CHAPTER II

LITERATURE SURVEY

2.1 INTRODUCTION

The review of literature is carried out with reference to the following sub-heads so as to maintain logical continuity with rest of the chapters of the thesis.

2.2 Infrastructure Support

2.3 Enabling Government Policy and Support

2.4 Biotech Ready Climate and Cluster

2.2 INFRASTRUCTURE SUPPORT

After the liberalization policy in 1991, the Government of India and the respective State Governments are encouraging the growth of biotechnology by establishing biotech clusters. (Vaidyanathan, Geetha 2008). According to Gilding, Michael, 2008 the Governments around the world are playing a significant role in developing biotech parks. clusters.

India is promoted as the global hub of IT and ITES enabled services. Government both central and state level have started to promote these sunrise sectors along with other areas like biotechnology

etc. in various manners by giving tax benefits, providing cheaper loans, upgrading infrastructure etc. (Sabyasachi Ghosh, Tirthankar Das 2008).

Chiranjib Chakraborty and Govindasamy Agoramoorthy, 2010, observed that infrastructure support provided by Central and State Governments to India's biotechnology industry has been growing rapidly so as to revolutionize biopharmaceutical and healthcare sectors.

Chen et al (1998) found that in many countries Biotechnology policies are in many respects similar in terms of policies, IPR, funding of biotech research, tariffs and providing seed money.

2.2.1 Research Gaps in Infrastructure Support:

Since the development of biotech park at genome valley is a recent phenomena there is research done to understand the government policy and support provided to the biotech industry in Andhra Pradesh. In view of this gap the following research question is being framed.

2.2.2 Research Questions to Address Gaps in Infrastructure Support:

1. *What infrastructure support in terms of quantity/quality of proviided for land, water, electricity, roads, lighting, incubations centers by the government and private developers for the biotech industry in the genome valley?*
2. *What are the concerns of the biotech industry with reference to the tariff for land, water, electricity and incubation centre space provided to the biotech industry in the genome valley?*

2.3 ENABLING GOVERNMENT POLICY & SUPPORT

The study by Agarwal, S. P et al (2007) indicated that because of lowering of tariff and tax rates in the context of WTO and liberalization of policies, the current incentives available are not attracting the R & D institutions and hence there is a need to revise the policies.

Growth in information technology and biotechnology sectors are due to knowledge driven entrepreneurship in regionalized and localized hubs(Cooke and Philip 2001). Bajpai et. al (2002) felt that IT and biotechnology can boost economic and social development and hence India should set new goals in that direction to attract inflow of foreign investments. Genetic modifications and germplasm can improve crops and solve food problem of the growing population and would also benefit producers, processors and consumers. (Krueger, Roger W 2001). Stern, Scott (2004) assessed the role played by the biological resource centers in life sciences and suggested a new policy framework for the benefit of all the stakeholders.

Athreye et al (2007) found that software and biotech associations are in a position to influence the Governments in coming out with policies for the success of their members. Giesecke and Susanne (2000) concluded that an indirect science and technology policy can help in the development of the biotech industry rather than interventionist policy.

Richard G. Hamermesh, RobertHiggins, (2007), observed that appropriate implementation of the licensing agreements is crucial to the development of the biotech companies.

Kasabov, Edward (2008) felt that there are problems in the current policies for the life science and biotech research and suggested that the future policies may address the requirement of the biotech industry. Oehmke et al 2001 studied the consumer preferences in the European Union and suggested that the developments in biotech R & D and regulation can yield significant economic benefits.

Malla, Stavroula et al (2003) opined that Government subsidy on research output of private firms can substantially encourage applied research for the benefit of the economy and the society.

Andreas Fier, Oliver Heneric, (2005), in their study observed that German biotechnology industry could not embrace key technology in the 1980s and therefore the policy makers may analyze the gaps and identify public funding schemes to encourage the biotech industry. Taking a strategic perspective SonjaKind, DodoZuKnyphausen-Aufseß, (2007), studied routine activities for business development of German biotech industry and observed that entrepreneurial biotechnological ventures have contributed significantly for strategizing and organizing work in the biotech companies.

Lee, Meng-Shiunn (2008) study examines the agricultural biotechnology industry in the context of value chain theory introduced by

Porter (1985). The study indicates that the critical success factors for the agricultural biotechnology industry's intra-disciplinary transformation are (from most to least important): technical development systems for production, intellectual property control, complete education systems, risk management control in new product development, nurturing technical and R&D employees, and institutions of relevant laws and regulations.

