INTRODUCTION

India, the 7th largest and 2nd most populated country in the world, extends about 3214 km from Jammu & Kashmir in the North to Tamil Nadu in the south, and 2993 km from Arunachal Pradesh in the east to Gujarat in the west. With an area of 3.2 million km$^2$, the country has four well defined regions:

i) The great mountain zone of the Himalayas

ii) The plain of the Ganges and Indus river

iii) The desert region and

iv) The southern peninsula.

The northern plains stretch from Punjab in the west to Assam in the East. It includes the states of Punjab, Haryana, Delhi, U.P, Bihar, West Bengal and Assam.

With the population of 1.16 billion in 2009 and having agriculture the main occupation of the vast people (52% of total work force), it has high levels of poverty (25% of the total population lives below the poverty line), underdeveloped infrastructure for food delivery and an agriculture system that focus on grain and legume food security & also large proportion of malnourished population. Most of the people existing below the poverty line belong to the agriculture sector. So, in order to improve this sector the National and State Government have recognized the need to increase productivity, farmers’ incomes and to promote agribusiness. Together with these, rapid urbanization, increasing per capita income, diversifying size of holdings & falling productivity of scarce natural resources like soil & water on the supply side induces farmer to includes **vegetables** in the existing farming systems.
In view of the diversifying production for sustained increase in income & employment, promoting value addition & export, the role of vegetable sector becomes more important than it was in the past.

The importance of this sector can be stated as follows:

i) Vegetables contribute towards food & nutritional security of the people.

ii) Higher labour intensity in vegetable production provides good scope to generate employment opportunities for small & marginal farm holders (especially for women & children).

iii) In order to reduce the post harvest losses which is very high in India, the growth of vegetable sector is very important.

iv) As a supplementary crop in cereal or legume farming, vegetable sector can be developed together with the extension of irrigation facilities in the rainfed areas.

v) Vegetable sector can provide scope for food processing & preservation sectors.

vi) For promoting value addition & export, the role of vegetables become important.

Thus the vegetable sector can play some important role as a key asset for productivity improvement, market development, income generation and livelihood security in India.
Significance and Justification of the study

With the focused attention given to the vegetable sector, there has been spectacular change in terms of production and availability of vegetables. Of the total land, an operational area of 166 million ha (107 million farms) are available for agriculture (INDIASTAT, 2007) with 4% used for vegetables. Small holders dominate both Indian agriculture and vegetable production. Across all the production sectors more than 80% farms have area ≤ 2 ha, and on average 0.6 hectare. Income from staple crops is inadequate, so farmers supplement with off-farm and non-farm income and increasingly grow high value crops such as vegetables (Birthal and Joshi, 2007). Across all farm sizes, on average, 14.9% of the farm area was used for vegetables (GOI, 1999, Birthal and Joshi, 2007).

India is now the second largest producer of vegetables (125.8 million tonnes) after China contributing about 13% of the total world production. The total production of vegetables in the world is around 946 million tonnes. Vegetable production in the country increased from a mere 23.31 million tonnes in 1962-63 to 86.42 million tonnes in 1999-2000. During the year 2001-2002, India has produced 88 million tonnes of vegetables from 6.15 million ha of land accounting a productivity of 14.4 million tonnes/ ha, whereas in the year 1991-92 the total production was 58.5 million tonnes from 5.6 million ha of land, productivity being 10.5 million tonnes/ ha. The productivity in the vegetable sector has achieved 38% increase, which is more than change in world productivity of 12.3%. The vegetable production in India has recorded a growth rate of 5.14%, whereas the corresponding figure for world was 7.03% per annum.

In vegetables, country has made highest contribution for okra production with share of 70.8% in the world production pool followed by green pea (29.4 %) and cauliflower (29.2 %), brinjal (28.8 %), onion (17.7%), potato (11.2 %) and tomato (8.9 %). Simultaneously per capita annual vegetable production has reached around 200kg in 2000-01, from only 41.61kg in 1962-63.
Vegetable consumption has also increased by 2.9% annually during 1984-2000 and consumption also rose among poor consumers. Food habits of population are changing and demand for fresh vegetables has been steadily growing due to urbanization, globalization, increasing health consciousness and increasing income levels.

Apart from this, there has been a steady increase in India’s share of fruits and vegetables in the world export. It increased from 0.8% to 1.0%. The quantity and value of export of vegetables has shown remarkable progress in recent years (Singh, 2000). The impressive growth rate of vegetable export from India at 9.76% per annum is recorded in the last decade.

To meet the growing needs of vegetables (in the national and international markets) it is projected that we need to produce 108-111 million tonnes of vegetables by the year 2006, 123-129 million tonnes by 2011 and 139-149 million tonnes by 2016 (Kumar et al, 2002). With the diverse agro-climatic conditions in the country, these targets are not very difficult to reach provided an appropriate policy environment is created.

