

Detailed Project Report

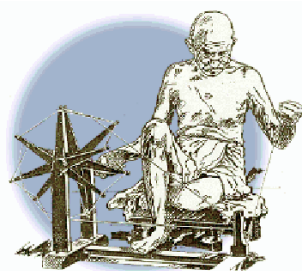
on

Setting up of

NATIONAL INSTITUTE *for* RURAL INDUSTRIALISATION



कामये दुःखतमानाम्।
प्राणिनाम् अतिनिश्चयम्॥



Project Sponsored
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KHADI AND VILLAGE INDUSTRIES COMMISSION

Consultants

INDIAN INSTITUTE OF TECHNOLOGY, DELHI

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Preface

In the Gandhian vision of “ Gram Swaraj”, self-reliant villages constitute the basic building block of sustainable economy and a humane civilization. In such a model, “Gramodyog” or village industries are expected to be the main engine of economic development. To make this possible, it is essential that quality inputs of science, technology and managerial skills be coupled with the traditional skills and knowledge base to develop efficient means of decentralized production of quality goods. Unfortunately, this did not happen and after independence, we also chose to follow the mainstream western model of development based on heavy industrialization.

The KVIC did try its best to promote rural industries. It reached out even to remote areas, and expanded its network enormously, but the KVI sector continued to be deficient in professional competence and its products could not penetrate the market adequately. The result, its contribution to GNP today is a measly 0.5 % and the economy of the country is primarily governed by the organized sector. The result of following this model of development for over fifty years are before us- extremely skewed economic growth, enormous unemployment, and alarming moral shrinkage.

Throughout the world, there is now increasing realization that heavy industrialization is inherently unsustainable and alternatives like the Gandhian Model of decentralized production need to be implemented seriously and widely. To give a fair trial to this concept it is essential that an infra-structural network be created to provide quality S, T & M inputs to rural industrialization. The present project aimed at setting up of a National Institute of Rural Industrialization at Wardha is expected to fulfill this long felt need.

The project has been conceived after sustained deliberations and consultations over two years between I.I.T.Delhi and KVIC. The MOU to initiate the project was signed in April 2001. Since then a number of field visits and consultations have been held to evolve an appropriate vision for NIRI. In July 2001 A National Workshop was organized in IIT Delhi to discuss in detail the vision, structure and modalities for setting up of NIRI. This draft DPR is based on this collective wisdom. We invite further suggestions for the improvement of this document, which will be finally launched on Gandhi Jayanti, October 2, 2001.

Acknowledgement

We would like to express our sincere gratitude to the Ministry of Small Scale Industries, Govt. of India, and Khadi & Village Industries Commission, especially Dr. Mahesh Sharma, Chairman KVIC, for reposing confidence in us and sponsoring this major project for establishment of NIRI to the IIT Delhi team. It is because of the unstinted support we have received from all the officers and staff of KVIC both at the headquarters in Mumbai and at JBCRI Wardha, and various regional offices, MDTCs, etc. that the project team could make so many field visits and get a first hand experience of the ground realities. These visits and interactions have been of great help in preparing this DPR, and we would like to thank all the people who made this possible. We would also like to acknowledge the cooperation and support of Dean IRD, IIT Delhi in accommodating so many requests of ours in view of the special nature of this project. Both the past Director of IIT Delhi, Prof. V.S. Raju and the present Director Prof. R.S. Sirohi have encouraged us to take up this challenging task and assured fullest cooperation from IIT administration. Our grateful thanks to both of them.

We would also like to put on record our deep gratitude to distinguished Gandhians and Sarvodaya Workers, people working with artisans and craftsmen, and others who participated in the National Workshop on rural industrialization organized by us in July this year, and shared their valuable experiences. Their guidance and suggestions have been of great help in clarifying our vision and have given us confidence that their blessings and good wishes for the success of this mammoth task are with us.

We would also like to express our sincere thanks to the colleagues from IIT, Delhi and other technical institutions who have given inputs to the DPR in many different ways. Our special thanks to the six section coordinators who have painstakingly worked for the chapters on different sections. Last but not least, we would like to put on record our appreciation for the dedicated work of the project staff, who worked overtime to meet the stringent 'deadlines' often set by us for various tasks.

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Chapter 1

Introduction

1.1 Background

The saga of India's development in the post-Independence era is one of remarkable achievements. We are today self-sufficient in food and have made remarkable strides in the fields of atomic energy, space exploration, information technology etc. A formidable infrastructure of heavy industries has been setup and we now have the ability to manufacture the most sophisticated machinery within the country. Viewed purely in economic terms, the achievements of our republic during the last 50 years are certainly remarkable, as can be seen from a perusal of basic statistics pertaining to Indian economy presented in the recent economic survey by the Ministry of Finance [Economy survey-2000], Table 1, which brings out a comparison between the production of various essential commodities in the year 1950-51 (before launching of the First Five-Year Plan) and in 1998-99, approaching the end of the Ninth Five-Year Plan.

Table 1: Production of Important Essential Commodities

(Million Tonnes)

Item	Year 1950-51	Year 1998-99
Food Grains	50.8	203.5
Cotton (M sq.m.)	4215	17948
Sugar	1.134	15.520
Steel	1.041	373.1
Aluminium	0.004	0.5368
Copper	0.007	0.0377
Cement	2.7	88.0
Paper and Paper Products	0.116	3.117
Electricity Generation (billion KWHr)	6.575	448.6
Crude Oil	0.3	32.7
Petroleum Products	0.2	64.5
Bicycles (thousands)	99	10373
Automobiles (thousands)	16.5	642

The figures speak for themselves and the tremendous strides made (in so far as the overall economic growth of the nation considered as a unit is concerned) are obvious.

Table 2 presents the corresponding figures for the services sector and once again, we can see an appreciable improvement in the services available in the country. As a measure of the overall increase of the "wealth" of the nation we may cite the increase in Gross Domestic

product from 140477 crores in 1950-51 to 1083047 crores in 1998-99, over seven fold increase in five decades.

Table 2: Data Relating to Service Sector

Sector	1950	1998
Health	9,209	43,322(1995-96)
Hospitals&Dispensaries	61,800	5,03,900
Doctors(Allopathy)	32yrs	63. 2 yrs.
Life Expectancy		
Transport Railways	53,596	62,800
Routes (Kms)	93.0	441.6
Goods (million tones)	1284	4411
Passengers (millions)		
Roads	399,942	3319,600(1996)
Length (kms.)	0.306	37.23(1996)
Motor Vehicles (millions)		
Air Travel	0.303	36.97
Passengers (millions)	33,600	6,99,000
Freight (tons)		
Communications		
Post Offices	30,180	1,37,043
Rural	5,284	15,598
Urban	8,205	43,452
Telegraph Offices	1,68,000	2.64 crores
Telephone Connections		
<i>Education</i>		
Schools (millions)	0.23	0.904
Colleges for gen. Edn.	370	7199
For Professional Edn.	208	2075
Universities	27	229
School Teachers (millions)	0.751	4.605

This is, however, only half of our story of development. The other half emerges if we ask ourselves the question: Who exactly has benefited from this increase in the national income? Has our cherished objective of a socialistic pattern of society been achieved? The statistics for this aspect of development are unfortunately very disappointing. The increase in GDP, it is revealed, is largely due to the growth in production of the items of consumption and services for the affluent sections of the (urban) society, viz., cars, scooters, televisions, refrigerators and air-conditioners, five-star hotels, flyovers and skyscrapers, etc., while the growth in the production of items of the poor man's budget, viz., coarse grain, pulses, cotton cloth, etc., has been dismal,(Table 3).

Table 3: Per-capita availability of certain important articles of consumption.

<i>Item</i>	Year 1951	1998
Cereals	334.2 g/day	417.3 g/day
Pulses	60.7 g/day	33.1 g/day
Cotton	14.4 m/year (1955)	13.1 m/year
Tea	362 g/year (1955)	676 g/year
Edible oil	2.5 kg/year (1955)	10.3 kg/year

The disquieting aspect of India's development becomes more clear when we disaggregate the data presented earlier. Table 4 compiled from the data in World Development Indicators 2001, for example, presents a picture of the distribution of the income in the country.

Table 4: Income distribution in India (1999)

	Population (millions)	Size of income (Billion USD)	Per capita income USD
Bottom 10%	99.8	15.5	155.3
Bottom 20%	199.6	35.7	178.9
Second 20%	199.6	51.1	256.0
Third 20%	199.6	66.2	331.7
Fourth 20%	199.6	85.2	426.8
Highest 20%	199.6	203.6	1020.0
Highest 10%	99.8	148.0	1482.9

The extremely skewed nature of the distribution is evident. While the top 20% of the population accounts for 46.1% of the income, the bottom 20% had a share of only 8.1%. More than 80% of the population had per capita income below the national average of USD 442. Even by our own national standards, 35% of our population continues to live below the poverty line i.e. the minimum subsistence level. The situation is further skewed with respect to the rural areas, with the percentage of people below the poverty line being 36.7% in 1993-94. Considering the fact that about 72% of the population resides in rural areas, it means that in 1994, 238 m people in rural areas and 77m in urban areas were living below the poverty line.

This stratification in our society is getting further exacerbated due to the sudden change in economic policies necessitated by signing of WTO agreement. This process of Globalization is again benefiting the top 20% of the population, i.e., the rich and the upper-middle class and proving detrimental to the bulk of the citizens. With restrictions on imports of most commodities lifted, the markets are flooded with cheaper goods from abroad, and

the local industries, especially those in small scale and tiny sector, and even the farmers, are finding it difficult to sell their products. The result is increasing industrial sickness and impoverishment of rural areas. As pointed out by the Prime Minister's Council on Trade and Industry (2001), "As on March 31, 1998, there were 2,24,012 sick/weak units and the total bank credit locked in such units was Rs. 15,682 crores. As the industry is undergoing transition and restructuring in the face of globalization, it is compelled to rationalize the employed workforce, giving rise to the problem of joblessness, when the need is to create more job opportunities."

It is evident from this analysis that there is a great need not only to increase the overall growth of the economy, but also to reduce the inequity in the society, for "stark inequalities can be a recipe for socio-political and economic de-stabilization in a globalising economy" [PM's Council-(2001)]. How to do so, is the moot question?

1.2 Growth with Equity – Gandhian Perspective

Economists have always recognized the need for economic growth with equity, but the suggested means to achieve it differ. In the mainstream 'free-market' economics, it was presumed that the "invisible hand of Providence" would do this job and "make nearly the same distribution of the necessities of life which would have been made had the earth been divided into equal proportions among all its inhabitants". [Adam Smith, 1776]. There was, therefore, no need of any 'intervention' in the free market and competition. The evidence of over two centuries shows that the 'invisible hand' has failed to operate. As Lutz and Lux (1979) point out, this is because Smith presumed the existence of "moral sentiments" in the society, which allows the operation of the invisible hand of Providence. However, increasing mass production, ever-widening markets and resulting increase in insatiable greed have led to a moral decay, which threatens to destroy the very framework of the market place itself. "With social and moral framework eroded and defunct, rules and regulations are necessary to ensure the working of the system, and more and more rules to enforce these rules, so that we arrive at the present point where so much of society is encased in huge bureaucratic frameworks. Modern business today is more and more the process of making and enforcing contracts and subcontracts. Anybody who visits the headquarters of a large corporation will be overwhelmed by the presence of lawyers everywhere". [Lutz & Lux, (1979)].

At the other end of the spectrum of models of economy is the "scientific-socialistic" model of Karl Marx and Engels, in which the state and the entire citizens share/ own all property it, more or less according to their need. Thus it is hoped that can end the inequalities brought about by capitalist mode of production and free-market economy. However, the disintegration of Soviet Union and most other communist regimes has clearly shown the inadequacy of this model. As has been pointed out by Dhar & Gaur (1992), the attempt to mix a humanistic urge of sharing with fraternity into a fundamentally materialistic model (which, like the capitalist model, considers the only human goal to be maximization of well-being through wealth), is basically flawed.

The third stream of economic philosophy – much admired and equally reviled, but never implemented, is what may be termed as Humanistic Economics. Its objective: design of appropriate institutional arrangements pertaining to the process of production, distribution and consumption that will enable optimal satisfaction of the whole spectrum of human needs. [Lutz and Lux (1979)]. Unlike the other two economic theories mentioned above which assume that human being is interested only in consumption and accumulation, i.e. satisfaction of its physiological wants, humanistic economics recognizes the whole hierarchy of Maslovian needs ranging from physiological to social, moral and self-

actualisation needs. John Ruskin was probably the forerunner of this thought in modern times, and this was articulated forcefully in twentieth century by Mahatma Gandhi and later by E.F.Schumacher. We shall focus on the articulation of this philosophy as done by Gandhiji as it is of direct relevance to our country.

The basic tenet of Gandhian economics, as it is known widely now, is regional self-sufficiency, or *Gram Swaraj*.

“My idea of village Swaraj is that it is a complete republic, independent of its neighbours for its wants, and yet interdependent for many others in which dependence is a necessity. Thus every village’s first concern will be to grow its own food crops and cotton for its cloth. It should have a reserve for its cattle, recreation, and playground for adults and children. Then, if there is more land available, it will grow useful money crops, thus excluding ganja, tobacco, opium and the like. The village will maintain a village theatre, school and public hall. It will have its own waterworks ensuring clean supply. This can be done through controlled wells and tanks. Education will be compulsory up to the final basic course. As far as possible, every activity will be conducted on the co-operative basis. There will be no castes such as we have today with their graded untouchability. Non-violence with its technique of Satyagraha and non –co-operation will be the sanction of the village community. There will be a compulsory service of village guards who will be selected by rotation from the register maintained by the village. The government of the village will be conducted by Panchayat of five persons, annually elected by adult villagers, male and female, possessing at least minimum prescribed qualifications. These will have all the authority and jurisdiction required. Since there will be no system of punishments in the accepted sense, this Panchayat will be the legislature, judiciary and executive combined to operate for year of office. ”

He realized that to achieve this dream of self-sufficient village republics, revival of rural industries was absolutely essential. But this could not be achieved by following the western model of industrialization based, as it was on exploitation .The technology that enabled this exploitation, therefore, needs to be eschewed. In 1934, he created All-India Village Industries Association (AIVIA) to work towards development of a model of non-exploitative rural industrialization. It is not that he was opposed to all heavy industries. Elaborating his vision of rural industrialization, he wrote in Harijan in (27-28 January) 1940:

“I do visualize electricity, ship building, iron works, machine-making and the like existing side by side with village handicrafts. But the order of dependence will be reversed. Hitherto industrialization has been so planned as to destroy the villages and village crafts. In the state of the future, it will sub serve the villages and their crafts Nothing will be allowed to be produced by the cities, that can be equally well produced by the villages. The proper function of cities is to serve as clearing houses for village products”.

It is evident from the above that promoting equity is the hallmark of Gandhian economics. He was not against science and technology but wanted it to be used judiciously so that the inequity in the society was reduced. In fact he took the initiative of inviting the attention of S & T community towards some important issues needing input from them, which alas await attention even now! The following excerpts from his speech at the inauguration of AIVIA bring this out succinctly:

“I sent a questionnaire to several of our well-known doctors and chemists asking them to enlighten me on the chemical analysis and different food values of polished and unpolished rice, jaggery and sugar etc. Many friends, I am thankful to say, have immediately responded, but only to confess that there has been no research in some of the directions I had inquired about. Is it not a tragedy that no scientist should be able to give me the chemical analysis of such a simple article as gur? The reason is that we have not thought of the villager. An esteemed Doctor friend writes to say that in his hospital polished rice is taboo and that it is proved after experiments on rats and other animals that polished rice is harmful. But why have not all medical man published results of their investigations and joined in declaring the use of such rice as positively harmful?”

The most common criticism of Gandhian model of development is that it is utopian, infeasible, and would take the country back into mediaeval times. With ever increasing population, it would not be possible to meet even the basic needs of food, clothing and shelter, if the heavy industries are neglected and replaced by tiny cottage and village industries. Of course, these are only apprehension based on the fears that we may be left behind in the race of ‘development’ *a la* west. Detailed mathematical simulation studies carried out at IIT Delhi (Ajit Kumar (1991)) have shown that it is possible to design village republics (using the currently available decentralized rural technologies) which are not only self-sufficient in so far as their basic needs are concerned, but are able to generate appreciable surplus produce for the cities.

We also need to appreciate that the ‘growth’ that we have achieved by following the western model is in fact, illusory. The amount of external debts, which our country owes today, is mind boggling 98 billion USD, about 21% of our GDP. The debt service payments amount to about 16% of current revenue receipts. If we include the external borrowing of the government, the picture is even grimmer. Today the total interest payments are 64% of the tax revenues, i.e. about two thirds of taxes collected go to meet obligations of the past borrowings [PM’s council (2001)]. Surely, on alternative model, which promises self-sufficiency, is worth exploring!

It should also be evident from Gandhiji’s statements quoted above that there is no question of replacing the heavy industries which play an important role in National Development. Rural industries play a complementary role not just to provide gainful employment but because, it makes sound economic and ecological sense to produce most items of daily use, especially the agro-based product, in villages. Of course, we need to ensure that the methods of production, quality control and marketing are efficient.

There is also the important issue of sustainability, which has, of late, been in focus. Many of the technologies and products currently in vogue, and the lifestyles of some of the ‘developed’ nations are inherently un-sustainable, both ecologically and socially. As has been pointed out by Dhar & Gaur (1992), this is due to the inherent characteristics of modern technology conceived and fostered in a materialistic world view – a belief that equates human happiness with hedonistic pleasures gained through material prosperity. No

wonder all societies that have embarked on 'modernization' through industrialism are experiencing an outbreak of materialism and all its adjuncts like consumerism, urbanization, increasing inequity and resulting strife, corruption, alcoholism, environmental degradation etc. Gandhiji the visionary that he was, had forewarned the society about these consequences of industrialism and resulting urbanization:

“Our forefathers reasoned that large cities were a snare and a useless encumbrance and that people would not be happy in them, that there would be gangs of thieves and robbers, prostitution and vice flourishing in them and poor men would be robbed by rich men. They were, therefore, satisfied with small villages”.

It seems evident to us that the only way to achieve growth with equity is by giving a massive push to the process of rural industrialization, which has been going on at a rather slow pace over the last four decades, but keeping in view the holistic vision of development as laid down by Gandhiji. Thus, while we need to increase the productivity and quality of the produce, this should not be at the cost of reducing employment or creating environmental pollution; we need to increase the purchasing power of rural India but not by pampering the baser instincts; we need to promote economic growth but not at the cost of moral shrinkage and increasing debts.

