14. Is there any availability of investment agency/mechanism to fund innovative biotech companies in AP.

2.5 CONCLUSION

Based on the gaps in the review of literature and the need to understand the implementation of the biotech policy, the above 14 research questions are framed for the purpose of the study. Chapter III discusses the objectives of the study, hypotheses framed and the research methodology followed to address the above research questions.

CHAPTER III

RESEARCH METHODOLOGY

3.1 INTRODUCTION

While the Government has a mission for 2020, there is a need for studying the experiences of the entrepreneurs and senior managers who established/intending to establish their companies in the genome valley so that corrective steps can be taken for
providing the appropriate entrepreneurial support systems for the
development and sustenance of the biotech industry in Andhra Pradesh.

3.2 THE PROBLEM

From the review of literature it can be noticed that all the governments across the world are giving policy guideline, support and incentives for the development of biotech industry. Companies in countries like Germany when they missed the opportunity to embrace appropriate technologies are initiating policy changes that would suit the requirements of the biotech industry. Experiences of biotech companies which networked with the government and with the biotech research organization indicate a positive relation contribution for the development and sustenance of the biotech industry. As mentioned in the research gaps and questions, there is a need to study biotech cluster in the genome valley to understand whether there are any issues confronting the biotech industry. Hyderabad has several biotech research institutions and there is no evidence of industry-institution interaction between them. In India, the general opinion is that the scientists are working in isolated environments and they neither interact with the executives of the industry nor with other scientists from other organizations in the same area. Lack of communication system for sharing research results or outcome of different stages of research
may be the reason for not arriving at the synergies for mutual benefit and for the benefit of the society at large. The present research work is an attempt to address this crucial problem so that the biotech industry and the nation benefits from the fruits of the research which is funded from the revenue generated from the tax payers. It is also expected that the infrastructural support given from the public resources to the biotech industry give desired results to the society.

### 3.3 NEED FOR THE STUDY

The need for the study arises for the fact that the Government of Andhra Pradesh is seriously encouraging the biotech industry by acquiring and allotting, land, water, electricity and other resources. This study will be useful to understand the gap in the expectations of the stake holders so that necessary steps can be taken for the benefit of the industry in particular and the society at large.

### 3.4 OBJECTIVES

In order to study the infrastructural support given to the biotech industry, government policy and incentives and to understand the biotech cluster and climate at the genome valley, the following objectives are considered for the purpose of the study.
1. To study the infrastructure facilities provided at the genome valley.
2. To analyze the adequacy of the government support and incentives provided to the biotech industry at the genome valley.
3. To understand the mutual support between biotech companies and the R & D institutions in and around genome valley.
4. To understand perception of entrepreneurs regarding the security for the industry from political issues.
5. To understand whether the entrepreneurs maintain green name and take up activities as per the vision of the Government.
6. To understand the factors influencing the biotech industry.

3.5 HYPOTHESES:

Following are the hypotheses to study the objectives. The term “organization type” used in the hypotheses indicates comparison of the data collected from the biotech company executives, government officials and R & D scientists. It may be noted that by R & D organizations/scientists it refers to government funded R & D organizations in and around Hyderabad.

3.5.1 Hypotheses on Infrastructure Provided

_Ho1: Regarding infrastructure (land, water, roads, lighting, incubation space) provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D._
H₀₁.¹: Regarding land provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀₁.²: Regarding water provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀₁.³: Regarding roads provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀₁.⁴: Regarding lighting provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀₁.⁵: Regarding incubation space provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

3.5.2 Hypotheses on Electricity Provided

H₀²: Regarding electricity provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

3.5.3 Hypotheses on Tariff on Infrastructure

H₀₃: Regarding tariff per unit of land, water, electricity, incubation space provided, there is no significant difference in the
level of satisfaction of the respondents of company, Government and R & D.

\( H_0 \) 3.1: Regarding tariff per unit of land provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

\( H_0 \) 3.2: Regarding tariff per unit of water provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

\( H_0 \) 3.3: Regarding tariff per unit of electricity provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

\( H_0 \) 3.4: Regarding tariff per unit of incubation space provided, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

3.5.4 Hypotheses on Enabling Government Policy and Support

\( H_0 \) 4: Regarding government policy and support, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

\( H_0 \) 4.1: Regarding adequacy of incentive and support for land, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.
H₀4.2 : Regarding adequacy of incentive and support for capital investment, there is no difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀4.3 : Regarding adequacy of incentive and support on VAT / Sales Tax, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀4.4 : Regarding adequacy of incentive and support for Events and Forums, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀4.5 : Regarding special department for biotech industry, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀4.6 : Regarding time taken by single window clearances, there is no significant difference in the level of satisfaction of the respondents company, Government and R & D.