According to Henry I. Miller, Gregory Conko, (2003), large biotech firms like Dow, Ciba-Geigy influenced policy makers to bring regulations in their favor to avoid competition with highly innovative small and mid-sized companies and academic researchers.

According to Harvey S. James Jr., Leonie A. Marks, (2006), in UK in 1990s, a host of negative developments took place in terms of opposition to the biotech foods and crops by the consumers and this resulted in increasing the risk of investing in the biotech industry by the entrepreneurs.

2.3.1 Research Gaps on Enabling Government Policy and Support:

The biotech policy of the government of Andhra Pradesh is expected to attract investments for solving the food, health care and other needs of the society. While the policy document is similar to the policy frame work in other countries, there are gaps in terms of implementation of the policy in letter and spirit. In addition there is a need to understand the expectations of the biotech industry and R & D community regarding

policy support and incentives from the government. Hence the following research questions are identified to understand the problems in the present policy.

2.3.1 Research Questions to Address Enabling Government Policy and Support:

3. *Are the departments like single window, licensing, pollution control board, Excise/VAT/Sales Tax, addressing the issues of the biotech industry and delivering services on time?*
4. *Is the government policy and support conducive for the development and sustenance of biotech industry at genome valley?*

2.4 BIOTECH READY CLUSTER AND CLIMATE

Bessette, Russell W 2003 observed that because of the increased support of University research on biotechnology, public and private companies in the US are able to overcome the financial challenges. Because of the availability of the biotech ready human resources, Brazilian universities are able to innovate and increase competitiveness. Further global trends indicate that there is a need for prioritization of this sector (Antunes, Adelaide; 2006).

Local networks and inter-firm collaboration for transfer of knowledge would lead to technological dynamism (Gertler, M. S et al 2005). There is a significant difference in the economic geography of network of biotech industry and the network of semiconductor & telecommunications

equipment. The former has more entrepreneurial supports than the later (Kenney et al 2005).

There is a positive relationship between human capital and entrepreneurial activity and that interaction among biotech firms and innovation organizations is important for regional innovation (Cooke, Philip 2003, Bates, 1990; Shane and Khurana, 2003; Colombo and Grili, 2005, Antoine Bureth et. al., 2010). Biotech industry is characterized by knowledge working on knowledge to create economic value by decoding in genomics and proteomics (Cooke, Philip 2002).

High performance of organizations is strongly correlated with managerial experience gained in the past activities. Combination of technical and commercial skills can yield highest growth rate in biotech firms (Colombo and Grili, 2005).

Biotech revolution resulted in transformation in the research methods in large US pharmaceutical firms. Though they were slow before 1980s, they developed commercial ties with the star scientists and enhanced their share of patents (Lynne G. Zucker, Michael R. Darby(1995).

A constitution of a network of partners results in social capital. Social capital view of entrepreneurship ignores interdependencies between multiple players of innovation. The success of a biotech company depends on gathering competences distributed across a large number of players (Powell, 1996). An entrepreneur has to interact with

other members to succeed in his enterprise. In the biotech industry the locus of innovation has shifted from individual organizations to networks (Freeman and Perez, 1998; Baum et al., 2000). Innovation is not a solitary venture and biotech organizations rely more on an open innovation strategy (Chesbrough, 2003).

There is a positive effect on biotech firms located close to Universities and R & D centers where there is research on biotechnology(Jaffe et al., 1993) or being part of an industrial cluster (Audretsch and Feldman, 1996; Audretschd and Stephan, 1996; Aharonson et al., 2004; Casper, 2007). In US since 1970s Bio-pharmaceutical industry have an extraordinary inter-firm collaborations (Hagedoom (2002, Roijakkers and Hhagedoom, 2006). According to McKelvey(1998) 30% of total collaborations in all industries in 1998 are between biotech and pharma companies. He observed that small biotech start-up companies do not replace pharmaceutical companies and instead act as a link between Universities and large pharmaceutical firms having specialized knowledge relevant to biotech innovation. New biotech firms may have collaborations with government research centers and big pharmaceutical companies so that they can gain both scientific and market knowledge(Kim and Higgins, 2007; Stuart et al., 2007, Shane and Cable, 2002). The success of new biotech firms can also depend on having informal relations with scientists and industrialists to gain

complementary competences and also finance for the start-ups (Powell et al., 2002; Shane and Cable, 2002).

