansion in the consuming industry. The gap between the production and consumption of cotton over the years is depicted in Table 1.1.

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[3] The weight of cotton lint is expressed in bales, which is a pressed bundle of 170 kgs in India. Cotton Bale weights are different in different countries. For instance, it is 218 kgs in USA, 227 kgs in Australia, 327 kgs in Egypt, etc.

Table 1.1. Trends in cotton production and consumption

Year	Production	Consumption	Difference (%)
1948-49	22.7	42.6	-87.4
1961-62	49.7	56.9	-14.4
1971-72	70.0	63.6	9.2
1981-82	84.0	71.2	15.2
1991-92	119.0	103.1	13.4
1995-96	168.7	137.4	18.6
1996-97	177.9	150.4	15.5
1997-98	158.0	143.2	9.3

Source: ICMF, 1998

The cotton production in the country was deficient by 87.4 per cent in 1948-49 in comparison to the consumption of cotton, which was filled by imports. By the year 1961-62, the deficiency had come down to 14.4 per cent although the consumption was increasing due to the efforts to step up the domestic production of cotton by bringing additional area under the crop. By the turn of the '70s the country was not only self sufficient in cotton production but became a net exporter.

Cotton mill consumption has experienced rapid growth over the past three decades. Mill consumption was 71.2 lakh bales in 1981-82, about 12 per cent higher than in 1971-72. However, growth has been accelerated since then. Mill consumption reached 150.4 lakh bales in 1996-97. Increased domestic consumption and export of cotton textiles are responsible for the rapid rise in mill consumption, in particular since 1982. Availability of cot-

ton clothing rose from 13.2 square metres per capita in 1971-72 to 15.6 square metres in 1997- 98 (Appendix -1). Given the large population of India, such an increase reflected significant rise in production. Exports of cotton yarn increased from 7, 000 tonnes in 1980 to 4, 02, 300 tonnes in 1996 (Appendix – 2) and exports of cotton fabrics increased from 56, 000 tonnes to 1, 88, 000 tonnes during the same period (Appendix – 3).

The government's efforts to restructure and modernise the textile industry have been pivotal to the recent surge in exports of cotton textiles. The removal of various controls on the textile industry including delicensing and decentralising and the setting up of a Textile Modernisation Fund Scheme (TMFS) bolstered industry, which experienced a 40 per cent increase in the number of mills, mainly spinning units and 50 per cent increase in cotton yarn production between 1991 and 1998 (Appendix – 4). Despite the continuous increase in the number of mills, mill consumption of cotton was lower at 143.2 lakh bales in 1997-98 compared to 150.4 lakh bales in 1996-97. This 5 per cent decline in consumption was due to several factors, including the financial crisis in the Southeast Asia, the slowdown of domestic demand for cotton products and the imposition of anti-dumping duty on grey fabric by the European Union (EU).

1.5. Cotton trade prospects

India has been neither a significant importer nor exporter of raw cotton in the world market. Its net imports reached 7.45 lakh bales in 1969-70 and net exports reached 13.82 lakh bales in 1986-87, the highest in the past 40 years (Appendix – 5). However, the net imports exceeded 21 lakh bales in 1999-00. Balance sheet of cotton in India during 1997-98 to 1999-00 is given in Table-1.2.

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Table 1.2. Balance sheet of cotton in India

(In lakh bales)

Particulars	1997-98	1998-99	1999-00
Opening stock	30.38	30.00	36.50
Production	158.00	165.00	156.00
Imports	4.00	7.87	22.01
Total Supply	**192.38**	**202.87**	**214.51**
Consumption			
- By mills	143.24	145.53	150.60
- By small spinning units	6.54	6.24	8.37
-Extra factory	9.10	13.59	14.39
Exports	3.50	1.01	0.65
Total Demand	**162.38**	**166.37**	**174.01**
Closing Stock	30.00	36.50	40.50

Exports of cotton from India are currently under government control. The guiding considerations for the export policy were to strike a balance between the interests of the cotton growers on the one hand and that of the mills and decentralised handloom and power loom weavers on the other. Another aim of the country's cotton export policy was to ensure India's continued presence in the international market. Export quotas are determined and announced by the government at the beginning of the cotton season. On the other hand, since liberalisation in 1994, no license is required for imports of cotton, which are not subject to any customs duty or other restrictions.