H₀4.7 : Regarding time taken for issuing licenses, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀4.8 : Regarding time taken for clearances by inspector of factories, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.
\( H_0 4.9 \) : Regarding time taken for clearances by pollution control board, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

### 3.5.5 Hypotheses on Biotech Ready Cluster and Climate

\( H_0 5 \): Regarding Biotech Ready Cluster and Climate, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

- **H\(_{0} \)5.1**: Regarding availability of biotech ready human resource, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

- **H\(_{0} \)5.2**: Regarding availability of biotech investment agency, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

- **H\(_{0} \)5.3**: Regarding availability of biotech R&D institutes & testing centers, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

- **H\(_{0} \)5.4**: Regarding availability of connectivity (AIR, RAIL & Road- Domestic & International), there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

- **H\(_{0} \)5.5**: Regarding safety & security for business from political and communal issues, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.
H₀5.6: Regarding availability of quality & cost effective biotech cluster, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀5.7: Regarding anticipated activities are launched in Genome Valley, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀5.8: Regarding biotech companies working as per the vision of the biotech policy, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀5.9: Regarding biotech companies are really green or just using the green name, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀5.10: Regarding adequate funding mechanism, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀5.11: Regarding Government R & D Labs benefit growth of biotech industry, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀5.12: Regarding capitalizing and commercializing by R & D Labs through genome valley, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.
H₀5.13: Regarding facilities in the incubation centers, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀5.14: Regarding adopting biotech companies by R &D Labs, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

H₀5.15: Regarding biotech companies taking direct support from R &D Labs, there is no significant difference in the level of satisfaction of the respondents of company, Government and R & D.

3.5.6 Further Analysis of Data:

In addition to the above hypotheses, additional hypotheses are also framed to understand the association between company and government, company and R & D. (i.e., taking two organization types at a time). While H₀1 to H₀5 give the overall results, the results for the remaining hypotheses are expected to yield results that would highlight the specific issues for intervention by the policy makers for ensuring development and sustenance of the biotech industry at genome valley.

3.5.7 Hypotheses Between Biotech Companies and Government

The researcher felt that there could be specific issues between company and government which need to be resolved. The same was also opined by the professors during the doctoral colloquium. Hence the following hypotheses are framed and the data collected from biotech companies
and government are be analyzed so that differences in the level of satisfaction of biotech company executives and government officials can be understood to take corrective steps.

$H_6$: Regarding support for land, water, incubation center space provided, there is no significant difference in the level of satisfaction of the respondents of company and government.

$H_7$: Regarding support for roads, lighting, electricity provided, there is no significant difference in the level of satisfaction of the respondents of company and government.

$H_8$: Regarding tariff on land, there is no significant difference in the level of satisfaction of the respondents of company and government.

$H_9$: Regarding tariff on water, electricity, incubation, there is no significant difference in the level of satisfaction of the respondents of company and government.

$H_{10}$: Regarding enabling government policy and support for land, license, forums and events, there is no significant difference in the level of satisfaction of the respondents of company and government.

$H_{11}$: Regarding enabling government policy and support for capital investment, VAT/exise/sales tax, factory clearance, clearance from pollution control board, single window clearance, there is no
significant difference in the level of satisfaction of the respondents of company and government.

H₀12: Regarding biotech ready cluster and climate for availability of biotech ready human resources, special department to address biotech industry issues, availability of investment agency, transport (air, road, rail connectivity), safety & security for business from political and communal issues, adequate funding, R & D testing, transport, quality cost, funding for innovative biotech firms, adequate facility at incubation centers, adoption of biotech companies by R & D institutions, direct support from R & D institutions by biotech companies, there is no significant difference in the level of satisfaction of the respondents of company and government.

H₀13: Regarding whether companies are working as per the vision of the biotech policy, biotech companies are really green and not just using the green, anticipated activities are launched in the genome valley and R & D institutions are commercializing through biotech industry, there is no significant difference in the level of satisfaction of the respondents of company and government.

H₀14: Regarding objections by inspector of factories, objections by pollution control board and A.P Policies biotech industry expectations, there is no significant difference in the level of satisfaction of the respondents of company, government and R & D.
3.5.8 Hypotheses Between Biotech Companies and R & D Organizations

In order to understand the variation in results, the data collected from the questionnaire are analyzed for results between company executives and R & D scientists as respondents. Such analysis is expected to yield results that would explain the areas of agreement and disagreement between companies and public R & D institutions so that corrective steps can be identified for bridging the gaps. For the data analysis of the company and R & D the following hypothesis are identified:

$H_015$: Regarding support for land and electricity, there is no significant difference in the level of satisfaction of the respondents of company and R & D.