Casper, Steven (2007) observed that social networks emerged between biotech scientists and senior managers of biotech companies in San Diego, California. Roijakkers et. al., (2006) found that since 1975 equity based inter-firm partnerships emerged between R & D and pharmaceutical biotech industry.

A variety of technology competencies, technology transfer, and networking between universities and medical supplies firms helped in the growth of biomedical and biotech companies (Cetindamar et. al., 2003). While explaining factors for differential growth in biotech firms Niosi et. al., (2003) noted that alliances are behind growth and performance of new biotech firms.

Van Geenhuizen, Marina (2008), felt that a biotech cluster would help in formation of local and global network with biotech service companies during the early stage of the start-up and with research organizations around the cluster at a later stage. Nader Salman, Anne-Laure Saives (2005), found that biotech firms can have useful knowledge from direct partners to increase innovation and indirect networks created can be its intangible strategic resource. AlanL.Carsrud et al (2009) suggested that a biotech company with high profitability and low growth can make a transition to high profitability and high growth than a firm that starts with low profitability and high growth.

The empirical study by Coenen, Lars; Moodysson, et al, (2006) found that agro-food cluster is more localized than biopharmaceuticals cluster. Heavy investment, ongoing innovation, dynamic technical change and concentration on market is the key to the success of agricultural biotech industry (Pray, Carl et al 2005).

The paper by Hopkins, Michael M. et al, (2007) did not find any evidence of biotech revolution as promoted by academicians and consultants.

According to Mangematin et al (2003) biotechnology industry is emerging because of the creation of research intensive small and medium enterprises. According to (Ottoo et al1998) R&D plays a strategic role in giving quick response by the biotech firms. Successful R & D and gaining access to productive technology to introduce new products in the market before competitors is the key to the success of a biotech firm.

Frank T. Rothaermel and Marie C. Thursby, (2006) in their empirical study accepted the hypothesis that "an incumbent firm's ability to exploit new methods of invention depends initially on access to tacit knowledge on how to employ the new methods".

Multinational pharmaceutical and biotech companies are converging in terms of technology agglomeration strategies and increasingly competing over innovation from small biotech firms (Mark J Ahn, Michael Meeks, Sally Davenport, Rebecca Bednarek, 2010).

According to Paula E. Stephan,David B. Audretsch (2009) age and status of the scientist in the scientific community would influence the acceptance of the biotech company by the stake holders. Filson et al , Darren; Morales, Rosa (2006), found that use of equity links in the new projects depends on the firm's R & D projects and its previous alliances.

Keeping in view the above literature the present study attempts to understand the association between biotech companies and public R & D organizations around the genome valley.

2.4.1 Research Gaps to Understand Biotech Ready Cluster and Climate:

From the above review of literature it may be observed that several researchers expressed the need for formal or informal networking for the development and sustenance of the biotech industry in different countries. Biotech companies are getting the benefits due to association with the R & D institutions and star scientists in and around their respective biotech clusters. While there are 13 public R & D organizations in and around Hyderabad, there is no established research to suggest that there is networking and co-operation between them. To address this issue the following research questions are identified for the formulation of hypotheses for this research work.

2.4.2 Research Questions to Address the Availability of Biotech Ready Cluster and Climate at Genome Valley:

5. *Is the investment made by the Central and State Government of AP for the development of biotech research organizations in and around Hyderabad, beneficial to development and sustenance of biotech industry at genome valley?*
6. *What is the availability of biotech ready human resource?*
7. *Are biotechnology research institutes in AP useful as testing centers for the biotech companies and are they fully capitalizing their technologies by commercializing through the genome valley?*
8. *Does the facilities at the incubation centers at Alexandria, SP Biotech, IKP Knowledge Park etc., are adequate or is there any need to upgrade the facilities?*
9. *Is it practically possible for the R & D organizations to adopt any of the biotech firms in genome valley to try out their results?*
10. *Is it practically possible for the biotech companies in the genome valley to take direct R & D support from the academic institutions in and around Hyderabad.*
11. *Is the biotech industry safe & secure for business from political and communal issues in AP?*
12. *Is the biotech cluster effective in terms of quality and cost?*
13. *Does biotech companies launch anticipated activities as per the vision of the biotech policy and are they green or just using the green name?*