This aspect of Moral shrinkage, i.e corruption and immorality is often treated as extraneous to the discussion of our model of development for we usually assume that technology is value neutral, just as a tool can be put to any use. However, as discussed at length by Dhar and Gaur (1992) this is an erroneous view. At least this much is self-evident that the Gandhian concepts of cooperative living, frugality and voluntary simplicity (which are a means to contain and eventually sublimate the baser instincts of man) are implicitly rejected by the modern industrialism, which advocates cutthroat competition (to increase quality and innovation) and consumerism (to increase product demand). It is, therefore, only natural that ruthlessness, arrogance and ostentation are the values adored in the society which embraces the developmental path chalked out by industrialism. Our leaders had repeatedly warned the nation against the twin demons of acquisitiveness and consumerism (associated with industrialism) and it was their hope that state control (through licensing and taxation, preferential treatment given to various sectors, etc.,) along with our age-old beliefs would be able to insulate us from their evil influence. Unfortunately, this was not to be and today we are totally in the grip of these demons, which seem to have completely devoured the values and beliefs cherished by us for thousands of years. Corruption and immorality in our public life have become so widespread and deep that almost superhuman will power and convictions are needed to stay honest, for bribes and kickbacks have now come to be accepted as 'normal'! The extent of corruption can be gauged from the fact that estimates of the unaccounted money in circulation today range from 30 to 50% of our GDP. Transparency International and Gottingen University bring out a ranking of countries based on the perception of business people on the extent of corruption in the society. In its 1996 survey, of the 54 countries studied, India was placed 46th, or 9th most corrupt country among these. It will not be an exaggeration to say that all our gains in the economic field are much too 'small' in comparison with the losses in the ethical and moral field. This hard fact should also motivate us to sincerely consider the alternative Gandhian Model of Development and create mechanisms to give a fillip to process of rural industrialization.

1.3 Summary

The development of India in the post independence era has resulted in skewed economic growth and moral shrinkage. These problems of increase in inequity and decreasing morality, which are getting exacerbated by the policy of unbridled liberalisation and globalization,

threaten the very social fabric of our country. The only way out is by making sincere efforts to implement the Gandhian Model of Development with its pre-eminent emphasis on rural industrialization.

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Chapter 2

Challenges of Rural Industrialization

2.1 Background

To give a decisive push to the process of rural industrialization is certainly a very challenging task. Many attempts have been made in this direction, in our country, and they have certainly borne some fruit. Today the Khadi and village industries sector, has its activities spread over 2.61 lakh villages. In year 1999-2000, the total product of Khadi was worth Rs.551.94 crores and that of village industries amounted to Rs. 5613.41 crores. The figures of employment for the same year are 12.35 lakh persons in Khadi and 46.88 lakh persons in VI sector. Though in absolute terms, the magnitude of production looks substantial it amounts to only 0.5% of the GDP. In contrast, the small-scale industries contributed Rs. 5,27,515 crores to the economy in 1998-99, which is about 45% of GDP, out of which exports were valued at Rs. 49,481 crore, about 35% of country's total exports. The corresponding figure for the exports of KVIC sector for the year 1998-99 was Rs. 24.69 crores.

It is evident from these figures that the potential of K & VI sector remains largely underutilized. The productivity per person employed in KVI sector was Rs. 10,1410 per year in 1999-2000, as against the corresponding figure of Rs. 1,68,322 per year in small industries sector in year 1998-99. Of course, one cannot hope to have similar levels of productivity in highly mechanized small-industries sector and that in the KVI sector with minimal mechanization. But surely, the order of magnitude difference in these two figures does indicate the potential for improvement of the productivity in KVI sector.

Increasing productivity is not the only challenge facing this sector. There is equally, if not more, daunting task of improving the quality of the products. We need to provide science, technology and management inputs at par with that has been given to the organized sector, so that "production by masses" can be done so efficiently as to enable it to compete with mechanized "mass production". A SWOT analysis of the present scenario reveals to us the complete picture. The strengths of our country lie in a large highly competent manpower trained in science, technology and management. Besides, there exists a vast base of skills and traditional knowledge in the countryside. The KVI sector that has been nurtured by the government over the last four decades has also established a network of training centers, production units and specialized laboratories across the country. Its rich experience is an asset to the process of rural industrialization.

Many new opportunities exist for this sector today. The increasing awareness of ecological damage being done by the heavy industries is increasing the acceptability of tiny industries and their products, which can be produced and consumed without harming the environment. The largest ever assembly of the Heads of State took place at the UN Conference on Environment & Development held in 1992, wherein all nations resolved to work for sustainable development. The fact that village industries, with their small-scale operations, are inherently environmentally benign, and can be easily tailored to meet the requirements of ecological sustainability, should help increase their acceptability. Even in terms of specific product choices, which have evolved our last decade, we find increasing demand for cotton fabrics (as against craze for synthetics in the seventies), popularity of natural and herbal foods, and increasing acceptance of ayurvedic remedies. All these are ideally produced in the village industries.

The biggest threat to popularization of village industries seems to be from vested interests of policy makers working in connivance with heavy industries. The unbridled globalization leading to unfair competition between Trans National Corporations and tiny sector units is another factor, which needs to be addressed.

In so far as the weaknesses are concerned, the biggest deficiency today is that there exists no institutional mechanism to provide, in a well-coordinated manner, all the inputs needed to promote rural industrialization.

In the absence of this coordinated input the products of KVI sector are unable to compete with those of the organized sector, even in those areas where they hold a natural edge. Not that efforts have not been done till now, but these have been fragmented, and have not been so fruitful, since even a single weak link in the production-marketing-supply chain can play havoc with the economics. A brief review of the efforts made to strengthen KVI sector follows.

2.2 Review of past efforts at strengthening KVI sector

The strengthening of KVI sector started with the advent of modern science and technology in India in the second half of 19th century. The Swadeshi movements of Bengal, Maharashtra and other places were, at that time, motivated by the application of modern science of technology to the traditional sector of village industries. Countries like Japan were providing the guidelines to modernize and industrialize by using modern science and technology in the traditional sectors of production. Eminent Scientist in India like Dr. Mahendralal Sircar, Prof. C.V. Raman, Prof. J.C. Bose, Prof. P.C. Ray and others were all seriously pursuing the task of modernizing India through development of indigenous science and technology and its application for the benefit of the masses. National leaders like Bal Gangadhar Tilak and Mahatama Gandhi provided the necessary support and a national perspective to such efforts and took them to the level of mass movements. The one Paisa glass factory movement of Pune led by Tilak in the early 20th century, creation of All India Spinners Association in 1925 by Mahatama Gandhi, setting up of All India Village Industries Association in 1934 were steps in this direction. After independence, the First Five Year Plan underlined need of an All India Organisation for Rural Industries at apex level. Govt. of India created the All India Khadi and Village Industries Board in 1953. The Khadi and Village Industries Commission was constituted by Parliament Act No. 61 in 1956 with executive as well as administrative powers for the development of KVI programmes.

The basic objectives of KVIC are: “providing employment”, “producing saleable articles”, and “creating self-reliance” amongst the people & building up of a strong Rural community spirit.

The KVIC is charged with the functions of planning, promotion, organization and implementation of programmes for the development of Khadi and other village industries in the rural areas in co-ordination with other agencies engaged in rural development wherever necessary. Its functions also comprise building up of a reserve of raw materials and implements for supply to producers, creation of common service facilities for processing of raw materials as semi-finished goods and provisions of facilities for marketing of KVI products, apart from organization of training of artisans engaged in these industries and encouragement of co-operative efforts amongst them. To promote the sales and marketing of Khadi, products of village industries and handicrafts, the KVIC may forge linkages with established marketing agencies wherever necessary and feasible. The KVIC is also charged

with the responsibility of encouraging and promoting research in the production techniques and equipments employed in the Khadi and Village Industries sector and providing facilities for the study of the problems relating to it, including the use of non-conventional energy and electric power with a view to increasing productivity, eliminating drudgery and otherwise enhancing their competitive capacity and arranging for dissemination of salient results obtained from such research. Further, the KVIC is entrusted with the task of providing financial assistance to institutions and persons who are engaged in the development and operations of khadi and village industries and guiding them through supply of design, prototypes and other technical information. In implementation of KVI activities, the KVIC may take such steps as to insure genuineness of the products and to set standards of quality and ensure that the products of khadi and village industries do conform to the standards. The KVIC may also undertake directly, or through other agencies, studies concerning the problems of khadi and village industries besides experiments or pilot projects for their development.

2.3 Industries Under Purview of KVIC

Khadi means any cloth woven on handloom in India from cotton, silk or woollen yarn handspun in India or from a mixture of any two or all of such yarns. 'Village Industry' means any industry located in a rural area (population of which does not exceed twenty thousand) which produces any goods or renders any service with or without the use of power in which the fixed capital investment (in plant and machinery land and building) per head of an artisan or a worker does not exceed Rupees fifty thousand. The KVIC has grouped various villages industries under following seven heads for the purpose of implementation of its programmes:

Mineral Based Industries like cottage pottery, limestone, stone cutting etc. Manufacturing of paints, pigments varnishes and distemper, glass toys, glass decoration cutting, designing and polishing, gems cutting.

Forest Based Industry like handmade paper, manufacture of gums and resins, cottage match industry etc.

Agro Based and Food industry like processing, packing and marketing of cereals, pulses, spices, condiments, masala etc., palm gur making, cane gur and khandsari, bee-keeping, fruits and vegetable processing, ghani oil industry, fibre other than coir, collection of forest plants and fruits, cashew processing, leaf cup, milk products, cattle feed, poultry feed.

Polymer and Chemical Based Industry like flaying, curing and tanning of hides and skins and ancillary industry, cottage soap industry, rubber goods (dipped latex products), product of rexin PVC etc., camphor and sealing wax, essential oils, detergents and washing powder (non-toxic).

Engineering and Non conventional Energy like carpentry, black smithy, manure and methane (Gobar) Gas from cow dung and other waste products (such as flesh of dead animals, night soils etc.), vermiculture and waste disposal, manufacture of electrical and electronic items, carved wood, hand carts, bullock carts, small boats, assembly of bicycles, cycle rickshaw, motorized carts etc.

Textile industry (Excluding khadi) like Lok Vastra cloth, hosiery, carpet weaving.

Service Industry like laundry, barber, plumbing, repair of diesel engines, pumpsets, servicing of electric wiring and domestic electronic appliances and equipments, tyre vulcanizing unit, agriculture servicing for sprayers, insecticides, pumpsets etc.

Negative List

KVIC has approved the negative list of activities, which should not be considered for funding under KVIC's Scheme. These are:

- **Special Ethos of KVIC:** Any industry/business connected with Meat (slaughtered), its processing, canning and/or serving items made of it as food, production/ manufacturing or sale of intoxicant item like Beedi/Pan/ Cigar/Cigarette etc. Any Hotel or Dhaba or sales outlet serving liquor, producing tobacco as raw materials, tapping of toddy for sale.
- **Jurisdiction:** Any industry/ business connected with cultivation of crops/plantation like tea, coffee, rubber etc., Sericulture (cocoon rearing), activities related to coir, horticulture, floriculture, pisciculture, piggery, poultry, animal husbandry, any project producing yarn and cloth (cotton, woollen, silk and polyvastra) with the help of power, textile made out of mill yarn.
- Any project, which causes Environmental Problems: e.g. Manufacturing of polythene carry bags and other items, which cause environmental problems.

2.5 Jamnalal Bajaj Central Research Institute (JBCRI)

Jamnalal Bajaj Central Research Institute (JBCRI), Wardha was established in 1955 during the First Five Year Plan, to promote research in the techniques of production of Khadi and in the development of Village industries, and to provide facilities for a study of problems relating to Khadi & Village industries. It was expected to serve as a liaison between National Laboratories and small research institutes, in the entire field of Khadi and Village Industries. The land of JBCRI was taken on lease from Sarva Seva Sangh, initially for a period of 15 years from 1955 and then renewed for 30 years from 1979. Meanwhile in 1990, it was acquired by KVIC. To begin with, JBCRI had been started by KVIC on the premises of Maganwadi. There is a historicity attached to this place, which being the third Ashram Gandhiji created in India after coming back from South Africa. The first Ashram was at Kochrab and second at Sabarmati, both in Ahmedabad city, and Maganwadi was the third Ashram started in 1934 and he lived here for two years before settling at Sewagram. It was at Maganwadi that he started the All India Village Industries Association (AIVIA) for the development of Village Industries in the country. For 20 years, from 1934 to 1954, AIVIA had its headquarters and research, production and training center at this place. These were developed by Prof. J.C. Kummerappa to make this the nodal place from which the village industry movement in India took inspiration. To continue this noble mission KVIC took over the premises of Maganwadi in 1954 and started the JBCRI. From its inception to 1976, JBCRI was carrying out R&D activities. From 1976 to 1978, it was closed for a brief period and then restarted. However, no major R&D project was undertaken at the Institute after 1976. A number of Committees have gone into the restructuring of JBCRI, the latest being the report submitted in 1995 by the Committee headed by Shri. Bhagwat Saboo, Member KVIC. A new phase opened in the Fifth Five Year Plan when, the National Committee of Science and Technology (NCST) set up by the Department of Science and Technology, Government of India recognized KVIC as the nodal body for carrying out R&D work in KVI Sector. While acknowledging the contribution already made by KVIC to the adoption of improved technology, the committee

highlighted some of the shortcomings. The Committee concluded that there was no escape from the adoption of improved technology and the use of modern equipment and instruments. While the Department of Science and Technology provided the funds and monitored the programme during the Fifth Plan, this responsibility was transferred to the administrative ministry (viz: Ministry of Industry) during the Sixth Plan. To look after the above programme, the KVIC created a separate Directorate of Science and Technology in 1976. The Directorate was required to maintain close co-ordination with various Science and Technology institutions in the country. However all was not satisfactory. The KVIC Review noted “although a separate Directorate was created in the KVIC for these purposes, it was not equipped with the personnel and the authority necessary for guiding and implementing the research programmes”.

The withdrawal of the Department of Science & Technology from the programme in the Sixth Plan also had some adverse effects on the technical content. The discontinuance of the Central Advisory Committee on S&T from 1982 made matters worse. “None of the members of the KVIC had the training or background to provide the necessary drive and leadership in the fields of Science & Technology. No serious attempt was made to make good this deficiency, as was done in earlier decades, by associating eminent scientists with the work of the KVIC through adhoc committees and by giving them sense of purposeful participation”, noted the review committee. The importance of S&T for the decentralized sector and for production by the masses had been amply emphasized by the Technology Policy Statement of January 1983 also. The Seventh Five Year Plan carried the matter further. The working group on R&D set up in connection with the Seventh Five Year Plan had also made a number of recommendations. But neither the suggestion made by Working Groups nor those made by Review Committee were properly implemented, and hence the state of affairs in KVIC in general, and the JBCRI in particular, regarding Science & Technology inputs left much to be desired.

The Government of India has recently launched, (Budget’99), a new program named ‘National Program for rural Industrialization, (NPRI)’. It has been emphasized there that “Rural Industrialization is important for creating employment opportunities, raising rural incomes and strengthening agriculture –industry linkages. Thus far it has been pursued by a multiplicity of government agencies. However, the inputs of their program at the grassroots level have remained modest. We must integrate the efforts of the various government agencies and clusters every year to give a boost to rural industrialization and to benefit the rural artisans and unemployed youth. In the long run it will reduce rural-urban disparities. The proposed rural clusters will be spread throughout the country, with a reasonable balance between high potential and backward rural areas”.

Khadi and Village Industries Commission (KVIC) will play an important role in this. It was in August 1990 that the KVIC decided to adopt cluster approach in order to have a wider coverage of artisans, particularly those engaged in traditional industries under its purview. In the year 1998, as a part of ‘Abhyudaya’ – KVIC’s celebration Program of Golden Jubilee of India’s Independence- KVIC made a thorough review of this scheme and decided to revive the cluster approach in a vigorous manner. The commission in its 481st meeting held in June 1998 decided to:

- Set up 50 clusters per year in back-ward districts/ rural areas.
- Promote clusters of village industries to create more employment opportunities.
- Establish forward and backward linkages and common services network supporting the satellite cluster units from mother centers.
- Make available common services facilities and technological back up services in the selected centers to the cluster units, and

- Create/upgrade infrastructure facilities like power, water communication etc. in the new as well as existing centers.

The NPRI has also envisaged that the marketing infrastructure available with KVIC would be put to optimum use in this effort. It will go a long way in the marketing of rural industrial products if KVIC could develop its own brand name for the purpose.

The Council for Scientific and Industrial Research (CSIR), New Delhi; The Council for Advancement of people's Action and Rural Technology (Ministry of Rural Development); The Department of Science and Technology (DST) under its Science & Society Scheme; The Center for Rural Development and Technology, IIT Delhi; CITARA, IIT Bombay; ASTRA, IISC Bangalore; RTC, Gandhi gram and many other such research organizations have over the last few decades developed many viable, sustainable and replicable technology packages /models, particularly in rural industries which can be utilized for the benefit of weaker sections in villages. These models have been proved through field projects and in some cases, through All-India Co-ordinate Programme (AICPs) under which several projects were set up and monitored for long periods. These models have been evolved and implemented through voluntary agencies with S&T Institution providing necessary knowledge back up support for these programmes.

These institutions, however, have neither the mandate nor the funds to take up widespread replication. Similarly, whereas the Khadi and Village Industries Commission (KVIC) implements numerous programmes, there has been little integration with or utilization of technologies or models developed by S,T and M institutions, National Laboratories etc. or even utilization of the technical expertise available therein. There is a need for both these S,T and M institutions and KVIC to interact actively and evolve programmes of dissemination of proven technology packages through villages industries development efforts of the KVIC.

This interaction and collaboration could generate a major programme of Rural Industrialization in the country providing employment to a very large number of people and bringing about comprehensive development of the rural areas as well as the national economy as a whole.

2.6 Summary

To give a decisive fillip to rural industrialization is a very challenging task. KVIC is the nodal agency entrusted with this task by an act of parliament. A review of the past attempts made in this direction reveals the necessity of synergising the expertise available in the large number of S, T & M institutions spread across the country with the in extensive network of KVI institutions.

Chapter 3

A Vision for NIRI

In the light of above analysis it emerges that the most important requirement for accelerating rural industrialization is to create a mechanism of providing all the inputs (be these scientific, technical, managerial, financial, marketing or quality assurance, etc.) in a well coordinated manner, so that the productivity levels rise, the product quality improves and these become easily available to the users at a competitive price. Of course, the goal shouldn't be merely economic revival of VI sector, but creating conditions for moving towards the Gandhian Model of sustainable and holistic development, which envisions economic, mental, moral and spiritual development of the society. To propose that a single institution can meet this tall order may seem rather presumptuous. However, considering the various constraints existing at present, and the need to start such an experiment at a modest level, it is proposed that initiation of this task be entrusted to the National Institute for Rural Industrialization (NIRI) to be set up at the present JBCRI compound with the following broad goal:

To upgrade and accelerate the process of rural industrialization of our country so that we can move towards Gandhian vision of sustainable village economy and the products of KVI sector can coexist with those mainstream industrial sector and become equally popular in the country.