Appropriate policy interventions may be directed to:

i. To improve production per unit area by solving chronic problems of production.

ii. To improve seed quality regulation (because India is one of tropical Asia’s major vegetable seed producers and exporters).

iii. To optimize crop nutrition reducing over-use of chemical fertilizers.

iv. To optimize pest management (inorder to produce disease and pest resistant varieties).

v. To develop F₁ hybrids.

vi. To standardize agro-techniques for different agro ecological situations.
vii. To remove the problems faced by the horticultural sector so as to tap its huge potential; private sector and government agencies should work together.

viii. To include post harvest management policy.

ix. To undertake more cost-benefit modeling.

x. To improve infrastructural facilities such as electrification, harmonization of trade and financial system.

xi. To develop internal and external market and processing industries.

xii. To plan and prioritize research and development activities in this sector.

xiii. To maintain production of qualitative vegetables and varieties.

Including vegetable sector, agriculture and allied sector like forestry and fishing accounted for 18.5% of total Indian G.D.P in 2005-06 and employed about 58% of the country’s workforce (C.S.O. 2007).

Despite a steady decline of its share in the GDP (1990-91 → 22 %, 2005-06→18.5 %, and 2008-09→ 15.7 %), agriculture is still an important sector and plays a significant role in the overall socio-economic development. Majority of workforce continue to depend on agricultural sector for employment and in rural areas dependence on agriculture is more for nearly 75% of the rural population. The limited opportunities for rural non-farm employment triggers disguised unemployment which leads to lower resource productivity in the sector relative to other sectors of the economy. The lower productivity and resource utilization leads to higher rates of poverty in the rural areas.

Therefore, for a sustainable solution, fostering rapid, sustained and broad based growth in agriculture remains the key priority of the Government.
The Central Government budget for 2003-04, announced the launching of schemes on hi-tech horticulture and precision farming with an initial provision of Rs. 50 crore and additional cold storage facilities for 30.5 lakh tonnes. The Prime minister announced a National Horticulture Mission with the objective of doubling horticultural production by 2010. This sector was given a boost by enhancing its outlay from Rs. 1000 crore in 8th plan to Rs. 1454 crore in 9th plan and further to Rs. 2105 crore in the 10th plan.

Adoption of modern technology, making use of provisions under the National Horticulture Mission and using research infrastructure will boost Horticulture sector. Agriculture has seen revival in the last 3 years and is poised for the second green revolution. Horticulture sector & specially vegetables sector will contribute significantly in this revolution.

The diverse agro-climatic zones of India make it possible to grow almost all types of vegetables. And during last decade, the growth rate of vegetable production is exceeding the population growth in the country.

**Research objectives**

Keeping all these facts the present study was proposed with the following objectives:

1) To evaluate the growth trends of vegetables cropped area, production and productivity.

2) To evaluate the time series analysis of different important vegetable crops in terms of production, productivity and market price.

3) To evaluate the export potential of important vegetable crops.
Hypothesis

- Testing different growth equations for vegetables area, production and productivity at country level.
- Testing identified best-fit equation for evaluation and interpretation of data relating to vegetable sector.
- Testing export potential of some farm fresh vegetable crops.
- Testing market dynamics and market integration for major vegetable crops across Indian market.

Limitation of the study

Crop yield is the function of many factors like weather, soil type and its nutrient status, management practices and availability of other inputs. Of these, weather plays an important role, probably more so in India where aberrant weather such as drought, flood, etc., is a rule rather than an exception. Efficient crop planning, therefore, requires proper understanding of agro-climatic conditions. This calls for collection, collation, analysis and interpretation of long-term weather parameters available for each region to identify the length of the possible cropping period taking into consideration of water availability.

Major constraints in vegetables production and marketing have been identified as:

I. Non availability of location specific recommendation.
II. Non availability of quality seeds.
III. Water scarcity.
IV. Finance scarcity.
V. Inadequate and/or imbalanced manuring and fertilization.
VI. Micronutrient deficiency.
VII. Loss due to pests.
VIII. Loss due to diseases.
IX. High variation in yield and attributing parameters.
X. High cost of production.
XI. High levels of poverty are a major factor affecting vegetable consumption by the poor. But consumption will not increase if vegetables become unaffordable due to inadequate supplies or excessive demand.
XII. Lack of qualitative vegetables & varieties due to poor technology development and dissemination.
XIII. Illiterate & unskilled farmers, workers and consumers.
XIV. Lack of private sector investments and prospect of growing off season vegetables
XV. Low production & productivity of the crop & huge post harvest losses arising out of inadequate storage, cold chain & transport infrastructure.
XVI. Lack of comprehensive and consistent information on various aspects of vegetables for planning & prioritizing research & development activities in this sector.
XVII. Lack of rapid expansion of internal & external market and processing industries (In India less than 2% of the fruits & vegetables produced are processed as against 65% in the USA, 70% in Brazil, 78% in Philippines, 80% in South Africa and 83% in Malaysia.

In spite of these limitations, India is among the most potential developing economies in the world. India is even considered as one of those most stable countries which bore the burns of global recession the least, in the recent past. The supporting factor for this is Fiscal policies of the Government of India, and obviously the back bone of this strong potential and most competent economy is Agriculture.