$H_016$: Regarding availability of biotech ready HR, availability of biotech R&D institutes & testing centers, there is no significant difference in the level of satisfaction of the respondents of company and R & D.

$H_017$: Regarding R & D beneficial to the biotech industry, commercializing of R & D through genome valley, adoption of biotech companies by R&D labs, adequate facilities at the incubation centers, biotech companies can take direct support from R & D organizations, there is no significant difference in the level of satisfaction of the respondents of company and R & D.
3.6 RESEARCH METHODOLOGY:

The study is aimed at understanding the differences of opinion on the support systems provided so that necessary steps can be taken to identify the gaps. Value drivers so identified may be considered for implementation by all the stakeholders to foster development and sustainability of the biotechnology industry at the genome valley. The data are analyzed for company, government and R & D; company and government; company and R & D so as to understand the mutual perception.

3.7 SCOPE OF THE STUDY

The scope of the study is limited to the understanding of the entrepreneurial support systems provided by the A. P. State Government in collaboration with the private sector like IKP Knowledge Park, S.P Biotech and Alexandria at the Genome Valley, the R & D organizations in and around Hyderabad and the A.P State Government Departments supporting the cause of biotech industry at the genome valley.

3.8 PERIOD OF THE STUDY:

The period of the study is from January 2007 to July 2011. The review of literature, design of questionnaire, pilot study are completed during 2007 to 2009 and the actual data for the questionnaire are collected during January 2007- 2009 and the actual data are collected during December 2009 – June 2010.

3.9 SAMPLE
A multi-stage sampling technique is used for the purpose of the study. First simple random sampling technique is used for the selection of biotech companies so that they represent the population of biotech companies in the genome valley. Next purposive sampling technique is used in this study because for the questions in the questionnaire only specific people can give reliable information. For example the sufficiency of the infrastructure, tariff on electricity, tariff on water etc. are not known to all the employees in the organizations. When approached with the questionnaire the organizations authorized only concerned executives to fill the questionnaire so that the data collected is reliable.

For the collection of data from government officials and R & D scientists almost all the government organizations and public R & D institutions are considered for data collection. Even in this case purposive sampling technique is used to ensure that only those dealing with the activities of the biotech industry or research are considered as sample for the purpose of the study.

The total sample size for this study is 266. Data are collected from 77 biotech company executives, 44 government officials dealing with biotech industry at genome valley and 145 biotech R & D institutions. The primary data to understand the biotech support systems, enabling biotech policy and incentives and biotech ready cluster and climate are collected through a questionnaire given in appendix I. Table 3.1 gives the sample composition.
Table 3.1: Sample Composition of Organizations and Designations of Respondents (Total 266).

<table>
<thead>
<tr>
<th>Organizations</th>
<th>Designations</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6 Government organizations</strong></td>
<td>Director, Joint Director, Assistant Director, Deputy Director, Associate Director, R &amp; D Head, Assistant Manager.</td>
<td>44</td>
</tr>
<tr>
<td>1. Department of Biotechnology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Commissionerate of Industries, Govt. of A.P. APIIC</td>
<td></td>
<td></td>
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<tr>
<td>4. APSFC</td>
<td></td>
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<td>5. APITCO</td>
<td></td>
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<tr>
<td>6. Directorate of Oil Seeds</td>
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<tr>
<td><strong>20 Private and 77 Respondents</strong></td>
<td>President, Entrepreneur / CMD, Vice President, General Manager, AGM, Facility Manager, Group Leader, Manager Operations, Quality Manager, Manager Support, Plant Manager, Production Manager, Trainee Manager, Chemist, Senior Analyst, Analyst, Deputy COO, Deputy Manager, Assistant Manager, Officer HR, Programme Officer</td>
<td>77</td>
</tr>
<tr>
<td>1. Actus Pharam</td>
<td></td>
<td></td>
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<tr>
<td>2. Alexandria Biotech</td>
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<td>3. Bharat Biotech</td>
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<tr>
<td>4. Biological Events(BE)</td>
<td></td>
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<tr>
<td>5. Chem Bio</td>
<td></td>
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<tr>
<td>6. Clintox Bio</td>
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<td>7. Endoven Pharma</td>
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<td>8. FABA</td>
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<td>9. IKP Knowledge Park</td>
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<td>10. Incozen</td>
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<tr>
<td>11. Management Life Sciences Private Limited</td>
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<td>12. Nandi Foundation</td>
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<td>13. Nektar Pharma</td>
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<td>14. Reddy’s Labs</td>
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<td>15. S.P.Biotech</td>
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<td>16. Shanta Biotech</td>
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<td>17. Spinco</td>
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<tr>
<td>18. Unique Biotech Limited</td>
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<tr>
<td>19. Vivo BT</td>
<td></td>
<td></td>
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<tr>
<td>20. Vimta Labs</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>13 R &amp; D Labs and Universities</strong></td>
<td>Scientists Professors</td>
<td>145</td>
</tr>
<tr>
<td><strong>145 Respondents</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.10 DETERMINATION OF SAMPLE SIZE