We need to clearly delineate various sub-goals or objectives, which put together would enable us to achieve this goal. This can be done by recalling the various facts of Gandhian Model of development briefly enunciated in Chapter 1, and the challenges of rural industrialization discussed in Chapter 2.

It is evident that to make the products of KVI sector survive in the competitive market, there is a need to provide S&T inputs to upgrade the technologies, increase their productivity without displacing labour, and improve the product equality. This also demands adapting modern techniques of industrial engineering like production management, SQC, TQM, supply chain management for VI sector. Novel marketing and financing strategies would have to be evolved to ensure that there are no bottlenecks in the procurement of raw materials and the sale of finished goods.

Considering the wide diversity of products in KVI sector it is evidently impossible for any single institution to do all these tasks. It is proposed that all these S, T&M (science, Technology & management) inputs be sought from the experts available in various institutions like IITs, IISc, RECs and other engineering colleges, IIMs and other university departments of management etc. NIRI should act as the coordinating institution to provide this upward linkage with appropriate experts. Its role would be to translate the actual problems facing the rural industrialists, the artisans and craftsmen into well defined S, T&M problems which could be transferred to the experts. In the task of problem identification it would take the help of institutions, which have direct interaction with the field. These could be various KVIC institutions, the community polytechnics or NGOs engaged in such activities. Thus the most crucial task of NIRI would be to establish an effective two-way linkage and act as a nodal point between the village industries and S, T&M experts. This linkage should also eventually include corporate houses, chambers of commerce and industry who need to be educated about the need for sustainable technologies and motivated to join in this task of establishment of an egalitarian society through rural industrialization.

To motivate the S, T&M experts to join in this task, it would be essential to work towards creation of an ethos in the country, especially in institutes of professional education, to attract young scientists, engineers and managers towards Gandhian Model of development and rural industrialization. This would need a sustained effort in development of suitable HRD programmes, which should be able to motivate these academic institutions to initiate debate on models of sustainable development. Of course, there also exists the need for specialized training programmes to promote rural entrepreneurship, improve productivity, quality control, and management in KVI sector, enhance creativity and innovation etc. The most effective way of building and maintaining the enthusiasm of S, T, &M experts would be to sponsor live projects in mission mode so that within 2-3 years substantial thrust can be given to the market penetration of selected VI products.

A crucial aspect of promoting rural industrialization is to give due regard and value to the traditional knowledge imparted in the age-old institution through *guru-shishya* parampara (teacher-disciple tradition). Special HRD programmes need to be developed to enable master craftsmen trained in such informal manner to gain equivalent technical diplomas/degrees so that they can get pecuniary benefits commensurate with their skills by getting integrated in the mainstream professional education.

Encouraging innovation and development of new technologies/products is of crucial importance in facing the challenges imposed by Globalization. To enable this 'user-friendly' mechanism would have to be developed by NIRI so that pilot level demonstrations and field trial of innovative ideas can be undertaken with minimal risk to the entrepreneur.

In the light of changes in the preferences of people brought about by increased awareness of ecology, holistic health etc., there is a need to identify newly emerging areas where opportunities for VI sector contribution exist. The advances in the field of information and communication technology also open new vistas for VI sector, and a judicious use of these new developments needs to be done, e.g. through development of exhaustive GIS and MIS for this sector which could be accessed through the web. This would speed up the availability of technical and commercial information thus increasing both the productivity and the marketability of the products.

Another important task visualized as a part of mandate of NIRI is to facilitate the setting up of Rural Industrial Estates. NIRI should identify regions rich in resources, both material and skilled manpower, where such clusters of Khadi and Village industries could be set up, and provide the basic infrastructure facilities like electricity and other forms of energy, water, sanitation, cold storage, tool rooms, marketing facilities etc. This would enable artisans and small entrepreneurs to just 'move in' a ready-made space and start production without debilitating delays usually faced by them in setting up an enterprise due to non-availability of basic infrastructure facilities. Such industrial estates could be designed in a holistic manner e.g. with cattle providing milk for processing, their dung and local bio-mass used to provide energy to process the agricultural produce and run other industries. We could thus take a decisive step towards demonstrating the viability of Gandhian model of self-sufficient village republics.

3.1 Summary

There is a need to set up an apex institute to give a major thrust to the process of rural industrialization. Its activities should include:

To set up a strong two way linkage between NIRI, the rural 'industrialist' and the 'technical' experts available in the professional institutes to facilitate quick

- availability of S, T & M inputs for rural industrialization, and to identify newly emerging areas where opportunities for V I sector contribution exist.
- To set up rural industrial estates with all the necessary infrastructure facilities like power (preferably renewable energy based), water, sanitation, cold storage, specialized tool rooms/testing facilities, linkage for marketing & raw materials etc.
 - To undertake / sponsor project in mission mode to give substantial thrust to the market penetration of selected VI products.
 - To conduct specialized HRD programmes in generic areas like Quality Systems, Enhancing Productivity, TQM, creativity and innovation, Rural Entrepreneurship Development, Gandhian Model of Development Cooperative management practices etc.
 - To promote innovation by supporting pilot level studies / field trials of new ideas.

Chapter 4

The Proposed Structure

To achieve the objectives set forth for NIRI in Chapter – 3, it would be necessary to plan its organizational structure in a manner which is least bureaucratic and yet has sufficient checks and balances to ensure accountability. In view of the vast range of industries encompassed by the KVI sector, it is essential to group these in a manner which is in tune with the S, T & M inputs needed so that optimal use is made of the in house expertise. Accordingly, it is proposed that the activities in NIRI be sub-divided into following six generic areas:

- Khadi and Textile Industry
- Rural Chemical Industry
- Bio-Processing based Industry
- Rural Infrastructure and Energy
- Rural Crafts and Engineering
- Management and Systems.

4.1 NIRI at Work

Each of these sections would respond to all the needs of production, quality assurance, product diversification, marketing, etc. of the products which come under its purview, as indicated in Table 1 below:

Table 1: Typical Products in the purview of various sections.

Khadi & Textile Industry	Khadi, polyvastra, lok vastra, natural dyes, hosiery, design and production of readymade garments, embroidery.
Chemical Products	Soaps, shampoos, hair oils, handmade paper, pottery, match and agarbatti, candle & sealing wax, rubber goods etc.
Bio Processing	Food products-honey, bakery products, snacks, gur and khandsari, processing of cereals and pulses, jams & pickles, ketchup etc., bio-Fertilisers, vermiculture etc. Herbal products, cow based products
Infrastructure and Energy	Biogas, gasifiers, solar and wind energy implements, low cost housing materials and construction, water supply, sanitation, transportation.
Rural Crafts and Engineering	Pottery, decorative & utility items of stones, iron, metals, bamboo/cane, glass, horns, ivory etc. bangles, jewellery items, emerging crafts like production and repair of radios, cassette recorders, voltage stabilizers and invertors, electronic clock and alarm time-pieces, motor winding, iron grille making, carpentry, smithy etc.
Management and Systems	Preparing and updating the MIS and GIS for rural industries, Quality Audit – ISO, BIS, Agmark compliance, production, marketing and financial management. Policy studies

The management section would, however, provide advice to all other sections in its area of expertise, viz., quality assurance, production, marketing and financial management. It would also receive the pertinent inputs from other sections for inclusion in the MIS/GIS to be created and maintained by it. While all other sections would concentrate their efforts in their respective domains of activity, these shall not become water-light compartments. Thus areas of overlapping interest shall be jointly taken care of, e.g. bamboo would be of great interest to the rural infrastructure section as a low cost, earthquake-proof house-construction material but it would also be of interest to the rural engineering and crafts section since numerous utility articles are made out of bamboo strips and canes. Similarly, inputs from

chemical section may be sought by Textile group (say for analyzing dyes), or by bio-processing section (say for chemical analysis of oils etc.). The organizational structure of NIRI shall ensure that such inter-section interaction proceeds smoothly.

Each section would be responsible for preparing and continually updating the database of available technologies, scientific and technical experts, available in the country, in its area of work and get it included in the GIS/MIS to be prepared by the ‘management’ section. It shall also prepare a list of standing consultants who are willing to offer their services at a short notice. Its main task shall be to translate the ‘live’ problems encountered in the field into well-defined scientific-technical problems and arrange to get these solved through the experts available in the country. To do this efficiently, it would build linkages both with the institutions in touch with the field (like KVI supported units, training centers, community polytechnics, NGOs etc.) and with the experts available in various professional institutions. It would device mechanisms to keep these linkages strong and vibrant so that the response is quite fast.

The second important responsibility of each section shall be to ensure quality control of the products under its purview. For this purpose it shall carry out periodic quality audits and take all necessary pro-active measures to help VI units to comply with various standards like BIS, Agmark, ISO, etc. To ensure self-reliance in this crucial task, each section shall build a well-equipped laboratory with state of the art testing facilities for ensuring quality control of products. Each laboratory shall also be equipped with basic instrumentation needed for occasional research/development work which the section may decide to undertake in-house due to specific special reasons like urgency, availability of in house expertise, ease of availability of raw materials etc.

The third important task of each section shall be to identify a few (just two or three) among the products under its purview on which major thrust would be given over next few years in a well-coordinated manner to increase their market penetration. For each product interdisciplinary teams would be set up who would work towards achieving the well-defined targets in a Mission mode.

The fourth task of each section would be to assist the “Management Systems” section in conduction of specialized HRD programmes. The coordination of generic programmes on topics like TQM, production and marketing management, Rural Entrepreneurship Development, use of IT for KVI sector, Gandhian vision of development etc. shall be carried out by the management group but specialized programmes tailor-made for specific group of industries would be developed and coordinated by respective sections.

The Central Workshop (mechanical, electrical, electronic) of the institute shall be designed and operated by the “Rural Crafts and Engineering” section.

4.2 Organizational Structure

Figure 1 shows the proposed organizational structure of NIRI. The institute shall be headed by a Director (of the rank of Director CSIR or Director, IIT Delhi) who shall be assisted by six Deputy Directors (each of the rank of Professor, IIT Delhi) heading the six sections. In each section there shall be a number of senior scientific positions (ranging from 4-6) as per the requirements laid down in the chapters 5-10, and technical support staff (4-6) to assist in the laboratories / computer center. The Director as well as the Deputy Directors shall be professionally trained scientists / technologist / managers. The Deputy Directors shall oversee the working of their respective sections, facilitate smooth interaction within the group, build up the motivation, lay down and monitor the achievement of targets. The

Director shall ensure smooth interaction among various sections, help in building interdisciplinary teams for Mission mode projects and shall personally coordinate the setting up of Rural Industrial Estates, described in Chapter 3. He will also look after the central administration of the institute with the help of trained administration / accounting staff. The Director and the deputy directors shall be appointed on contract for a period of 5 years at a time, by inviting / selecting distinguished experts from S,T&M institutions to contribute to this task.

Sunlight, they say, is the best disinfectant. In tune with this dictum, it is now generally accepted that transparency of decision-making is the best way to ensure fairness. Further, Gandhian vision also demands that decisions be done collectively. Accordingly it is proposed that all the administrative decision making powers be vested in the executive committee consisting of the Director and the six Deputy Directors. As far as possible, the decisions should be taken by evolving consensus. However, in case of a tie, the director shall have the privilege of deciding the issue by his single vote. The minutes of the executive committee meetings shall NOT be kept confidential. Similarly, the decisions pertaining to the activities, programmes and priorities of various sections shall be taken collectively by respective section committees consisting of all scientific-technical staff, and chaired by the Deputy Director, looking after the section. Again, as far as possible, attempt shall be made to evolve consensus on all-important issues, and the minutes of these meetings shall NOT be kept confidential.

To oversee the functioning of NIRI, a governing body of seven eminent people shall be constituted by KVIC. It shall be presided by the Chairman KVIC. It shall make a periodic review of the achievements of NIRI and provide guidelines for its future course of action. During the three years of the project, the governing board shall consist of the four project core group members, project coordinator at Wardha and two more members, one nominated by the Director IIT Delhi and one nominated by the Chairman KVIC.

NIRI should eventually work as an autonomous institute of the ministry of ARI and created as an institute of National importance through an act of parliament. It should be fully funded for first five years to enable it to establish all facilities and linkages, build credibility and begin the process of resource generation from services offered by it to rural industries. Thereafter, its funding could be progressively reduced over next five years to a minimal sustaining level and by this time it should attempt to become largely self-sufficient.

4.3 Summary

The activities of NIRI shall be carried out in six sections, dealing with (i) Khadi & Textile Industry, (ii) Chemical Products, (iii) Bio-processing, (iv) Rural Infrastructure and Energy, (v) Rural Crafts and Engineering and (vi) Management and Systems. The common activities of various sections would include:

- Building two-way linkages with S, T & M experts and field level units.

- Constantly improving the quality of KVI sector products & facilitating compliance with pertinent standards.

- Building suitable laboratory to facilitate quality assurance and occasional in-house research work.

- To identify a few products on which major thrust would be given in a well-coordinated manner (through Mission mode project) to substantially increase their market penetration.

- To prepare and upgrade the database of available technologies, S, T & M experts available in the country and identify standing consultants from amongst them.

The special activities to be undertaken by “Management &Systems” section include developing and conducting special HRD programmes in generic areas like TQM, Production and marketing management, Gandhian Model of Development, Rural Entrepreneurship Development etc. It shall also be preparing and continuously upgrading the GIS/MIS of rural technologies and other related information. The rural Engineering section shall design and operate the central (mechanical, electrical/electronic) workshop of NIRI. The hallmark of NIRI administration shall be participatory and transparent decision making. Special emphasis would be laid on cooperative working, both within and among various sections.

Chapter 5

Khadi And Textile Industries

5.1 Introduction

5.1.1 History

Hand spinning and hand weaving were amongst the earliest creative activities of human race. This art seems to have been well developed in India even in prehistoric age. In Vedas which are regarded as the oldest books in the world, there is detailed description on the processes of spinning, weaving, dyeing etc for cloth production from natural fibres like cotton, wool and silk. In Ramayana and Mahabharat there is repeated mention of cotton fabrics with fanciful colours and artistic intricate weaving patterns. These accounts firmly establish the existence of the advanced spinning and weaving techniques in India several thousand years ago.

Discoveries of spindles and clay figurines clothed in fabrics from the ruins of Mohenjodaro are a clear evidence of common existence of spinning and weaving of cotton and wool during the days of Indus valley civilization around 2500 B.C. These activities continued to thrive even after this great civilization perished. The foreigners were highly impressed by the wonderful skill of Indian artisans spinning and weaving cotton fabrics.

During the days of Mauryan Empire, just preceding Christian era, Indian cotton and silk fabrics were very popular in western world. There was a great demand for Indian Muslin amongst the Roman nobility ladies. Printed Chintz of Calicut, Doria saris of Benaras, Chanderi saris of Kotah, Bandhanies of Rajasthan, Kalamkari of Andhra Pradesh, to cite a few examples, brought tons of white and yellow metals to India from abroad in exchange of exclusive Indian textiles. Indian fabrics attained further refinement as seen through the intricate designs depicted in Ajanta paintings. The famous Chinese traveller Huen Tsang, who came to India in 7th century, has also testified this. The European traveller, Marco Polo who visited India by the end of 13th century, also spoke very high about very fine Indian fabrics, which looked like tissues of the spider's web. Indian textiles reached the peak of their glory during the Moghul period. All this was achieved by hand spinning and hand weaving, i.e. Khadi (the formal use of this word started much later after the advent of Mahatma Gandhi on Indian scene).

5.1.2 Effects of Industrial Revolution

In late 17th century, the Indian textiles were popular in England; as a result there were agitations by English traders. The use of cotton fabrics from India was banned in England in 1700, but without much success. Another legislation passed in 1720 for the same purpose met with similar fate. The inventions of steam engine, spinning machine and power loom with fly shuttle brought revolution in cotton textile industry. These developments coupled with British power in India changed the entire scenario of cotton hand spinning and hand weaving in India. In 1771, the first cotton textile mill of England was established, followed by dozens of similar establishments for which cotton was imported from India. The story of transformation of India from the biggest producer and exporter of hand spun and hand woven cotton textiles to only supplier of cotton, as raw material to the English cotton mills, is unfortunate and sad. The emergence of British as the rulers of India seems to have played more crucial role than technological innovations in textile production. To protect the English textile industry British mercilessly suppressed production of hand spun and hand woven textiles in India. As a result millions of hand spinners and weavers throughout India

were rendered unemployed, deprived of the only means to earn their livelihood and left to die of starvation.

5.1.3 Swadeshi movement

The unchecked deterioration of Indian economy and fast spreading misery amongst Indian masses, especially the artisans, attracted the attention of Indian intelligentsia and patriotic leaders. They all thought that India's acute poverty was the direct result of the destruction of cottage industries by British regime. As a logical corollary, the nationalist leaders urged the people to use only Indian goods and gave a clarion call for **Swadeshi**. The Swadeshi movement was gathering momentum slowly. It reached its climax as a result of partition of Bengal in 1905, propagating vehemently the boycott of imported goods, specially the English cloth. However, it then made no distinction between hand-spun and hand-woven cloth (khadi) and Indian mill made cloth. After the arrival of Mahatma Gandhi in India in 1915, the movement underwent a complete metamorphosis.

5.1.4 Charkha, The best Gift of Gandhi

Gandhiji discovered charkha in 1908 in London during discussions with fellow Indians regarding the economic conditions in India. He felt that without charkha there was no Swaraj, and that everyone should spin. He had a clear vision of his programme of reviving the ancient industry of hand spinning and making charkha the focal point of economic regeneration of poverty stricken villages as well as political awakening amongst the Indian masses. When Mahatma Gandhi finally came to India in 1915, Swadeshi movement through boycott of foreign goods, especially cloth, was going on. Gandhi's khadi programme gave a concrete and positive meaning to Swadeshi. He opined that khadi alone could make such boycott a practical proposition. In 1919, Gandhi formally launched the khadi programme in the country. But he clearly differentiated the charkha of medieval times and that of his vision, in so far as the former was a symbol of exploitation and helplessness of spinners, while the latter was a symbol of revolution in thought and action as well as embodiment of non-violence. The Indian National Congress in its Nagpur session held in 1920 decided to encourage khadi. The first khadi production centre was established in Kathiawad, Gujarat. In 1921 khadi found a formal place in the Congress programme and charkha its proud place on the national flag. In 1925, Congress formed an independent autonomous body called All India Spinners Association (AISA) or Charkha Sangh for implementing khadi programme vigorously throughout the country. Gandhi firmly believed that charkha was his best gift to the nation, contributing to its all sided development - economic, political, social and moral. He said "I may deserve the curse of posterity for many mistakes of omission and commission, but I am confident of earning its blessings for suggesting a revival of the charkha. I stake my all in it. For every revolution of the wheel it spins peace, goodwill and love"

While launching the khadi programme Gandhiji philosophically emphasized, "It is a tragedy of the first magnitude that millions have ceased to use their hands as hands. Nature is revenging itself upon us with terrible effects of this criminal waste of the gift, she has bestowed upon us as human beings. We refuse to make full use of the gift. And it is the exquisite mechanism of the hands that among few other things, separates us from the beast. The spinning wheel alone can stop this reckless waste". It can be revived if only every home is again turned into a spinning mill and every village into a weaving mill. Gandhiji invited one and all to join the "Yajna", an act directed to the welfare of others, without desiring any returns for it, and establish the dignity of labour in the society through spinning.