Several developments may encourage India to become more active in the world trade in cotton in the coming years, in particular in imports. India has aggressively expanded its presence and shares in the world textile market over the past few years and extended its penetration into the cotton yarn, fabric and clothing markets. In 1996, about 50 per cent of its cotton yarn was exported to countries in the Southeast Asia, with additional quantities going to other Asian textile exporting countries such as Bangladesh. Most clothing and textile final products are exported directly to developed countries, including the European Community (EC) and the United States. The implementation of the Agreement on Textiles and Clothing (ATC) would benefit the textile industry of India both directly and indirectly. The removal of quotas on India's textile exports to the EC and the US by 2005 would induce a direct increase in exports of textiles and clothing. Considering India's comparative advantage in textile production by way of cheap labour and comparatively low market share in global exports at 3 per cent in 1996 compared to 5.4 per cent of the Republic of Korea, India's textile exports should increase at a much faster rate than some other exporting countries. Moreover, the expected increase in textile exports from Southeast Asian countries after implementation of the ATC would generate increased demand for India's cotton yarn and fabrics. The fast increase in mill demand for cotton from 103.1 lakh bales in 1992 to 150.4 lakh bales in 1996-97(an expansion of 46 per cent in 5 years) has indicated how rapidly consumption can expand in India. Thus to meet the increase in mill consumption, cotton production should grow faster in the coming years. However, given the increasing pressure of demand for food

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and limited land for planting cotton, it would be difficult to increase cotton production by expansion of area. Having the largest area under cotton than any country in the world, the increase in cotton production has to come from increase in productivity.

1.6. The problem

India, having the largest area under cotton in the world and occupying more than one fourth of the world area under the crop (25.4 per cent), contributed only 8.5 per cent (20.7 lakh tonnes) of the world output (245 lakh tonnes) of raw cotton during 1999-2000. The dismal performance of production of Indian cotton is attributable to the low productivity (yield per hectare) of Indian cotton. The yield of cotton in India was the lowest in the world and is extremely low compared to the other major producing countries. The area, production and yield of cotton in major countries during 1999-2000 are given in Table 1.3.

Table 1.3. – Area, Production and Yield of cotton in major cotton Producing countries during 1999-2000

| Country	Area (Lakh ha.)	Production (Lakh tons)	Yield (Kg/ha.)
1. Australia	4.9	7.1	1454
2. Bangladesh	5.1	18.8	3655
3. Brazil	10.2	9.3	918
4. China	42.4	48.6	1147
5. Egypt	2.9	2.4	851
6. India	92.8	20.7	223
7. Pakistan	29.5	19.1	648
8. U.S.A	53.0	37.5	707
WORLD	365.2	245.0	671

Source: FAO Data base, 2001
Note: Production of cotton is expressed in tonnes rather than in bales in this table due to difference in measure of bales across countries.

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The yield of cotton at 223 kg/ha. in India was the lowest in the world during 1999-2000 as compared to 3655 kg. of Bangladesh, 1147 kg of China, 648 kg. of Pakistan and world average of 671 kg. However, the yield of 223 kg. achieved by India is by the continuous improvement in the level from 50 kg. in 1950-51. The yield level has increased considerably during the last one and half decades from 141 kg. in 1983-84. However, the yield performance depict wide inter state variations. The yield of cotton in major states during 1998-9ฯ is given in Table 1.4.

Table 1.4. – Yield of cotton in major states during 1998-99

States	Yield (kg/ha)
1. Andhra Pradesh	198
2. Gujarat	416
3. Haryana	255
4. Karnataka	239
5. Maharashtra	139
6. Madhya Pradesh	145
7. Punjab	180
8. Rajasthan	230
9. Tamil Nadu	301
ALL INDIA	223

Source: Agriculture, 2000. CMIE, Mumbai

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Figure 1.1. Statewise Yield of cotton during 1998-99
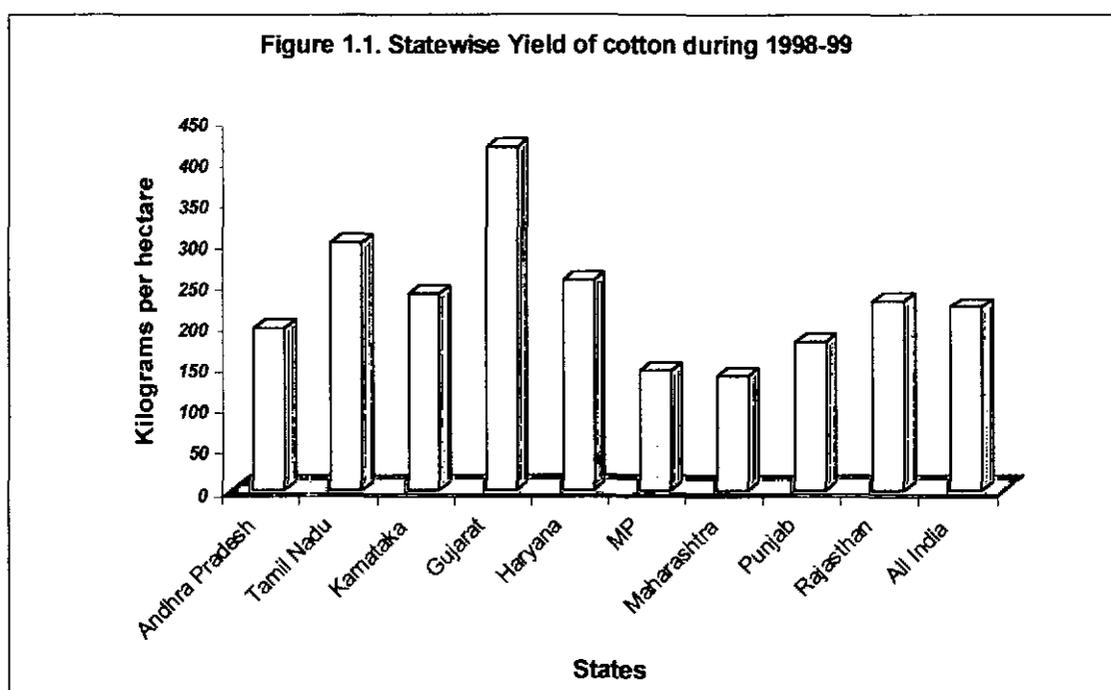
The state level average yield of cotton varied from 139 kg/ha. In Maharashtra to 416 kg/ha. in Gujarat. The states of Andhra Pradesh, Maharashtra, Madhya Pradesh and Punjab were having yield levels less than all-India average while the rest five major states had yield higher than the national average. However, the extremely lower yield in Maharashtra state, which is having the higher weightage in terms of area tend to keep the national average lower.