Categorical sample size formula is being used for determination of the sample size. The researcher assumed that a set alpha level a priori at 0.05 and planned to use a four point scale. The acceptable error was set at 3% and an estimated standard deviation of the scale of 1.167. Hence the following Cochran’s sample size formula for continuous data is used:

\[ n_0 = \frac{(t^2 \cdot s^2)}{(d^2)} \]

\[ = \frac{(1.65^2 \cdot 1.167^2)}{(4 \cdot 0.03)^2} \]

\[ = 257 \]

Where

- \( t \) = value for selected alpha level of 0.10 in each tail = 1.65
- \( s \) = estimate of standard deviation in the population = 1.167.
- \( d \) = acceptable margin of error for mean being estimated = 0.21.
(Number of points on primary scale * acceptable margin of error;
points on primary scale = 4; acceptable margin of error = .03(error
researcher is willing to except)).

The sample for the present study is 266 > 257 hence it is a valid sample.

3.11 RELIABILITY AND VALIDITY ANALYSIS

'Cronbach α is used to understand the internal consistency/reliability of the questionnaire. Cronbach Alpha is the average of all possible split off coefficients resulting from different ways of splitting the scale items. It is found that the range of reliability coefficient varied from 0.635-0.784. The study considered some of the reliability coefficients beyond 0.70 considering the exploratory nature of research. This coefficient varies from 0 to 1, and a value of 0.6 or less generally indicates unsatisfactory internal consistency/reliability.

3.12 PILOT STUDY

The purpose of the plot study was to refine the measure of resource re-configurability, and to get an idea on validity of conceptual frame work in the study context. The pilot study was conducted as with the co-operation of select government officials, company executives and R & D scientists. With contribution of different categories biotech experts the final questionnaire is being designed so as capture more valid information for the final study.

3.13 DATA COLLECTION
Primary data and secondary data are collected for the purpose of the research work.

3.13.1 Primary Data

The necessary primary data was collected through administering a questionnaire designed exclusively to address the needs of the different stakeholders like bureaucrats, entrepreneurs, senior executives working in the biotech industry and scientists/professors from public R & D institutions listed in table 3.1.

3.13.2 Secondary Data

The secondary data collected from the databases of research journals and from the company web sites. This was particular useful to review literature in chapter II for finding the research gaps for designing the present study.

3.14 STATISTICAL DATA ANALYSIS

After completion of pilot study, full-fledged survey was conducted with the revised questionnaire. For the purpose of data analysis, a coding file was created with a distinct code assigned to each variable. Further, the response was coded, in the form of numbers assigned to each response. Data are arranged in an orderly fashion in a summary spread sheet, by counting the frequency of responses to each question. The main aim of this analysis was to examine the differences in the satisfaction levels of the stake holders – company, government and R & D.
After collecting the primary data, the interpretation was done by using IBM SPSS 19.0 Predictive Analytics Software. The statistical tools like crobach alpha, item statistics to test the internal consistency of the questionnaire are used. Cross tables, chi-square tests are used to test the hypotheses.

3.14.1 Factor Analysis

To understand whether the sample is adequate, Bartlet’s Test was conducted to decide the eligibility of the data for factor analysis. Subsequently, factor analysis was carried out. Scree plot, total variance, component matrix, rotational component matrix are derived to identify the influencing factors.

3.14.2 Chi square test

The Squares of standard normal variate is known as chi-square variate with one degree of freedom. $x^2$ Test is used:

1) To test the goodness fit between theory and practice.
2) To test the independence of attributes.

Conditions for applying $x^2$ test

1) The sample observations are independent.
2) The total number of frequencies should be large at least 50.
3) No theoretical cell frequency should be less than 5.

Since the above conditions are satisfied, chi-square test is used to test the hypotheses.

3.14.3 Correlation and Regression

In order to determine the regression equation, the following dependent and independent variables are identified.
**Dependent Variables**

Dependent variable is the one which is caused by one or more variables in the model. The present study focuses on the dependent variable ‘Availability of Quality and Cost Effective Biotech Cluster’.

**Independent variables**

Independent variable is the one with no prior causal variable causes one or more variables in the model. There are five dominant independent variables. In this particular study R&D Testing, transport, vision, Green Name, Anticipate Activities are taken as independent variables.

Regression line is determined to study direct linkages between the dependent variable and the independent variables at a time.

The data analysis is carried out in chapter 4 and the discussion of results is carried out in chapter V of the thesis.