Khadi thus aimed at abolition of the distinction between the rich and poor, high and low, by making them equal participants in contributing to the society's wealth and adopt willingly the principle of 'simple living and high thinking'. It implied avoiding unnecessary multiplication of wants, or leading a luxurious life at the cost of fellow human beings.

5.2 Present Status

The question has often been asked whether khadi can survive in the present fast moving world. The original meaning of khadi as the hand spun hand woven cloth is gradually disappearing with the use of electrical power in some of its production operations and there are serious threats for the survival of khadi. However, the spirit of khadi can and should survive if sustained and planned efforts are made, particularly by providing scientific technical inputs through indigenous R&D and dynamic marketing strategies.

The present project of setting up of National Institute of Rural Industrialization (NIRI) at Wardha is one such effort in this direction. It is envisaged that such a institute would provide improved technology to produce good quality khadi cloth not only to rural masses but also to the elite class. New technical inputs would also generate employment opportunities for a large number of unemployed and underemployed people in the villages. Such a decentralized textile industry, run on modern scientific lines, with hundreds of its production centres scattered all over the country, along with other rural industries is bound to reduce poverty and unemployment of rural masses and thus strengthen rural economy which, in turn, would strengthen national economy as a whole.

Hand spun, hand woven fabric made of cotton, wool and silk is known as Khadi. There is a variety categorized separately as Muslin, which is essentially a cotton khadi woven by using very fine yarn of high count. There is also khadi cloth made of polyester/cotton blend and marketed under the name polyvastra. The general mode of production essentially consists of production of sliver by mechanical means. Presently there are five centralized central sliver making plants located at Etah (U.P.), Rai Bareilly (U.P.), Sehore (M.P.), Chitra Durg (Karnataka), and Trichur (Kerala). The sliver is distributed to different production centers where spinning is done using hand operated charkhas. (Recently power operated 48 spindle charkha has also been introduced). Individual spinners carry out the spinning at their own residence and at production centers as well. The yarn is then supplied to handloom weavers. The weavers bring back the cloth to production centres from where it is transported to different outlets for sale.

In general, the cloth is produced in anticipation of sale. This means that only small quantity of cloth is produced against order. Also, market trends for designs and colour combinations are marginally taken into account while manufacturing the cloth. Apart from quality of fabric, lack of new design inputs is also one of the reasons for khadi cloth's inability to capture high market share.

5.2.1 Facts

Some statistics related to khadi as available from KVIC (year 1999-2000)

Total yarn production(lakh Kg)	265.36
Total cloth production(million square metres)	84.32
Total value of fabric (Rs crores)	551.94
Total employment (lakh persons)	12.35
Per capita production	
Yarn (kg)	26.04

Fabric (Sqaure metres)	620.00
Per capita earning (Rs)	2152.00

5.2.2 Closing stock of khadi cloth

The closing stock of khadi cloth for the last five years is given below

Year	Closing Stock (Rs.crores)
1995-96	522.23
1996-97	626.40
1997-98	624.10
1998-99	635.89
2000-01	551.94

Thus, it would be noticed that per capita production and per capita earnings are miserably low. Also, with each passing year the closing stock is increasing continuously. The technical inputs through indigenous R&D would improve the quality of product, which shall certainly go a long way in improving per capita production, better earning, and also reduce closing stocks.

5.3 SWOT Analysis

Strengths

- Very good employment opportunities
- Major involvement of weaker sections of society
- Opportunities to artisans to express their individual creativity and skill
- Activity spread all over the country at the grass-roots level
- Use of locally available raw materials and equipments
- Sentimental value related to independence struggle
- Environment friendly products
- Comfort properties
- Minimal investment
- Simple technology can be handled by unskilled person
- Opportunities for entrepreneurs

Weaknesses

- Low technology level
- Non-organized and scattered production base
- Difficult to approach the scattered individual artisans
- Drudgery in some processes
- Non uniform quality
- Total absence of quality control
- Lack of information according to market trends
- Absence of designs according to market trends
- Lack of innovation in product development
- Inadequate R&D inputs
- Inadequate marketing and advertising
- Improper machine designs
- Low productivity

- Low wage earning
- Lack of technically qualified manpower
- Inadequate training and guidance for quality control
- Inadequate supervision during production
- Poor, unhygienic and non congenial working conditions during spinning and weaving operations
- Absence of spot supervision at individual's working places
- Improper machine designs
- Inadequate repair and maintenance facilities
- Non availability of spare parts, locally

Opportunities

- Scope for improvement in design and product development and further expansion
- Scope to reduce drudgery through technical inputs
- Value addition through modern mechanical and chemical finishing techniques at centralized level
- Opportunities for garment designing
- Introduction of knitting technique in cotton and polyvastra for knitted fabrics
- Introduction of cotton rich blends with polyester for improvement in spinnability and yarn appearance
- Introduction of fancy yarns
- Introduction of acrylic fibre, particularly in knitting
- Scope for export, especially home furnishing
- Scope for improvement in marketing strategy

Threats

- Non compatibility with mill sector
- Exploitation of artisans by middlemen/traders
- Globalization of trade
- Lack of enthusiasm amongst young generation because of poor remuneration and working conditions

5.3.1 New inputs required

- From the SWOT analysis it would be seen that the major issues before the khadi sector are:
- Quality improvement at the pre-spinning, spinning, weaving and finished product stage
- Machine design development and easy availability of spare parts at the production centres
- New design inputs in woven and printed fabrics based on color forecasts
- Introduction of new technical inputs for value addition
- Improvement in dyeing techniques for better fastness properties
- Production planning according to market trends
- Aggressive marketing strategy
- Involvement of technically qualified personnel in khadi sector
- HRD programme on continuous basis
- Revamping of MDTC
- Healthy working conditions at the production centres.

On the basis of these requirements following Thrust areas for NIRI have been identified.

5.4 Thrust Areas

5.4.1 Quality Parameters, Norms and Quality Checks

For improvement of quality of khadi and quality maintenance, it is essential to have quality norms for different fibres used such as cotton, wool and silk, and various yarns and fabrics produced. Proper technical supervision and regular quality checks would help in maintaining the quality. It is also desirable to prepare BIS standards for most popular products. This should be a regular activity of NIRI.

NMC Charkha Modification

The NMC charkha has been very successful due to its ease of operation. There is further scope to modify it to produce yarn of desired quality by minimizing variations in yarn count, tip, thick and thin places etc.

Fabric and Garment Design Developments

Design developments based on colour forecasts and market trends would be very useful for value addition and to boost the khadi sales. This would help in minimizing closing stocks.

5.4.4 Mercerization of Cotton Fibres and Yarns

Low strength is one of the drawbacks associated with the khadi yarns and fabrics. The strength of khadi yarns can be enhanced by yarn mercerization. This would give considerable value addition to khadi fabrics. Mercerization has several other advantages such as improvement in dye uptake, luster, and chemical reactivity. These are most important properties for value addition. Fibre mercerization is a new concept that can be explored for deriving maximum benefits of mercerization and value addition.

5.4.5 Dyeing with Synthetic Dyes

Dyeing is a perennial problem in khadi sector. Some of the dyeing problems associated are non-reproducibility of results, uneven dyeing, inadequate fastness properties, shade matching and shade variations etc. Selection of proper dye class and standardization of dyeing parameters for selected dye class is necessary. Design of machines for dyeing on small scale would also help in maintaining dyeing quality

5.4.6 Dyeing with Natural Dyes

There is a revival of natural dyes due to environmental considerations. Khadi being eco-friendly, there would be further value addition if dyed with natural dyes.

5.4.7 Wrinkle Free Khadi Garments

One of the major problems associated with khadi garments is wrinkle formation during use and on washing. This adds cost to the maintenance of khadi garments. This problem can be dealt with by imparting wrinkle free finishing to khadi garments. This is a popular concept and would not only give value addition but also boost khadi garment sales.

5.4.8 Knitting of Polyvastra Yarn

At present Polyvastra yarn (polyester/cotton blend) is used for the manufacture of woven fabric. This yarn can also be used for the production of knitted fabric, which then can be used for product development like T-shirts, which has good market potential.

5.4.9 HRD Programme and Revamping of Multi-disciplinary Centers

Dissemination of technical information is very important for giving impetus to R&D activities and to keep abreast of the recent developments. The technical interaction also helps in analyzing the day-to-day problems and to derive the most appropriate solutions. Organization of HRD programmes on continuous basis assumes importance from this point of view. Out of the above nine thrust areas, following four mission projects have been identified to be taken up on a priority basis.

5.5 Mission Projects

5.5.1 Philosophy

The philosophy of undertaking these mission projects is to improve the quality of khadi products and to give value addition so that khadi fabric/garments become popular in the higher market range. There would thus be additional avenues for employment generation. It is also envisaged that due to new technological inputs technically qualified personnel would get attracted towards khadi sector. Implementation of these projects would also give impetus to research and development activities in khadi sector, which is the main purpose of setting up of NIRI.

Project 1: Improvement in NMC Charkha (launching October 2001)

The essence of khadi activities is to improve the quality of life of those who are dependent on khadi for their existence. The people involved with the production of yarn on NMC charkha need care and attention to ensure decent living. In order to get an idea about the need of spinners, some of the spinning units in Hapur and Meerut were visited. The yarn produced in such units was found to be

- Irregular and un-clean
- Containing slubs and thick and thin places.
- The NMC was found to have certain deficiencies which leaves some scope for further improvement in terms of :
 - Roller setting adjustability
 - Flexibility of introducing different levels of twists
 - Possibilities of making the charkha sliver feed especially for coarse yarn production
 - Design improvement from ergonomics point of view.

These charkha design related improvements will lead to

- Improvement in the productivity and quality of yarn
- Make NMC more adaptable to different kinds of fibres and blends.

Methodology

- Two NMC charkhas would be procured. One of this would be used for spinning as per the existing practice. The problems faced in conventional spinning would be carefully observed.

- Depending on the problems, the second charkha would be dismantled and appropriate modifications would be implemented.
- Comparison of productivity and yarn quality produced on unmodified and modified charkha shall be made.
- Transfer of technology to KVIC.

NMC design improvement in itself is not enough unless the sliver quality is also looked into. The clean look of the yarn depends on the extent of cleansing the sliver has undergone. If the sliver contains too much of short fibres, the corresponding yarn would also be irregular as drafting on NMC would not be proper. Therefore, working of sliver manufacturing plant would also need a thorough study.

Project 2: Wrinkle Free Finishing Of Khadi Garments (Launching October 2001)

One of the problems associated with cotton garments, whether made in khadi sector or mill sector, is creasing during wearing and also heavy creases on washing. Cotton garments therefore need care to keep it crease free. One of the common practice for khadi garments, particularly for kurta / pyjama, is to do starching and pressing. The process has to be repeated after every wash, which adds to the maintenance cost. Of late wrinkle free garments have become very popular. Various brand products are floating in the domestic market. Though the process of wash and wear or crease resistant / wrinkle free processes are not new but these processes were mostly carried out in the fabric form prior to garment making. Recent trend is to carry out these processes in ready-made garment form. Wrinkle free finishing imparts permanent creases at the desired places in the garment and maintains them in crease free form during wearing. Also after washing a touch of ironing is adequate for smooth wrinkle free appearance of the garment. It would therefore be most appropriate to introduce this technology in the khadi sector for ready-made khadi garments. This process would not only improve the appearance of khadi fabric, but it would enhance the image of khadi garments amongst the younger generation and executive class. The production cost is more than compensated by the value addition.

Methodology

- Different qualities of khadi fabrics and garments would be procured from the authentic source (Khadi gramodyog, Gramshilp).
- The easy care finish would be imparted at the fabric and garment stage. The process essentially consists of saturation of garment with a cross-linking agent, softener and acid liberating catalyst. Removal of excess liquor by centrifuge, drying at room temperature on hanger and curing at high temperature. All the necessary chemicals are available commercially. It would be necessary to have centrifuge machine and garment curing oven.
- The wrinkle free finish performance would be evaluated in terms of
 - Crease recovery angle
 - Tensile/tear strength
 - Bending length
 - Abrasion resistance
- The durability of the finish would be tested by subjecting garment to 5 and 10 washing cycles and evaluating the above-mentioned properties.
- Transfer of technology to KVIC production unit.
- The wrinkle free process imparts all desirable properties to garment. However, the strength loss to an extent of 25-30% is unavoidable. This can be compensated to some extent by using mercerized fabric. The process is ideal for polyvastra.

Project 3 Mercerization of Yarn and Fibre (Launching October 2002)

Yarn Mercerization

One of the problems associated with khadi yarn is poor strength. Therefore there is an urgent need to introduce a process, which would enhance the strength of yarn and help in reducing the breakage during weaving. This would facilitate production of good quality fabric with better durability. Mercerization essentially consists of treatment of cotton yarn or fabric with concentrated solution of caustic soda. It offers several advantages such as improvement in strength, luster and dye uptake. It is one of the important processes used on industrial scale with the help of sophisticated machines. It is proposed to introduce this process in khadi sector by manual means while ensuring safety of the workers and environment management.

Methodology

- Design and fabrication of suitable metal frame with two arms, which can be moved backward and forward with the help of a threaded rod. This would facilitate the application and release of tension on yarn during mercerization.
- Loading of the yarn onto frame holding it between two arms.
- Application of desired tension, which is essential to prevent yarn shrinkage.
- Saturating the yarn with caustic soda solution of mercerization strength.
- Washing of yarn while under tension, till major quantity of alkali is removed.
- Release of tension and neutralization of caustic soda.
 - Evaluation of yarn properties like
 - Improvement in strength
 - Improvement in dye uptake
 - Microscopic changes in cross section and longitudinal view
 - Barium activity number for efficiency of mercerization.

The production will depend on the number of frames used and the quantity of yarn, which can be loaded on each frame.

Fibre Mercerization

This is a new concept still not practiced on industrial scale. It can be conveniently carried out in khadi sector. One of the major advantages of this process is that any non-uniformity would get eliminated due to thorough mixing of fibres during the pre-spinning processes. This is particularly important in case of dyeing where any unevenness of dyeing carried out in yarn or fabric form is immediately noticeable. The mercerization in fibre form would offer several advantages such as improvement in fibre strength and, therefore, the breakages during spinning would be reduced. The resultant yarn would be stronger and uniform. The dye uptake on yarn or fabric produced from mercerized fibre would be higher. There would also be removal of undesirable immature fibres.

Methodology

- Opening of the fibre by mechanical means
- Further manual opening of fibre
- Loading the fibre in polyester gauze fabric.
- Treatment of fibre with caustic soda solution of mercerizing strength in a specially designed vessel provided with liquid circulation pump
- Washing the fibre to neutral pH in the same vessel

- Drying
- Conversion of fibre to yarn by conventional processes.
- Efficiency of mercerization would be evaluated by
 - Measurement of improvement in fibre strength
 - Microscopic view of cross section of the fibre
 - Behavior of fibre during conversion processes from fibre to yarn
 - Spinnability
 - Properties of resultant yarn
 - Weavability of yarn
 - Properties of resultant yarn and fabric
 - Dye ability of fibre, yarn and fabric

Precautions

Concentrated solution of caustic soda (25%) is used for mercerization. Utmost precaution would be necessary during the preparation and use of this solution. It would be necessary to impart training to a person responsible to carry out the process of mercerization. The precautions to be taken during the preparation and use of caustic soda solution should be prominently displayed in the work area. Provision of safety glasses and long rubber hand gloves would be absolutely essential; also children should not be allowed to enter the work area. The process should preferably be carried out by male rather than female workers.

PROJECT 4 Fibre Dyeing With Natural Dyes and Vat Dyes (Launching October – 2002)

Natural Dyes

The use of natural dyes is becoming popular at the international level. There is great demand for naturally dyed fabric particularly in the export market. This is due to environmental considerations. In fact, before the discovery of synthetic dyes, the fabric coloration was done with natural dyes only. After the discovery of synthetic dyes in 1856, the use and popularity of natural dyes decreased because of a variety of reasons. However, from 1990 onwards environmentalists all over the world have shown serious concern for environmental damage by several synthetic dyes. Therefore recently, a very large number of synthetic dyes have been withdrawn from the market and their manufacturing stopped because these dyes were not only causing environment pollution but they posed serious health hazards due to their carcinogenic properties. In view of this there is international awareness and demand to revive the use of natural dyes for the coloration of textiles. Khadi fabric being not only comfortable but environment friendly, it would be the most appropriate to popularize the use of natural dyes in khadi sector.

Methodology

- Experience has shown that when dyeing is carried out in yarn or fabric form, it is uneven and non reproducible. In the present project it is, therefore, proposed to carry out dyeing in fibre form. It has the advantage that any unevenness during fibre dyeing would get evened out due to fibre mixing during pre-spinning processes. The resultant yarn and fabric would, therefore, have uniformly dyed appearance.
- Initial experiments would be carried out for the dyeing of mercerized as well as unmercerised cotton fibre with synthetic indigo. The use of synthetic indigo is justified because the chemical structure of natural and synthetic indigo is identical. Synthetic indigo is used on large scale for the dyeing of yarn for the production of denim

fabric, which is universally popular. Indigo dyed fibre would be converted into yarn and denim fabric would then be produced.

- The denim fabric so produced would be subjected to enzyme wash to get the stone wash effects.
- After standardization of process for dyeing cotton fibre with synthetic indigo, cotton fibre would then be dyed with natural indigo under standardized conditions
- Dyeing results of natural and synthetic indigo would be evaluated spectra-photometrically.
- Similarly, dyeing of cotton fibre with selected natural dyes would be investigated
- Transfer of technology to KVIC production units shall then be undertaken.

Room Temperature Dyeing With Vat Dyes

One of the major problems faced in khadi sector is inadequate wash fastness of dyed yarn or fabric. This is either due to selection of dyes belonging to inappropriate dye class or not maintaining the recommended dyeing conditions. One of the major factors for deviation is maintenance of appropriate dyeing temperature. Any method where dyeing is carried out at room temperature would be welcomed.