1.7. The present study

This study on productivity of cotton with specific reference to the determinants of productivity such as human capital, financial capital and infrastructure intends to identify the factors affecting productivity of cotton. The stress on variables related to human capital in the study is on account of the relatively higher role played by the

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knowledge of the farmer about the high yielding varieties, crop management, plant protection measures, etc. in the productivity of the crop. The productivity of cotton is related to a wide range of factors, that include physical factors such as irrigation, soil type; biological factors like quality of seed, seed rate, cultural practices, inputs like fertiliser and pesticides; socio-economic factors like education, institutional factors like training and extension services, availability of credit, etc. and infrastructural factors like availability of roads, electricity, markets, etc. Against this background, the specific objectives of the study were the following.

Objectives

1. To identify the major determinants of productivity of cotton including human capital, financial capital and infrastructure like rural roads.

2. To estimate the impact of human capital, financial capital and infra structure on cotton productivity

3. To identify critical components of human capital, financial capital and infrastructure that influence cotton productivity.

1.8. Chapter scheme

The thesis is presented in 10 chapters. Following the first chapter on introduction to the study, review of literature relevant to the study is cited in chapter II while chapter III discusses the data and methodology used

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in the study. The introductory chapter presents a biological description of the cotton crop first and geographical spread of cultivation of cotton crop across the world and in India. A brief account of the production and consumption of cotton in the country over the years, prospects for India in cotton trade, emerging problems in cultivation of cotton in India and the basic premises on which the study is based are also discussed in chapter I. The chapter on review of literature provides an account of the emergence of the theory of human capital and its consideration in production relations. Evidences from both India and abroad that has used human capital, financial capital and infrastructural variables to agricultural productivity are also cited in this chapter. Chapter III on study design and methodology describes location of the study area, sampling procedure, data and analytical tools used in the study.

Chapter IV presents an overview of cotton cultivation in India. Chapters V and VI explain the characteristics of the study area and demographic and socio-economic characteristics of the sample households. The chapter on overview of cotton cultivation in India explains the state wise spread of cotton cultivation, growth in area, production and productivity of cotton in various states. General cultivation practices of cotton in India and different agencies engaged in marketing of cotton including the monopoly procurement scheme of cotton are discussed in this chapter. The location of the study districts and their general characteristics and infrastructural base are discussed in the chapter on

study area. Characteristics of the sample farmers and their households with regard age and experience of the farmer in cotton cultivation, education level of the farmer and all the members in the household, farm size, cropping pattern of the sample households, income from cultivation of cotton and other crops, other sources of income including livestock and non-farm source, etc. are discussed in the chapter on demographic and socio-economic characteristics. This chapter further discusses the institutional characteristics of the households such as borrowings during the reference year, their sources and purpose. This chapter also discusses the infrastructural characteristics of the sample households such as connectivity to all weather roads and electricity, distance to the nearest market, availability of irrigation and its source, mode of transport used for marketing of cotton, etc.

Chapter VII discusses the package of practices and cost of cultivation of cotton. Chapter VIII presents the analysis on determinants of cotton productivity. Conclusions of the study are discussed in Chapter IX and policy implications emerging from the study are discussed in Chapter X. Package of practices recommended for cotton cultivation by the State Department of Agriculture vis-à-vis that followed by the sample farmers are discussed in the chapter on package of practices. Cost of cultivation of cotton, following various concepts of cost adopted by the Commission on Agricultural Costs and Prices (CACP) are also discussed in this chapter. Chapter on determinants of productivity relates various sets

of explanatory variables such as human capital, financial capital and infrastructure to cotton productivity. This chapter also relates human capital and infrastructural variables to demand for crop credit of the sample farms. Further, an analysis on the adoption behaviour of the sample farmers of the recommended package of practices for cultivation is also presented in this chapter.