Among the various dye classes available for dyeing of cotton, vat dye class, although the most expensive, shows the best all round fastness properties. Therefore, to overcome the problem of poor wash fastness it is proposed to carry out dyeing of cotton fibre with vat dyes at room temperature.

Methodology

- The reduction (vatting) and application of cotton in fibre form would be carried out at room temperature.
- Dyed fibre would be converted into yarn and fabric.
- The dyeing results in terms of uniformity of dyeing and fastness properties would be evaluated.
- Technology transfer to KVIC production units shall be then undertaken.

5.6 Regular Activities

5.6.1 Quality Parameters

For any quality assurance, the knowledge of quality parameters is very essential. KVIC has the collection of quality parameter data for all the fabrics produced in the khadi sector. However, these are not properly disseminated and quality checks are not seriously implemented due to lack of basic laboratory facilities and technically qualified staff at each production centre.

Methodology

- Collection of quality parameter data for different varieties of khadi fabrics from KVIC.
- Analysis of this data and grouping the fabrics having close quality parameters.
- Procurement of best quality fabrics from most popular varieties and physical check with the quality parameters.

- Suggestion of quality parameters for different varieties of fabrics which can be produced under practical conditions.
- Production of few fabrics as per the suggested quality parameters and checking closeness of the fabric to the suggested quality parameters.
- Communication to Bureau of Indian Standards for preparation of BIS standards for quality parameters of yarns and fabrics.
- Suggestion of basic equipments required at each production units for quality checks and maintaining quality of fibre, yarn and fabric.
- Close interaction with KVIC office for the implementation of quality norms at different production centres.

5.6.2 HRD Programmes and Revamping of Multi-disciplinary Centres

Dissemination of technical information is very important for giving impetus to R&D activities and keeping abreast of the recent developments. The technical interaction also helps in analyzing the day-to-day problems and to arrive at most appropriate solutions. Organization of HRD programmes on continuous basis assumes importance from this point of view.

5.7 Strategy for Implementation

- Quality monitoring from raw material to finished product by proper supervision and quality checks.
- Design development of machines, yarn and fabric through indigenous R&D.
- HRD programmes from artisan to management levels.
- Market surveys for manufacture of products according to market trends.
- Aggressive social marketing through all possible media.
- Participation in national and international trade fares and fashion shows.
- Involvement of good textile and garment designers for product development.
- Co-ordination through various export promotion councils.
- Training of people for repairs and maintenance.
- Publication of technical literature.

5.8 Deliverables

- Setting up of the R&D laboratory.
- Organization of model technical HRD programmes at the managerial level.
- Selection of appropriate technical staff for R & D laboratory.
- Development of hand mercerization system
- Providing the linkages with other institutions.
- Listing of parameters for quality evaluation.
- Few products with new designs.
- Launching of mission projects.

5.9 Laboratory Equipments, Space and Manpower Requirements

Laboratory Equipments

The procurement of laboratory equipments can be divided into two phases.

PHASE I: Cotton fibre related laboratory equipments and those which would be of immediate requirements (List of equipments along with the costs is given).

PHASE II: Other equipments which could be purchased depending on the availability of funds (only the list is given)

Following are the lists of equipments various laboratory :

Cotton Fibre Lab	Approximate cost (Rs.)
Fibro graph	2,50,000
Stelometer/Pressley tester	3,00,000
Projectina Microscope	50,000
Trash analyzer	1,50,000
Fibre fineness tester	3,50,000
Single pan balance	25,000
Moisture meter	50,000
Humidity chamber	25,000
Total	12,00,000

Yarn Lab	Approximate cost (Rs.)
Lea tester	50,000
Wrap reel	60,000
Twist tester (single and ply yarn)	65,000
Single thread strength tester	3,50,000
Yarn hairiness tester	1,50,000
Uster evenness tester	1,50,000
Quadrant balance	10,000
Total	8,25,000

Fabric Lab	Approximate cost (Rs.)
Ends/picks analyzer	2,000
Elmendorf tear strength tester	30,000
Bursting strength tester	60,000
Martindale abrasion resistance tester	50,000
Peeling tester	25,000
Crease recovery tester	5,000
Bending length tester	10,000
Light fastness tester	1,50,000
Launderometer	60,000
Perspiration fastness tester	10,000
Flame retardancy tester	45,000
Spectrophotometer	3,50,000
Water repellency tester (Spray test)	10,000
Sublimation fastness tester	10,000
Crock meter	25,000
GSM cutter with cutting blades	10,000

SDC Grey scale	20,000
Colour matching cabinet	25,000
Fabric thickness gauge	5,000
Shrinkage scale and Template	5,000
Hot air oven	20,000
Drape meter	20,000
pH meter	10,000
Hot plates (3 no.)	10,000
Constant temperature water bath	20,000
Total	9,87,000

Chemical processing (Laboratory models)	Approximate cost (Rs.)
Jigger	50,000
Winch	45,000
Padding mangle	50,000
Drying and curing chamber	1,25,000
HTHP dyeing machine	50,000
Hank dyeing machine	75,000
Steamer	1,00,000
Screen printing and Block printing tables	25,000
Transfer printing machine	50,000
Single pan balance (2 kg. capacity)	30,000
Total	6,00,000

Equipments Phase I Total cost **36,32,000**

5.9.2 Equipments to be procured from KVIC

- Different types of charkhas (one each)
- Different types of hand looms (one each)

5.9.3 Phase II

Prototype/Laboratory model equipments

Spinning

- Miniature card
- Miniature draw frame
- Roving frame
- Different types of spinning wheels (Charkhas)

Weaving

- Hank sizing equipment
- Miniature warp sizing machine
- Spool winder

- Pirn winder
- Horizontal drum warping set
- Different types of handlooms including Dobby and Jacquard

Knitting

- Sample knitting machine
- Single jersey knitting machine
- Hand operated knitting machine

Garment designing

- Garment stitching machines
- Pattern making and pattern cutting machine
- Fusing machine
- Steam Press
- Dummy model

Computer software

- Computer with colour matching software
- Weaving and knitting design software
- Garment designing software
- Print design software
- Computer hardware, computer, printer, scanner, digitizer, plotter

Silk

- Reeling machine (Paddle driven / CTRS)
- Yarn size meter
- Seriplane board winder
- Black board examination stand
- Silk Uster tester
- Cohesion tester
- Silk doubling and twisting machine (Laboratory model)

Wool

- Wool fibre length tester
- Blend analyzer

5.9.4 Space Requirement

Khadi Laboratories

A separate wing on ground floor of 600 square meters containing following Sections:

- Physical testing laboratory
- Yarn manufacture laboratory
- Fabric manufacture laboratory including knitting
- Chemical processing laboratory
- Garment designing laboratory
- Store

5.9.5 Man power requirements

- Scientists 4
- Laboratory technicians 4
- Attendant 2

Total Manpower Requirement 10

5.9.6 Qualifications

Scientist:

3 scientists (minimum qualification M.Tech/Ph.D) with specialization in yarn manufacture, fabric manufacture, chemical processing (one each) with experience of at least 5 years in industry/research organization/academic institute of repute.

1 scientist with post graduation in garment designing and manufacturing with experience of at least 5 years in industry/research organization/academic institute of repute.

5.10 Linkages

5.10.1 Educational Institutes

1. Department of Textile Technology, Indian Institute of Technology Delhi
2. VJTI, Mumbai
3. University Department of Chemical Technology (UDCT), Mumbai
4. GCTI, Kanpur
5. TIT Bhiwani
6. MLV Textile Institute, Bhilwara
7. Department of Textile Technology, AC College, Chennai
8. Department of Textile Technology, PSG College, Coimbatore
9. Institute of Jute Technology, Kolkata
10. National Institute of Fashion Technology (All branches)
11. National Institute of Design, Ahmedabad
12. SKSJ Textile Institute, Bangalore
13. DKTE, Ichalkaranji
14. Institutes of Handloom Technology, Varanasi, Salem, Guwahati, Jodhpur

5.10.2 Research Associations

1. Ahmedabad Textile Research Association, Ahmedabad
2. Bombay Textile Research Association
3. South India Textile Research association
4. North India Textile Research Association
5. Man made fibre Textile Research Association
6. Wool Research Association

5.10.3 Government Laboratories

1. Jute Technological Research Laboratory, Kolkatta
2. NIRJAFT, Kolkatta
3. CIRCOT, Mumbai and other regional laboratories

4. Central Silk Board, Bangalore and other regional laboratories
5. Central Wool Board
6. Central Sheep Breeding Research Institute, Avikanagar, Jaipur
7. Central Coir Board

NGO

1. Tasar 3 community center, Nitibagh, New Delhi 110049 (Tel: 6514682)

Chapter 6

Rural Chemical Industries

6.1 Background

In tune with the classification of VI products presented in Chapter 4, we have included the following under the broad category of rural chemical industries.

- 6 Mineral Based – Cottage Pottery and Lime Manufacturing industries.
- 7 Forest Based – Cottage Match and Aggarbatti, Hand made paper, Shellac, Katha, Organic Dyes, Gum Resins and Others.
- 8 Polymer and Chemical Based – Cottage Soap, Cottage Leather, Rubber goods and Polymer industries.

6.2 Status

Present status of these village industries is given below –

Sl.No.	Industry	SALES (Rs in Crores)					
		1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000
Mineral Based							
1	Cottage Pottery	284.64	310.05	337.33	395.27	559.49	654.77
2	Lime Manufacturing	103.91	118.08	135.76	179.69	209.56	248.96
Forest Based							
1	Cottage Match and Aggarbatti	39.09	44.13	57.30	59.83	53.28	62.24
2	Handmade Paper	30.37	35.11	43.12	56.73	62.41	85.50
3	Shellac	1.94	1.96	1.92	2.66	3.02	2.58
5	Katha	10.01	10.01	13.09	15.71	22.36	14.41
6	Gum Resins	3.62	3.62	1.91	4.63	3.44	1.05
Polymer & Chem. Based							
1	Cottage Soap	76.34	84.82	110.47	80.58	85.50	116.08
2	Cottage Leather	530.02	574.45	636.80	776.82	958.18	1145.39
3	Rubber Goods	3.42	--	--	--	--	--
4	Polymer	33.20	36.52	55.80	104.46	118.86	166.75

Although the quality of the products of the VI sector is good, availability and sale of such products as compared to the products from the organized sector, is insignificant and manpower, which depends upon the sale of these products for its sustenance, does not get its share commensurate with the efforts put in by it.

It has been reiterated earlier that there should be a) production by masses, b) reduction of drudgery, c) increase in earning power, d) production of quality goods in comparison with the products of other sectors, e) use of locally available raw materials, f) the existing elements of skill and personal interest of the artisan / village worker should be preserved. It is the mandate of NIRI to assist KVI sector in achieving these objectives.

A major shortcoming of products in the VI sector is lack of standardization and quality assurance. NIRI and other S & T centers of KVIC should have the responsibility to lay down standards and assure the quality of the products being produced in the VI sector.

6.3 Role of NIRI in this Sector

- 6 **Identification of model production–cum–demonstration units** for some representative industries / products from amongst existing units of KVIC. The purpose of these units would be to establish Standard Production Procedures. Effect of variation in the quality of raw materials, variation in relative amounts of raw materials for a specific product and range of manufacturing conditions would be studied. Standard production procedures thus evolved would be properly documented and disseminated to various production units all over the country.
- 7 **Quality Assurance** – Novel procedures for quality assurance of products would be developed keeping in view the limited availability of instrumentation and testing facilities at small production centres. These procedures should permit multistep quality audit, starting from raw materials to the finished product and include checking during the production process. For this purpose a state of the art laboratory would be set up at NIRI.
- 8 **Training of Manpower** – It shall be a regular activity of NIRI to impart laboratory training for testing and quality control to personnel from other units of KVIC to make those units as self – reliant as feasible. Novel training programmes needing low cost testing equipment would have to be evolved.

On the basis of field survey, literature review and discussions with KVIC scientists, following products have been identified so that NIRI could take up these as ‘mission projects’ and ‘thrust areas’ during next few years and establish complete know how about these.

6.4 Thrust Areas

Thrust areas in this sector constitute-

1. Handmade paper
2. Soap and non edible oils
3. Leather
4. Pottery

Out of these thrust areas we have chosen first two as mission projects to be carried out in first three years of NIRI, as these two sectors are already well established sectors in Indian economy, though the share of KVIC in them is negligible. Hence it is relatively easy in these sectors to increase the share of KVI sector and hence provide the necessary push to NIRI. Details pertaining to each of the above products have been discussed separately in the following sections.

6.4.1 Hand Made Paper

6.4.1.1 Introduction

The Indian paper industry can be divided into following four major categories:

- Large-scale (integrated) units - 50,000 tones and above per year;

- Medium-scale units - 10,000 to 50,000 tonnes per year;
- Small-scale agro-based units - up to 10,000 tonnes per year; and
- Handmade paper units - 60 to 300 tonnes per year.

Due to increased literacy, industrialization, modernization and development, the per capita consumption of paper in India may increase from the existing level of 3 kg. to 4.5 kg. The Paper sector's performance has been relatively better in 2000 as compared to the previous two years. Production statistics for Indian paper industry are given in table 1. The Paper sector's performance has seen an upward trend in the last year and exports in this sector, showed a growth of 18% over the previous year; recording a total of Rs. 418.5 crore as against Rs. 355.7 crore in the fiscal year '98-99'. Paper and Paper products formed part of the top 10 exported items in the list of Chemical and Allied Products, value-wise. They also featured in the list of top 10 items of export in the same section, growth-wise.

Table 1

(1,000 tons) Paper & Board	Production		Imports		Exports	
	1998	1999	1998	1999	1998	1999
Newsprint	440	450	440	270	0	0
Printings/writings of which:	1,280	1,510	60	50	55	65
Wood free un-coated	1,130	1,300	45	40	20	20
Wood free coated	150	210	15	10	35	45
Corrugating materials of which:	730	795	10	5	0	0
Virgin fiber liner	125	145	10	5	0	0
Waste-based liner	250	275	0	0	0	0
Waste-based fluting	355	375	0	0	0	0
Other wrapping papers	50	60	0	0	0	5
Tissue	35	35	5	5	0	0
Other paper	115	125	10	5	10	10
Board	700	820	15	0	30	30
Total paper & board	3,350	3,795	540	335	85	110

Source: Confederation of Indian Industry.

The ancient art of handmade paper, which was revived during the freedom struggle under Mahatma Gandhi, is unfolding its potential and has grown into a Rs 50-crore business. Handmade paper, started as part of the Swadeshi movement, is fast replacing polythene and other chemically made mill paper in developed countries. Indian entrepreneurs should put themselves in top gear to meet this international demand. Handmade paper production meets only 0.5 percent of India's total requirement of paper. The handmade papermaking units are scattered throughout the country with more concentration in U.P., Maharashtra, Tamil Nadu, Rajasthan and Kerala.

• **Role of KVIC**

KVIC encouraged this industry through financial assistance, technical assistance such as introducing new equipment, new techniques, developing new varieties of paper, utilizing locally available diverse raw material and helping the entrepreneurs in their marketing efforts. Table-2 depicts the effort of KVIC in promoting handmade paper industry.

Table 2: Performance of Handmade Paper units

Year	Working Units(nos.)	Employment (1000's)	Production (Rs.Lakhs)	Sales (Rs.Lakhs)	Wages (Rs.Lakh)
1953-54	40	1	5	5	1.7
1960-61	108	4	24	21	9.1
1971-72	176	4	81	87	26.2
1989-90	300	5	724	749.1	94.0
1990-91	325	6	853	921	256.0
1991-92	344	7	1210	1238	337.0
1992-93	350	7.5	1532	1605	426.0

Source: Review Reports of HMPI

Considering the past experiences it is observed that substantial potential exists for increasing its contribution towards bridging the gap by producing different grades of paper, adopting intermediate technology, utilization of agricultural waste and providing gainful employment to rural masses. The export potential of the industry is evident from the fact that almost half of the 20,000 tonnes of handmade paper being manufactured by the 350 working units is being exported to the US and other European countries.

The Indian handmade paper industry produces a variety of papers and paper products mainly by using waste materials such as cotton rags, tailor cuttings, hosiery cuttings and small quantities of waste paper. Other agro and bast fibres available in the North Eastern region like jute, sabai grass, ramie, banana, straw, angelie grass, elephant grass etc. are also used to blend with the primary fibres for mottling effects and to manufacture special varieties of thin paper.

6.4.1.3 SWOT Analysis

Strengths

- Lower resource consumption
- Large-scale units consume an average of 2.5 tonnes of forest-based raw materials per tonne of paper; small-scale units consume an average of 3.5 tonnes of raw materials, mostly agro-based, per tonne of paper. In contrast, a handmade paper unit uses only 1.1 tonne of raw materials per tonne of paper produced.
- Consumption of resources is lowest in handmade paper units. Water consumption per tone of paper is 150 cubic meters for handmade paper, compared with some 250 cubic meters for paper from large-scale integrated units. Large-scale integrated units also consume large quantities of electricity and chemicals, and are polluting. Small-scale agro-based units are severely polluting, as they are usually unable to afford pollution control equipment.
- Ease of setup

When compared to a paper mill, a handmade paper unit is easier to set up for the following reasons:

- Paper mills would need a per capita investment in lakhs whereas a handmade paper unit can be set up with Rs 35,000 to Rs 50,000,. The investment varies depending on the type of the unit and the variety of the product produced.
- Workers are not required to have a high level of technical knowledge, as the process is simple.

- The industry can employ local people, especially rural women.

Weaknesses

- Standardization of Raw materials
- The raw material is not found in bulk quantity at all times. The sources are scattered and their identification and transportation becomes very difficult.
- At times the same kind of raw material cannot be found. It might be a seasonal one. This, in turn, affects the final product.

- Process Technology
- The process time is far greater than for mill paper.
- Old machinery and technology.
- No quality standards are available.

- Marketing
- Marketing is very difficult, for though there are patrons worldwide they are very scattered and therefore difficult to target.

- Poor Capacity Utilization
- Poor capacity utilization resulting in non-compliance of the order in time due to labor problems (heavily dependent on the skilled paper lifters).
- A sample survey of clusters of handmade paper industry pointed out the under utilization of installed capacity. In Kalpi ,distt Jalor U.P,out of 37 units surveyed, there are 13 tiny,12 small and 12 medium units having investment less than 10 Lakhs,10-20 Lakhs and greater than 20 Lakhs respectively. These mills have capacity utilization of the order of 50%, 60% and 70%, respectively.

Opportunities

Under the handmade paper industry, Govt of India has proposed to set up 460 new HMP units providing employment to 40,000 persons through Khadi and Village Industries under special employment programme. One registered institution at Faridabad has been identified under this programme. In addition to this, five traditional handmade paper units have been given financial assistance for revival. Under this programme, two-clusters have been financed in Rajasthan involving 19 individual entrepreneurs.

Nearly 70 per cent of the raw material required by mill-made paper is generated through forests. With many countries seriously contemplating banning the imports of non-biodegradable material in packaging and replacing it with Eco-friendly recycled products range, Handmade paper can give India a big opportunity in world market. The handmade paper and its allied products offer a vast marketing scope both inside and outside the country.

- Market Potential
- **Domestic Market** presents divergent scenario with persistent and sustained demand for quality products on one hand and scarcity of such quality items on the other Central government and State government are main purchasers of file covers, flaps, file boards and such kinds of paper. Govt. of India has decided to purchase 50% of it's requirements of file cover and office stationery from KVIC / KVIB units which is to be implemented in an organized way. If only 10 percent of this supply is reserved for handmade paper industries, it will be about 7 times the present quantum

of production. Following table gives glimpses of the potential clientele for handmade paper.

Table 3

S.No.	Clientele	Type of products
1.	Govt. deptts. / Institutions (Central and State), Banks, Railways, P&T etc.	File covers, File boards, Wrappers, Writing paper, Letter paper, Drawing paper, Bond paper, Fixed Deposit Receipts, Greeting cards, Visiting cards, Post cards, MO Form etc.
2.	Schools, Colleges, Universities and other educational institutions	Degree and certificate papers with or without water marks, strong envelopes, Drawing papers, Colored card sheets, Book covers, Marble papers, Decorative papers, File covers and File boards etc.

- Other potential clients are, Khadi institutions, Departmental & Book Stores, Decorators, Advertising Agencies, Hotels, Business Houses, Various Industries, Laboratories, Packaging Industry, Museums and Forest & Environment conservation related organizations.
- **Export Market:** Since 1991, the market of handmade paper industry in the country has increased by more than 100 % and in the export sector an impressive 1000% increase has been noticed. Export statistics recorded by the Paper and Paper Products, during the period extending from April - November 2000 in terms of highest item of export, indicate that handmade paper accounted for a total of Rs.57.52 crore worth of exports during the above period and ranked first.

Threats

- Introduction of new types of paper viz recycled and plastic based paper etc.
- International Exports from competitors like China & Phillipines

6.4.1.4 Role of NIRI

The handmade paper industry can flourish by adding new capacity, by rejuvenation of existing units through technology inputs, and by development of specific market segments. However, the sustained growth of handmade paper units will require intervention of NIRI at various levels:

- **R&D issues**
- **Handmade paper** production currently hinges on the availability of cotton rags and waste paper. Many other materials currently used only for blending could form a major component in the manufacture of paper. Materials identified for active research are silk cotton (a type of tree cotton), banana fibre, straws and grasses. These materials may be available as agro-waste or can easily be cultivated locally for paper production.
- The use of diverse materials will depend on the development of environment-friendly processes. One area of research will be the use of biotechnology, for example for the recovery of alpha cellulose from different non-forest based materials, and for lignin removal using organisms like white-rot fungi. The use of chemicals, and associated effluent disposal problems, could be avoided through the use of biotechnological processes for digestion.

- On the one hand improvement in available technologies and machinery, based on the feedback from existing units, will be a continuous process, while long term research on the development of low cost indigenous tools and machinery will be another task for part mechanization of some steps.
- Another area of research is the extraction of natural dyes from plant materials. The use of natural dyes can increase the choice of colors, textures and finishes, besides leading to the creation of jobs involving, for example, block printing.
- Evolution of newer production methodologies, which minimize waste. The goal will be zero effluent plants for hand made paper.
- Design of effluent treatment plants and development of eco-mark.
- **Skill development:** Handmade paper production requires close control on thickness and weight, both of which have traditionally depended on exceptional operator skills. Technology development will need to integrate methods for rapid skill development as a means of internal quality control. Hence NIRI should facilitate development of manpower.
- **Innovative production systems:** Handmade paper production is amenable to decentralization. Through research, units based exclusively on local production of non-forest based raw materials can be planned. Future small, decentralized units can easily be installed in rural areas, even areas with limited access to water and electricity. The part of the production system that requires major capital investments, and may thus benefit from economies of scale, could even be based in urban areas if necessary and integrated with the marketing system. NIRI will also have a role in identifying various rural clusters all over India, identifying potential raw materials in each cluster.
- **Evolution of technical and marketing circles:** NIRI will work for the formation of technical and marketing circles for various clusters. Based on the cooperative and cluster approach, these circles will identify various technical and marketing problems in long-term and solve these problems with help of NIRI. NIRI will also ensure interaction between circles of various clusters.

6.4.1.5 Action Plan

- Establishment of linkages between existing KVIC research institutions and production units.
- Raw material standardization and identification of potential areas for the growth of clusters.
- Development of standards.
- Diagnostic study of handmade paper units and revival of sick units.
- New product development and diversification projects.
- Optimization of quality parameters with cost analysis.
- Development of central testing facilities and test kits for quality parameters to be followed by the production units.
- Entrepreneurial training.

6.4.1.6 Important Institutions

- Kumarappa National Handmade Paper Institute, Sanganer
- Maharashtra State Khadi & Village Industry Board, Handmade paper Institute, Pune
- Institute of Paper Technology, Saharanpur
- Central Pulp and Paper Research Institute, Saharanpur
- Shankar Gramodyog Sewa Sansthan, Hapur

- Directorate of Handmade Paper, KVIC, Mumbai

Also, individuals with rich experience in the field of handmade paper making viz. Dr. S.N Singh, Retd. Director of KNHPI, and Prof. Dhake, Retd. from LIT, Nagpur would also be requested to act as advisors.

6.4.2 Soap

6.4.2.1 Introduction

The Indian soaps and detergents industry has a volume of around 3 million tonnes. The industry consists of traditional oil based laundry and toilet soaps and synthetic detergent products. India is one of the world's largest markets with a population of more than 1 billion people growing at the rate of more than 2% per annum. The per capita consumption of soaps and detergents in India is around 2.3 kgs/capita/year and is more than that in China whose per capita consumption stands at 1.9 kgs/capita/year. The per capita consumption of soaps and detergents in the Asia Pacific countries averages about 3 kgs/year and is significantly lower than the western countries whose per capita consumption is in excess of 10 kgs/year. The advent of washing machines and their growth will also provide the drive for compact detergents and value added products.

TABLE I: Projected Demand for Soaps & Detergents (1996-2000-2005)
Qty. ('000 Tonnes)

Year	Toilet Soap	Laundry Soap	Synthetic Detergents	Total
1996	525	810	1725	3060
2000	700	850	2725	4275
2005	950	895	4800	6645

6.4.2.2 Status

6.4.2.2.1 Growth Pattern

The soap industry is witnessing a mixed growth pattern. The demand for synthetic detergents (powders and bars) is projected to increase at the expense of the oil based laundry soap. Rural markets are projected to grow at 14-15% per annum whilst the urban market will have a growth rate of 5-6% per annum. Toilet soaps have seen a 4-5% growth rate in the last two years. An annual growth rate of 6% is projected for the next decade. Laundry soap has registered a negative annual growth rate (4-5%) in urban areas and the rural areas too have seen only a modest growth rate of 2-3% per annum. The laundry soap market is projected to grow at the rate of 1-2% per annum. The Indian market has evidenced introduction of milder bathing soaps and innovative technologies like structured soaps. The development of bath gels and liquid soaps in India is in its infancy but these markets will grow based on their appeal for better performance, skin mildness and enhanced performance properties.

6.4.2.2.2 Toilet Soaps

The Indian toilet soap market is dominated by Hindustan Lever, which started its production in India in 1933 under the name of Lever Brothers India Limited. There are many international and domestic players by now. The key players are Nirma, Procter & Gamble, Godrej Soaps, Colgate&Palmolive, Reckitt & Colman, Wipro, Karnatka Soaps &

Detergents and Johnson & Johnson. The market is divisible into four categories-premium, popular, sub-popular and carbolic soaps. The price brackets are as follows-

- Premium- over Rs. 12/75 g
- Popular- Rs, 8-12/75 g
- Sub-popular- Rs.5-8/75 g
- Carbolics- Rs. 5/75 g

6.4.2.2.3 Laundry Detergents

The laundry detergent market in India consists mainly of synthetic detergent bars and powders. The synthetic detergent bar market which accounts for 30% of the industry output is a unique example of the product catering to a consumer need. The detergent powder market too is unique in as much as it covers a wide range of products with prices ranging from Rs.10/kg to over Rs.100/kg. Lower priced products whose growth is driven by urban demand drive the product demand. Over 75% of the market volume is segmented in a price range below Rs.20/kg.

The low cost detergent products rapidly deteriorate the reflectiveness in new fabrics after 10-15 washes due to soil deposition, which leads to graying. The high-performing detergents, which can deliver superior stain removal and whiteness performance, offer a higher overall satisfaction and value to the users. The Indian laundry habits at low wash temperatures under hard water conditions using predominantly hand washing methods would be favorably inclined to compact detergent powders.

6.4.2.2.4 Packaging

In addition to the products themselves, their packaging is also evidencing a revolution. Improved package functionality and convenience are features demanded by the consumers. In an era where "small is beautiful" and "less is more", packaging innovations that deliver superior consumer value, minimize solid waste and are made using recyclable materials would be the preferred packaging materials. The concept of refills has been introduced in India and will become popular in the years to come. This would offer the consumers better value and a better environmental choice.

6.4.2.2.5 Raw Materials

Raw materials used for the manufacture of soaps are mainly oils from vegetable origin. The Indian industry's adaptability to the use of hydrogenated rice bran oil as an ingredient reflects the industry's flexibility and innovative ability. The development of structured soap technologies and higher performing oil based soaps at lower fatty matter levels demonstrates the manufacturers' commitments to offering the consumers value added products.

The laundry detergent industry is dependent on alkyl benzene sulfonate as the main active ingredient. Alternatives like alpha olefin sulfonates, alcohol sulfates, ethoxylates, etc. have been used in mixed active systems. However, the choice of blends depends on the formulation economics. The low cost dry mix detergent powders manufactured in India do not use phosphatic builders. However, compact and high performing detergents do use a combination of phosphatic and zeolite builders. The use of polymeric builders in detergents has not been cost effective. The builders in detergent formulations will be dependent on the market's perception of product quality and cost per wash. Specialty chemicals like enzymes, stain removers, fabric softeners, bleach aids and fragrance enhancers will find an increased use in high performing products.

The oil-based soaps have been in use over a few centuries. The soaps have demonstrated the safety of their use by consumers. However, the performance of the soap is affected by the water hardness and the substrate, which it has to clean. The use of super fatting agents, lime soap dispersing agents, foam boosters, etc. enhance the performance of soaps. However, the safety of using additives to soap needs to be guaranteed by the manufacturers.

6.4.2.3 SWOT Analysis

Strengths

- The per capita consumption of soaps and detergents in India is at 2.3 kgs/capita/year showing the strength of the industry.
- The soap industry mainly consumes non-edible oil and rice bran oil as main raw material for manufacture of laundry & toilet soaps. The collection of non-edible oil seeds like Neem, Karanja, Kusum, Sal, Mahua, Mango kernel, Pisa, Rice Bran, Undi, Ratanjot etc. is main strength of the Industry. The states where its activities are concentrated are Madhya Pradesh, Bihar, Orissa, Rajasthan, Gujarat, A.P. Karnataka, and U.P. for collection of seeds. In these collections, millions of tribals/people below the poverty line are engaged and it provides large scale employment to these people.
- India is one of the largest producers of rice in the world and nearly 3 million tons of rice bran remains un-exploited. Presently, we are producing about 0.3 million tons of rice bran oil by processing 2.0 million tons of rice bran. Approximately 60% of rice bran oil produced is non-edible having high FFA (20% to 70%), dark in colour. This oil is ideal for soap making.
- India produces large varieties of aromatic plants and flowers like Khus, Lemongrass, Cedar, Patchauli, Kewda, Rose, Jasmine, etc. These are main sources of natural perfumes/fragrances used in soap making. The cultivation and processing of these crops would generate more employment in rural areas.

Weaknesses

1. In the production and availability of non edible oil
2. The non-edible oil seeds are scattered in forests/waste land areas.
3. Short period of their collection coincides with rainy season.
4. Lack of storage facilities in rural areas: therefore quality of oil deteriorates.
5. Lack of quality control in collection and grading.
6. Collection being labour-intensive does not provide guarantee of proper returns to the collector.
7. Traders exploit most of the seed collectors.
8. Lack of proper road & transport facilities for transporting the seeds from inaccessible areas in the forest region.
9. Non-availability of crushing facilities at the collection centres.
10. In some states it is the monopoly of forest departments and local traders, due to which the poor collectors are exploited.
11. Instability in the oil market and fluctuation in rate of oils due to import.

Production of soap

- Most of the small-scale soap making units are facing problems of raw materials like non-edible oil, caustic, coconut oil, perfumes etc.
- Lack of technical input in terms of Quality Control, packaging, shelf-life of soap, perfume, colour etc. & also in energy consumption in the soap making process.
- Small scale units are facing technical problems in fat splitting, degumming, bleaching and deodorization of non-edible oils.
- Non-professional & non-commercial attitude of our units particularly due to non-availability of proper technical staff with the units, which increases the rate of dormancy of the units.
- VI sector is facing the problems of quality and standardisation of products.

Opportunities

- Proper utilization of non-edible oil seeds will create lot of employment opportunities in terms of collection and decentralized processing (crushing) in the collection centre in the forest/rural areas.
- Creating decentralization in soap making units will generate employment in soap making, packing, transportation etc.
- Natural perfuming raw materials like lemon grass, citronella, palmarosa, rose, khus, turmeric, basil, patchauli, geranium, cultivation & steam distillation will also create more employment opportunities in this sector.
- Production of synthetic detergent by small sector will create more employment to rural woman

Threats

- The greatest threat at the moment is from the organized sector. The large-scale manufacturers like Hindustan Lever, Godrej, Proctor & Gamble, Reckitt & Colman, Nirma etc. have well-organized network for manufacture and marketing.

6.4.2.4 Role of NIRI

R & D Issues

- Standardisation of raw materials, production procedures and products.
- Technological upgrading of the processes like degumming, oil bleaching, deodorization, saponification, mixing colour, additive perfume so that the quality of colour, consistency, compactness, shape, solubility in water, lather and detergents.
- Development of Herbal Soaps by using herbal extracts in the soap formulation.

Skill Development

- Training would be imparted to rural people both on-site and off-site. This would in turn help in filtering down the technologies from R & D centres to the rural areas.

Marketing Strategies

- NIRI will work for evolving cooperate marketing mechanism to promote and support a decentralised production system.

6.4.2.5 Action Plan

- Study of the existing soap making process of KVIC units and technological improvisation by modernization of equipments.
- Establishment of well equipped quality control and product development laboratory at Wardha.
- Establish standard production processes for toilet and laundry soaps using available non-edible oils available in different parts of the country.
- Establishment of well equipped quality control and product development laboratory at Wardha.
- Impart training on soap manufacture raw material testing, quality control of toilet and laundry soaps and also entrepreneurial training on establishing soap manufacturing units under KVIC.

6.4.2.6 Important Institutions

- Fragrance and Flavour Development center, Kanauj.
- Oil and Paint Department, HBTI, Kanpur.
- Department of Oil and Technology, LIT, Nagpur.

6.4.3 Leather

6.4.3.1 Introduction

The Leather Industry occupies a place of prominence in the Indian economy in view of its massive potential for employment, growth and exports. There has been increasing emphasis on its planned development, aimed at optimum utilization of available raw materials for maximizing the returns, particularly from exports. The exports of leather and leather products has gained momentum during the past decades. There has been a phenomenal growth in its exports from Rs.32 crores in the year 1965-66 to Rs.5798 crores in 1996-97.

Apart from a significant foreign exchange earner, leather industry has tremendous potential for employment generation, especially among weaker sections of the society and women. Direct and indirect employment in the industry is around 2 million, majority of whom are from down-trodden and weaker sections of the society. The skilled and semi-skilled workers constitute nearly 50% of the total work force.

Salient Features of the Indian Leather Industry

- Employs over 1.5 million people directly.
- A large part (nearly 60-65%) of the production is in the small / cottage sector.
- A small capital investment can generate a high turnover of two / three times of the investment.
- Export oriented - amongst top 5 export earners for India.
- India has 10% of the world raw material but only four percent of world trade.
- In footwear, which constitutes over 50% of world trade, India has less than 1% share of world trade.
- Has good potential for future growth.
- Very high value addition within the country.

6.4.3.2 SWOT Analysis for the Leather Industry

Strengths

▪ Raw Material

There exists a large raw material base. This is on account of population of 194 million cattle, 7 crore buffaloes and 9.5 crore goats. According to the latest census, India ranks first among the major livestock holding countries in the world. With 4.8 crore of sheep, it claims the sixth position. These four species provide the basic raw material for the leather industry.

The annual availability of 16.6 crore pieces of hides and skins is the main strength of the industry. Abundance of traditional skills in tanning, finishing and manufacturing downstream products and relatively low wage rates are the two other factors of comparative advantage for India.

▪ Man power

There is an abundant supply of cheap labour. In the leather sector, there exist a number of well-equipped training institutions working in close collaboration with reputed foreign institutions, for imparting training in various facets of manufacture of leather and leather products. Indian traditional skills in embroidery, handcrafting, etc., are areas of strength. With the proposed support to the unorganized/artisan sector by Government of India and National Leather Development Programme, along with the Leather Technology Mission, productivity levels as also of the quality of product of artisans and small-scale sector can change dramatically.

▪ Tanning Capacity

With tanning and finishing capacity for processing 19.2 crore pieces of hides and skins per annum spread over different parts of the country, most of which is organized along modern lines, the capability of India to sustain a much larger industry with her raw material resource is evident. In order to augment the domestic raw material availability, the Indian Government has allowed duty free import of hides and skins from anywhere in the world. It is an attraction for any foreign manufacturer who intends to shift his production base from a high cost location to a low cost base.

Weaknesses

- Social non acceptance, mainly due to poor working conditions.
- Highly Polluting Industry.
- Non availability of low cost machinery, hence poor decentralized production system.
- Poor fixation quality in vegetable tanning

Opportunities

▪ Export Potential

The leather industry, one of the major foreign exchange earners of the country, recorded significant growth since the beginning of the decade. Today the share of value added finished products in the total exports from leather sector are 80% as against 20% in 1970s. However, exports during the year 1996-97 stood at US\$ 1636.74 million (provisional) as against the previous year's performance of US \$ 1752.34 million recording a negative

growth of 6.60% in dollar terms. The overall exports of leather and leather products for the last four years are shown in the table below

Table 2

Category	1993-94	1994-95	1995-96	1996-97
Finished Leather	270.25	382.96	371.33	299.08
Leather Products	204.25	302.49	340.44	341.04
Footwear Components	253.39	247.49	242.99	223.48
Leather Garments	342.28	387.12	413.60	421.84
Leather Goods	229.18	292.04	383.97	* 351.30
Total	1299.35	1612.10	1752.33	1636.74

* Figures for Leather Goods Exports during 1996-97 are provisional

Source: CLE

▪ **Positioning of India in the Global Market**

Many units in the country cater almost exclusively to export. This export oriented modern production sector co-exists with a network of traditional production base for leather and leather products. Strengthening the traditional base of micro enterprise small/artisan level manufacturing, by endeavoring to standardize it with a very low cost of conversion and large outputs can be attained by forging linkages with the ongoing sector. This is a priority area for improvement of leather industry, and would lead to greater results with relatively smaller investments (as opposed to fully mechanized units being set up).

▪ **National leather development programme**

The National Leather Development Programme was implemented by Govt. of India in association with the United Nations Development Programme (UNDP). The Programme seeks to strengthen the industry in the areas of education and technical training, research and development, effluent control, export enhancement and coordination. It was aimed at integrated development of leather industry through select institutions/agencies in the country. A good deal of expertise from advanced western countries is expected to flow into the industry besides a number of Indian professionals being exposed to the western institutions and organizations for training. Many training institutions in India are being modernized and updated to fall in line with those working in the west.

The program concentrated mainly on (i) technological up gradation for product development with a special focus on the small scale and the artisan sector, (ii) improve value addition in the leather sector within the country through use of appropriate and eco-friendly technologies, (iii) develop and consolidate marketing and export linkages with emphasis on quality control and standardization of product; and (iv) in this process also tie up related aspects of technology, components, tools, machines, etc.

Threats

- Environmental issues especially pollution due to chrome tanning
- Awareness against using animal products
- Lack of product standardization and consistent quality

6.4.3.3 Role of NIRI

After an overview of the current national scenario of the Indian Leather industry a conclusion can be drawn on the role NIRI would play in the immediate future and the coming years in the rural areas. Besides imparting training to the people and facilitating the artisan in setting up of production units, the following have been identified as the fields in which NIRI will play a significant role.

6 R&D issues

- 6.4 Research can be carried out to develop new vegetable tannins and improvise the existing ones depending upon the availability of the plants in different geographical areas all over India.
- 6.5 Designing low cost effluent treatment plants especially for chrome tanning wastes
- 6.6 Developing various methods of utilizing by-products at various levels of leather treatment e.g. use of bone, meat, fat and other wastes for glue or gelatin production.

6.6.4 Innovative Production Systems

- 6.6.5 Improving equipments available for lifting of carcass and decentralized method for collecting raw hides.
- 6.6.6 Equipment modification at various levels of production and processing of leather and leather goods.
- 6.6.7 Encouraging growth of clusters among workers at the level of manufacturing of finished leather goods.

- **Quality Control and Standardization**

- Defining various standards and testing measures for manufacturers to comply to in order to ensure quality maintenance at various levels of production.

- **Marketing strategies**

- This would involve effective marketing techniques especially advertising of the products and facilitating upper and lower linkages with various exporters and similar research institutes nationally and internationally.
- The use of a unique selling point i.e using ECOMARK to attract customers who are environmentalists and animal lovers.

- **Similar Institutions**

- Gandhigram Khadi &VPIC Trust, Gandhigram, Dindigul, Anna Dist T.N.
- Haryana Charmodhyog Sangh, Bal Mukund Temple, Mohalla Palledor, Ambala Cantt, Haryana.
- Bhartiya Charmodhyog Sangh ,West Govind Nagar, Saket Colony,Agra.
- Dharavi Mahila Audyogik Sahakari Sanstha Shambhu Mansion, Bandra, Mumbai
- Central Leather Research Institute, Chennai
- HBTI- Kanpur

6.4.4 Pottery

6.4.4.1 Introduction

Pottery was developed as an art to fulfil requirements of ancient civilisations. Later on, it was transformed as a source of livelihood and it became a very important constituent of any village or a village cluster. It fulfills varied needs of villagers and is still a very large sector in villages, but gradually losing its importance due to industrialization and entrance of plastics, polythene and MNC's. It is estimated that there are more than 13 lakh potters in India today. Pottery products may be classified broadly into two types-

- 1) Utility products
- 2) Decorative items

6.4.4.1.1 Utility Products

This category includes products made up of white as well as red clay, which are abundant in India. Conventional method of moulding and hardening are used in manufacture of these products.

List of products- earthen pots and pans, bricks and tiles, earthen pipes, grameen sheetak (clay refrigerator), water filters- not only filters but also cools water, garden pots, smoke free chulhas, guna tiles- hollow cylindrical clay tiles suitable for arch roofing and low cost house, crockery etc.

6.4.4.1.2 Decorative Items

This category includes products made up of white clay and red clay used only for decorative purposes. This category also has a good export market.

List of products- white ceramic mugs, terracota pottery, blue pottery, white ceramic crockery etc.

Organized sector is not present in many of these products except for bricks, ceramic wares and crockery. Major contributors to the organized sectors being – Jaipur Glass and Ceramics Ltd., Bharat Potteries, Jaipur Ceramics, Kajaria Ceramics, Tata Ceramics Ltd. and Bell Ceramics.

6.4.4.2 Role of KVIC

When KVIC took over the development of the industry in 1956-57 from the All India Khadi and VI Board, the production of pottery was less than a lakh of rupees by about 17,000 potters assisted by the Board. The production and sales affected through the agencies assisted by the KVIC during 1993-94 for pottery were worth Rs.286.38 crores and Rs.325.52 crores, respectively. The KVIC's activities correspondingly reached over 5 lakh potters enabling them to earn Rs.10 crores. In addition, a large no. of traditional potters are also benefited indirectly. These activities are set up through a network of 2,506 Potter's Co-operative Societies, 771 registered institutions and 1,44,378 individuals.

Production, Sales And Employment

Year	Production (Rs. Lakhs)	Sales (Rs. Lakhs)	Employment		
			Full Time	Part Time	Total
1957-58	3.19	2.01	542	660	1202
1962-63	79.82	68.59	12110	14024	26134
1967-68	178.31	175.92	13662	21874	35536
1972-73	389.56	389.66	36748	22985	59733
1977-78	1120.85	1314.8	67677	43295	100972
1982-83	4163.75	5090.42	94486	127369	221855
1987-88	10403.07	12487	190527	136570	327097
1991-92	20419.91	24103	225595	235931	461526
1992-93	20419.37	29716	246129	247797	493926
1993-94	28637.64	32552	248337	254000	502337
1994-95	29567	36000	259000	271000	540000

These values suggest that this sector is a well-established sector with a sales value exceeding Rs.360 crores for the year 1994-95. But this sector has not taken the position it should have. The growth rate of the sales value is continuously decreasing hence the measures taken should be reconsidered and studied for effectiveness. On visiting various places like Khadi Bhawan (C.P. Delhi), Gram Shilpa (C.P. Delhi) and K.V.I.C. units like Capital Cooperative Society, it was found that problem lies in the policies of KVIC which does not purchase the products from its units outrightly. It rather takes the products for selling at its centers and pays the producer depending upon the sale of items. This leaves the producer at the mercy of KVIC outlet, which in turn is not interested in modifying the products. The result is that only low quality products are given to KVIC outlets.

6.4.4.3 SWOT Analysis

Strengths

- Large numbers of traditional skilled artisans are available.
- Availability of raw material in abundance.
- Low capital investment.
- Products are aesthetically beautiful, hence easy to market.
- Labour intensive industry.
- Prospective local and international markets.

Weaknesses

- Non-availability of good quality clay at reasonable price.
- Age-old techniques are used.
- Packing and transport is difficult.
- Cost of fuel is increasing.
- No proper organization of potters.
- Poor marketing of products.

Opportunities

- Products are aesthetically beautiful, hence easy to market.
- Products can be easily diversified depending on the needs.
- Introduction of power driven wheel, biogas kiln or LPG kiln can standardize the product.
- No big player in the sector except for glazed pottery, hence the market can be captured with less efforts.

Threats

- Competition from organized ceramic industry.
- Health hazards due to dust pollution and lead oxide.
- People leaving this art and coming to cities.

• **Role of NIRI**

Some projects for R&D, to be carried out at NIRI, are listed below. The requirements for the laboratory, library and pilot plant are discussed in the later part of this chapter.

• **Projects for R&D Centre**

In the context of village pottery industry, NIRI should lay stress on following areas in its first few years.

- Standardization of raw material
 - Clay preparation techniques.
 - Treatment of various types of clays.
 - Development of new mixtures that need less temperature for firing.
- Technical improvements in the processes like
 - Power driven potters wheel.
 - Leg driven potters wheel (like sewing machine).
 - LPG or Bio Gas fuelled standardized temperature controlled kilns.
 - Packaging and transport of products.

• **List of Institutes**

- Central Village Pottery Institute, Belgaum, Karnataka.
- Regional Pottery Training Centre, Bhadrawati, Dist. Chandrapur, Maharashtra.
- Regional Pottery Training Centre, Sarambhanpur, Darbhanga, Bihar.
- Regional Pottery Training Centre, Kozhikode, Kerala.
- Regional Pottery Training Centre, Sevvapet, Tamil Nadu.
- Dr. J. C. Kumarappa Institute, Madurai, Tamil Nadu.
- B. Kora Institute, Borivali(W), Mumbai.
- M.D.T.C. Rajghat, New Delhi.

• **Some Reputed Pottery Units (VI Sector)**

- Gramodaya Sangh, Bhadrawati village, Dist. Chandrapur,(M.S.), Tel.07175- 66029. For Crockery and Ceramic utility articles.
- Capital Co-operative Industries Society Ltd.,92 Sarai Rohilla, New Delhi, Tel. 5938450, 5461997. For Crockery, Utility items and Grinding media.
- Sundernagar Integrated Rural Development Association, Naulaka, Sundernagar, Dist. Mandi,(H.P.) Tel. 62312,62695. For Brick Bhatta unit.
- Navodaya Ceramic & Pottery Ind., Co-op. Society, Tadikalapudi (V), Kamavarapukota (M), Dist. West Godawari, A.P., Tel. - 20154. For Refractory Bricks, Blocks and Insulation Bricks.
- Gem Ceramic Mfg.I.C.S.ltd.,Plot No.35, Castile Hills Road No.2, Near NDMC office, Masab Tank, Dist. Hyderabad-56, A.P., Tel-220066. For refractory Bricks, Blocks and Insulation Bricks.

- A.P. Khadi Nav Nirman Sangham, 53/A, Madhura Nagar, Dist. Hyderabad-38 (A.P.) Tel.-896961. For Flower pots and Utility wares.

6.4.4.7 Some Reputed Pottery Units (Organized Sector)

- Jaipur Glass and Ceramics Limited, Tonk Road, Jaipur - 302018, Phone 91-141-513339, 516445, 514612 www.jaipurglass.com
- Bharat Potteries Limited, B-12, MGD Market, Jaipur, 302002, Phone 91-141-330624.
- Jaipur Ceramics (P) Ltd, Isharda House, Old Ajmer Road, Jaipur - 302002, Ph. 141-332324
- Kajaria Ceramics. Head office – J1/B1 (extn), Mohan Co-op Industrial Estate, Mathura Road, New Delhi 110044. Ph.-011-6946409

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6.6 Manpower and Infrastructure Requirement for Rural Chemical Industries

6.6.1 Manpower

A Senior Scientist will head Chemical Engineering Division. Four Scientific officers will also be required for the specialization in four thrust areas respectively. Workshop facility will be common for use by all the four divisions.

Designation	No. Posts	Qualification
Senior Scientific officer	1	Ph.D
Scientific Officer	3	B.Tech (Chem Engg. / Respective field)
Technical Supervisor (i) Physical Testing Lab Supervisor	1	M.Sc (Chemistry) with analytical Chemistry
(ii) Chemical Testing Lab Supervisor	1	M.Sc (Chemistry) with analytical Chemistry
(iii) Workshop Supervisor	1	Diploma in Mechanical with experience
	1	M.Sc.
Lab Assistant	3	Graduate in Sciences for Lab and ITI for Workshops
Total	10	

6.6.2 Infrastructure

Total Area Requirement for Production units/ Laboratory/Workshop

- General R&D facility 140 sq meter
- Physical Testing lab 60 sq meter
- Chemical Testing Lab 60 sq meter
- Workshop 60 sq meter
- Cubicles for scientists/staff 80 sq meter
- **Total 400 sq meter**

6.6.2.1 Pilot Plant Requirements (for mission projects)

Handmade Paper

Equipment	No of Units	Approx.Cost (Rs.)
10 Kg Pilot Plant		
Rag Chopper	1	20,000
Beater	1	70,000
Cylinder Mould	1	3,50,000
Hand Operated vat	2	5,000
Felt Press	1	50,000
Hydraulic Press	1	60,000
Dryer	1	80,000
Calendar (9"-30")	1	30,000
Cutter	1	15,000
Boiler (7 kg/cm ²)	1	1,00,000
Vacuum pump	1	20,000
Total		8 Lakhs

Soap

Equipment	No of units	Approx Cost (Rs.)
Non edible oil Degumming & Bleaching, pilot scale plant	1	2,00,000
Saponification unit for laundry & toilet soap	1	2,00,000
Sigma mixer	1	1,00,000
Roll mills and Plodder	1	1,00,000
Stamping Machine	1	25,000
Manual Packing unit	1	20,000
G.C for Analysis of fatty acid corporation	1	4,00,000
Tintometer to measure color of oil	1	2,00,000
Abbe Refractrometer	1	10,000
Total		12.55 Lakhs

Leather

Equipment	No of Units	Approx Cost (Rs.)
Flaying And Caracass Recovery		
Disintegrator	1	1,00,000
Carcass Cooker	1	30,000-80,000
Lime Yard Tools:		
Lime Plunger	1	200
Monitor Flesher	1	300
Spring Flesher	1	300
Broad Flesher	1	150
Rub Stones	1	200
Tanning Yard Tools:	1	300
Currier's Knives		
Bate Beams Stones	1	350
Staking Stands	1	300
Cork Graining Board	1	300
Skin softeners	1	300
Slickers	1	150
Fleshing machine	1	80,000
Tanning drums	3	80,000
Splitting machines	1	3,00,000
Shaving machines	1	1,50,000
Buffing machine	1	30,000
Staking machine	1	48,000
Air compressor with spray gun	1	60,000
Setting machine	1	75,000
Hot plate embossing machine	1	6,50,000
Total	25	16.55 Lakhs

Pottery (Capacity 50 kg)

Equipment	No of Units	Approx Cost(Rs)
Balance(100 Kg)	1	50,000
Ball Mill(150 Kg)	1	1,00,000
Vibrating Sieve	1	40,000
Filter Press	1	2,00,000
Pug Mill	1	50,000
Potter's Wheel	2	40,000
Temp Grad Oven	1	50,000
Temp Grad Kiln(700-1400) ⁰ C	1	2,50,000
Strong Tables	2 (10 ' * 4') each	10,000
Painting Brushes	5	500
Turning Tools	as required	2,000
Copper Wire		1000
Sponge	1	50
Knife	1	200
Total		8 Lakhs

6.6.2.2 Laboratory Requirements**Physical Laboratory**

Equipment	No. of Units	Approx. Cost (Rs.)
Tensile Tester	1	25,000
Tear Tester	1	20,000
Cobb Tester	2	10,000
Fold Strength Tester	1	50,000
Ink Absorbency	1	20,000
Opacity	1	80,000
Thickness Tester	1	30,000
Consistency Meter	2	20,000
Wax Pick Tester	1	10,000
Microscope	2	1,25,000
Lastometer	1	30,000
Trinocular Microscope(Dynamic)	1	2,00,000
Rotary Microtome	1	1,00,000
Freezing Microtome	1	1,00,000
Analytical Balance	1	80,000
Muffle Furnace	1	10,000
Vacuum Oven	1	50,000
Colour Fastness Tester	1	50,000
Flexometer	1	15,000
Shrinkage Tester	1	10,000
Scuff Resistance Tester	1	40,000
Specimen Cutting Press	1	25,000
Water Resistance Meter	1	20,000
Compression Set Apparatus	1	30,000

Fatigue Bending Tester	1	15,000
Split Tear Tester	1	50,000
Abrasion Testers	1	50,000
Clay Hardness Tester	1	1,50,000
Colorimeter	1	7,000
Cup Handle Adhesion Testing	1	10,000
Particle Size Analyzer	1	15,000
Porosity Testing	1	10,000
Flatness Measurer	1	10,000
Glaze Thickness Measurer	1	30,000
Digital Viscometer	1	50,000
Furnace Torsion Viscometer	1	50,000
Total		15 Lakhs

Chemical laboratory

Equipment	No. of Units	Approx. Cost (Rs)
Analytical Balance	1	80,000
Paraffin Embedding Bath	1	20,000
BOD Incubator	1	80,000
Autoclave (COD)	1	40,000
Oven	1	20,000
Furnace	1	20,000
ph Meter	1	70,000
Conductivity Meter	1	70,000
Soxhlet Extraction Unit	1	20,000
Gas Chromatograph	1	2,00,000
H.P.L.C. Equipment	1	5,00,000
Glass Wares		1,00,000
Chemicals		1,00,000
Mechanical Shaker	1	40,000
Moisture Content Measurer	1	20,000
Water Bath	1	5,000
Total for laboratories		14 Lakhs

Workshop & Auxiliary Facilities

(glass blowing, mini boiler, compressed air, exhaust hoods etc.)

16 Lakhs

Total (for Laboratories):

45 Lakhs

Chapter 7

Bio-Processing Based Industries

7.1 Introduction

7.1.1 Bio-fertilizers & Bio-pesticides (BF & BP)

Agriculture accounts for a third of India's national income and it provides employment to over 70% of the population. The current gross cropped area in the country is 190.6 m hectares, and the population has crossed 1000 million. With the current rate of population increase it is projected that India will have a population of 1500 million by 2025 A.D. To feed this population we must produce 310 MT of food grains. Green revolution technology i.e. an intensive use of land through the use of heavy doses of chemical fertilizers, pesticides, assured irrigation, hybrid seeds and improved agronomic practices etc, has resulted in significant increase in agricultural productivity. But the present level of production is not being sustained and there is a decline in productivity due to reduction in soil fertility. An ideal fertile soil is characterized not only by optimum physical properties and chemical constituents conducive for plants growth but also by a balanced micro flora in the rhizosphere. The application of chemical fertilizers not only unbalances soil fertilization but also affects soil micro flora. Moreover, chemical fertilizer production is an energy intensive process using fossil fuels and it is expected that in next few decades, their reserves may get exhausted. Also these chemical inputs are not only deleterious to environment but also injurious to human and soil health. India's overall growth rate of grain production is 2.6% & overall land availability estimated is 1,66,000 hectare.

The consumption of chemical fertilizers has increased from 0.23 m tons in 1960-61 to 16.6 m tons in 1998-99 of which N, P and K constitute 11.3, 4 and 1.3 m tons respectively (India infoline.com). The cumulative production of fertilizer nutrient in 1998-99 was 13.64 m tons (N, 10.4 and P, 3.16 m. tons). Urea is the most widely used nitrogenous fertilizer constituting more than 83% of the total Nitrogen requirement. Di-ammonia phosphate is the dominant phosphate fertilizer accounting for 58% of consumption followed by (Single Super Phosphate) with a 20% sale. The potassic fertilizers are not manufactured in the country due to non-availability of the basic feedstock and are completely imported. It has been projected that in 2011 the fertilizer production and requirements in our country would be 15.8 and 20.2 m tons respectively.

The increasing demand of fertilizers will result in setting up new fertilizer plants which would not only involve high investments, including foreign exchange but would also require a significant increase in subsidy to maintain the sale price of fertilizers at a reasonable level. Also from fertilizers, particularly nitrogenous ones, large portion is continuously lost from the soil by various processes like volatilization, baking, and demystification etc.

There is growing concern about the adverse effects of the indiscriminate use of chemical fertilizers on soil fertility, productivity and environment quality. Biofertilizer including organic manures are promising alternatives to meet the nutrient requirements of the crop on sustainable basis. Further, knowing the deleterious effects of using chemical fertilizers, the use of biofertilizers will be an environmentally benign approach to nutrient management and ecosystem function.

Biofertilizers include bio-inoculants namely *Rhizobium*, *Azotobacter*, *Azospirillum*, PGPR (plant growth promoting rhizobacteria), BGA (Blue green algae), *Azolla*, mycorrhizal fungi etc. and organic manures namely FYM (farm yard manure), vermicompost, composts, biogas sludge, green manure, concentrated manures (diff. types of seed cakes, bone meal etc.) and so on.

Nitrogen fixation by *Rhizobium* in the root nodules of legumes is in the order of 14 m tons of a global scale and is almost half that of industrial nitrogen fixation which has been estimated to be 30 MT per year. About 30 m ha of area is under pulses, including gram and forage legumes in our country. Our requirement for *Rhizobium* inoculants to cover this entire area will be around 15,000 tons and the present production is only around 800 tons. Similarly, we will be requiring about 4 lakh tons of BGA, if the entire rice area is to be covered. It is now known that the yield of pulses and oil seeds crops can be stepped up substantially by the use of rhizobial culture. Legumes are known to leave behind some residual nitrogen (e.g. soybean leaves 40 kg/ha) in soil for subsequent crop (wheat) under Indian soil condition. Recent reports on *Rhizobium* showed that it fixes 50-100 kg N/ha. Several experiments conducted in India have shown that nearly 50% nitrogen fertilizers can be saved through inoculation with efficient strains of *Rhizobia*. Likewise preparations of *Azotobacter*, *Azospirillum* and BGA can all provide additional savings. The beneficial effects of *Azotobacter* are attributable to multiple modes of action i.e. fixation of atmospheric nitrogen, synthesis of growth promoting substances and anti-fungal substance. *Azolla*, a water fern harbor nitrogen fixing. BGA *Anabena*, *azolla* multiplies 100 folds, resulting in yield of 10-15 tons fresh material /ha and thus improves the physico-chemical properties of soil and fixes considerable amount of nitrogen i.e. 60-80 kg/ha. Field experiments have shown that ~50% nitrogenous fertilizer can be saved through bio-fertilizers.

Next to nitrogen, Phosphorus (P) is a vital nutrient for plants and microorganisms. Tropical soils are deficient in available P. Also most of the soils fix P and thus make it unable for plant growth. Some microorganisms i.e. *Penicillium*, *Aspergillus*, *Bacillus*, *Pseudomonas*, mycorrhizal fungi etc. possess the ability to solublize insoluble phosphorus in soil. Mussorie rock phosphate, Udaipur rock phosphate etc. available in our country can be utilized with the use of P-solubilizing organisms.

Among P-solubilizing microorganisms, mycorrhizal fungus has created a keen interest among biological scientists, due to its other important characteristics as biocontrol agent, nutrients uptake and water absorption, production of plant growth hormones, synergistic effect with nitrogen fixers, improvement of soil structure and tolerance of mycorrhizal plants to adverse soil pH, temperature, draught and toxic heavy metals. Efforts are being made for production of bulk inoculums of AM (arbuscular mycorrhiza) fungi. It has been reported that by using mycorrhizal fungi 25-30% chemicals fertilizers could be saved.

Most Indian soils are generally deficient in organic matter. Improvement of soil properties as a result of application of organic manures takes place by way of improvement of soil structure, increased water holding capacity, increased chelating capacity for micronutrients and increased cation exchange capacity. Similarly, biological condition of soil is improved by way of increased population flux of micro-flora particularly in the rhizosphere region, increased supply of humic materials with high CEC, enhanced soil binding properties, increased release of organic acids with the ability to mineralize macro and micro nutrients in the soil for ready uptake by the plants. It is a well-established fact that the organic manures can play a significant role in the improvement of physical, chemical and biological condition of soil, besides enriching the soils with nutrients.

Vermi-composting is becoming widely acceptable in different parts of India. It is easy to prepare and has excellent properties and good nutritional value for plants. Many workers have reviewed the importance of vermicompost in agriculture, horticulture, and waste management. Earthworms are also known to accumulate toxic substances particularly heavy metals and agrochemicals from soil.

India's current manorial potential through livestock, human and bioprocessing of excreta of crop residue is estimated to be 14.85 m tons of nutrients, N, P & K which is close to fertilizer consumption of the country. By rapid composting technologies using bioinoculants mechanization, vermicomposting etc. good quality composts could be produced at faster rate. Enrichment of compost with nitrogen fixing and P-solubilizing microorganisms is one of the possible ways of improving nutrient status of the product. By application of compost, in addition to N, P and K, fair amount of micronutrients such as C₄, Cn, Fe, etc. are also simultaneously added to the soil.

Pesticides are essential inputs used for increasing agricultural production by preventing loss to crops. Crop pests are considered to be the vital factors affecting the crop yield. The damage covered by the pests and diseases to various crops and stored grains is 22-33% accounting for a loss of Rs. 6,000 crores per year. The farmers are largely depending on chemical pesticides but indiscriminate use of these leads to environmental problems including development of resistant insects/pests, resurgence of non-target pests, accumulation of pesticide residues in food, fodder and animal feed and destruction of beneficial insects, microbes and predators. India is allowing import and use of 33 pesticides, which are even banned in some countries. These include DDT Alachlor, Aldicarb, captan, cabary, carbosulfan methyl parathion, phorate etc. These banned or expired pesticides are seriously threatening health of millions of people. As pesticides degrade, they form products, which may be more toxic than original substances. In this regard bio-pesticides have become very important. They are environmentally friendly because of their high selectivity and biodegradable nature. The important bio-control agents in use include nuclear polyhedrosis viruses, trichoderma, and tricograma. Botanical pesticides, especially neem-based pesticides also assume great significance.

7.1.2 Herbal Products

The use of medicinal plants for health care as well as cosmetics has been known since times immemorial. While traditional physicians themselves largely undertook the preparation of these valuable products in earlier days, some organized production was started in twentieth century in India by the likes of Dabur, Zandu, Baidyanath, Gurukul Kangri, Dhootpapeshwar, unjha, Arya Vaidya Shala, Hamdard, Shama laboratories and others. With the advent of urbanization, when the physicians were unable to cope up with their needs and the industrial development also started in various spheres, many new companies including Himalaya Drugs, Charak and even allopathic companies have started their herbal division as the demand for herbal medicines increased in the post independence period. With the opening of new colleges, dispensaries and hospitals of Indian systems of Medicine and Homeopathy in the sixties and their division into four separate councils in 1978 gave further boost to this sector. On the global scene also these traditional health system got a boost when WHO initiated a program for them in 1978, particularly because of increasing realization that several diseases remained refractory to allopathic medicines while their costs kept on increasing and newer side effects were observed in many cases. The popularity of herbal drug's and nutritional supplements in developed countries increased during the nineties as can be judged by the fact that more than 25% of all prescriptions in USA, Germany, UK, Australia, Japan, Switzerland and elsewhere contained herbal preparations. Their trade in America alone was more than US \$ 21 billion in 1998. Ever

since there has been a spurt in the global demand of herbal medicines whose global market has crossed more than US \$ 60 billion and the estimates vary from a projection of upto US \$ 200 to 500 billion by 2020.

Realizing the importance of these traditional health systems and the potential it offers, the union government started a full-fledged department of ISM &H in 1996 and several state government have also promoted these systems in a big way. Until about a decade ago more than 80% production of drug's of ISM &H was in the small scale and village industries sector (or by the practitioners of these systems of medicines themselves) giving support to more than 5 lakh practitioners of these systems, besides additional employment to about 2 lakh workers in more than 8500 licensed pharmacies of ISM & H. While most of them continue to be in small-scale/village industries sector, about 25 large scale organized sector companies are having a sharing of more than 25% of this market which is currently estimated at more than Rs.5000 crore. The demand for herbal cosmetics has also greatly increased in the recent years, both in the internal as well as global market.

KVIC had also started supporting the production of herbal medicines and cosmetics since eighties when they revised their list of products under village industries. Though the share of KVIC and state KVI Boards in this sector is rather small, exact figures are not available. However, there is available renewed interest by KVIC since 1998 in this sector as also in the manufacture of medicines and cosmetics utilizing 'Panchgavya', i.e. the milk, ghee, curd, urine and the dung of indigenous cows. Despite emergence in this field of some large-scale organized sector companies in the country and an increased interest shown even by MNCs in this area, a lot of scope exists for VI sector.

- **Review of Current Status**

If we carefully analyze the current status of herbal products in the country and the emerging trends, it is apparent that there is enormous potential in this sector, if we systematically overcome some of the limitations and challenges faced by the VI sector in this field. Despite late entry, a systematic approach by countries like China, Korea, Thailand and Singapore etc has allowed them a stronger portion in the global market in this sector. India today has the global market share of only about US \$ 0.1 billion though its market has been growing at a comparatively faster pace during the last decade.

- **Food Processing**

Food Processing Industry is of enormous significance for India's development because of the vital linkages and synergies that it promotes between the two pillars of the economy, namely Industry and Agriculture. The growth potential of this sector is enormous and it is expected that the food production will double in the next 10 years and the consumption of value added food products will grow at a fast pace. It is also important to encourage the food processing industry in the country to minimize huge losses to the farmers due to the lack of adequate post – harvest storage capabilities on one hand and perishable nature of a number of crops, particularly fruits and vegetables. If adequate food processing facilities of appropriate nature are provided to the farmers in rural areas, linking these with marketing inputs, these will not only provide a lot of employment but also boost agricultural economy by saving the losses particularly from perishable crops, besides adding value to these crops. This growth of the food processing Industry will bring immense benefits to the economy, raising agricultural yields, reducing losses, creating employment and raising the standard of living of a very large number of people throughout the country, specially, in the rural areas. Economic liberalization and rising consumer prosperity is opening up new opportunities for diversification in food processing sector. Liberalization of world trade will open up new

vistas for growth. Food processing involves many types of value addition to the agricultural produce starting at the post harvest level. It includes even primary processing like grading, sorting, cutting, seeding, shelling packaging etc. The sector comprises of major areas like **Fruits & Vegetables** (Beverages, Juices, Concentrates, Pulps, Slices, Frozen & Dehydrated products, Potato Wafers/Chips etc.), **Milk & Dairy** (Whole Milk Powder, Skimmed milk powder, Condensed milk, Ice cream, Butter and Ghee). **Grain and Cereals** (Flour, Bakeries, Biscuits, Starch, Glucose, Cornflakes, Malted Foods, Vermicelli, Pasta Foods, Malt extracts), **Consumer Industry** (Chocolates, Confectionery, Soft/Aerated Beverages) **Plantations** (Tea, coffee, cashew, coconut and bananas etc).

- **Current Status of Food Processing Industry in India**

The Indian food industry's sales turnover is Rs 140,000 crore annually as at the start of year 2000. India exported processed fruits and vegetables worth Rs 524 crores in 1997-98. The horticulture production is around 102 million tonnes. Foreign investment since 1991, when economic liberalization started, stands at Rs. 8,800 crore. Products that have growing demand, especially in the Middle East countries include pickles, chutneys, fruit pulps, canned fruits, and vegetables, concentrated pulps and juices, dehydrated vegetables, frozen fruits and vegetables.

Milk and milk products are rated as one of the most promising sectors which deserves investment in a big way. When the world milk production registered a negative growth of 2 per cent, India performed much better with 4 per cent growth. The total milk production is around 72 million tonnes and the demand for milk is estimated at around 80 million tonnes. By 2005, the value of Indian dairy produce is expected to be Rs 1,00,000 crores. In last six years foreign investment in this sector stood at Rs3600 million which is about one-fourth of total investment made in this sector. Manufacture of casein and lactose, largely being imported presently, has good scope. Exports of milk products have now been decentralized.

Grains could emerge as a major export earner for India in coming years. India's food grains production is now at around 225-230 million tones. These include rice, jawar, bajra, maize, wheat, gram and pulses. Indian *basmati* rice enjoys command in the international market. Besides the growing Middle East market for *basmati* rice, many other countries are showing interest for this foodgrain. In 1998-99, export of *basmati* and non-*basmati* rice stood at Rs 6200 crores. There is a total rice milling capacity of 186 million tones in the country.

7.1.3.2 KVIC contribution in Food Processing Sector

KVIC aims at the preservation of the uniqueness of traditional skills of the artisans surviving in the villages, who are poorest among the poor, through rural industrialization. In their programme of industrialization of the villages industries, food processing sector is one of the major sectors. In the last year, Fruit Processing and Preservation industry ranked first in the performance. Its performance increased by 44% during the year. Ghani oil is also among the 5 top industries generating Rs. 395.94 crores from its production. On the employment front, Agro based and Food Industry group is very significant with its share in the total village Industry employment being about 47%. In the food processing sector KVIC is involved in:

- Bee Keeping
- Ghani Oil Production
- Gur Production
- Fruit and Vegetable Processing

The Production and Sales of the various groups are shown below:

(Rs. in Crores)

Industry	Production		Sales	
	1996-97	1997-98	1996-97	1997-98
1. Bee Keeping	32.58	32.82	39.16	42.54
2. Ghani Oil	358.35	395.94	385.42	443.99
3. Fruit Processing & Preservation	53.01	76.23	62.18	88.38
4. Cane Sugar & Khandsari	230.02	243.30	281.20	279.17
5. Palmgur	194.98	202.57	261.91	228.98

7.2 SWOT Analysis

7.2.1 Biofertilizers & Biopesticides

Strengths

Agriculture provides a major input to the Indian economy with ~70% of the population engaged in these activities. Predominant use of biofertilizer and biopesticides as bioinoculants in the agriculture can not only enhance the sustainability in agricultural productivity but it will also eliminate potential environmental threats caused by the use of agro chemical inputs. If judiciously used under specific guidance, these biological inputs can improve the soil structure and fertility, make nutrients available to the crop at a much reduced cost, provide certain growth promotive substances and finally reduce the crop damage by pests to a significant extent. Their use can be very simply included in the traditional farming practices adopted in India with short training. KVIC sector can contribute significantly by providing mechanisms for mass production of BF & BP and training manpower for their use.

Weaknesses

Although some efforts in agricultural Universities and R&D institutions have lead to the introduction of bioinnoculants in Indian agriculture, the results don't seem to have penetrated to mass field applications. The adverse performance so far can be attributed to:

- Non availability of microbial cultures that can survive in diverse climate and soil conditions
- Limited facilities for mass culture of bioinoculants
- Non availability of carriers
- Lack of quality control measures.
- Absence of an effective interaction among scientists, farmers and marketing personnel for agricultural inputs.

Opportunities

Vast requirement of agro inputs provides the major opportunity for industrial growth in the area of bioinoculants. Also, the growing awareness of concern among western world about the health hazard associated with food grain with excessive chemical inputs has created a situation where food products derived from non-chemical inputs can fetch a better price and also attract export opportunities.

Threats

The gigantic scale of operation, advertising and marketing network of the chemical agro inputs (fertilizers, pesticides, herbicides etc.) are a threat to bioinoculant industry. Also, these threats are compounded by lack of faith, created by some of the sub-standard manufactures.

7.2.2 Herbal Products

The SWOT analysis of Indian Herbal industry in a global context can be reviewed as follows.

Strengths

- India is not only rich in its fauna and flora with two of the world's 12 mega diversity zones within its fold but also rich in the traditional knowledge of using these medicinal plants
- We have more than 5 lakh trained practitioners of ISM & H, besides more than 1 million traditional healers like dais (traditional birth attendants), bone-setters, herbal healers, tribal and folk healers, besides experts like Netra Vaidyas, Danta Vaidyas and Marma Chikitsaks etc. Our knowledge resource base in this sector is also very rich with more than 1,00,000 manuscripts in different languages besides several hundred published texts of the organized knowledge systems of ISM & H.
- Several Research Agencies including CCRAS, CCRUM, CSIR, ICMR medicinal institutions and ISM & H colleges and ICAR, and university departments have been involved in R&D on various aspects of herbal products since independence. This has received a further boost with involvement of pharmaceutical companies in these efforts, as well as coordinated R&D projects initiated by CSIR, ICMR and Deptt. Of ISM & H of GOI.
- The cost of production of most of these products can be maintained low by utilization of locally available raw materials as well as skilled manpower available across the country.

Weaknesses

1. Since the medicinal plants used as raw materials by a large number of companies, (whether in the VI, small or large-scale sector) are collected from wild, there is little standardization and quality control criteria that are followed with the raw/crude drugs.
2. Several medicinal plants, which are of high value but are getting extinct, are not used by the manufactures and instead most companies use their cheaper substitutes.
3. Since the pharmacopoeias of most of the finished formulations are being finalized and the enforcement of standards in complex formulations is difficult (often nearly impossible), the quality of the drugs available in the market varies greatly.
4. While it provides employment to many skilled and semi-skilled workers preparation of many of the medicines involves long drawn and cumbersome producedures encouraging companies to resort to short-cuts on one hand and at times not

following appropriate processing and storage conditions. This adversely affects their quality and brings disrepute to the system as well as to the medicines produced by 'good' manufacturers.

5. The dosage forums in most of the formulations involve large quantities, while often not being of pleasant taste. The customers (patients), particularly of the vulnerable age groups(youth and children) avoid these drugs.

Opportunities

- Consistent increase in disease conditions refractory to allopathic medicines and the ever-increasing costs of allopathic therapeutic/health care approach offers great opportunities not only within the country but also abroad.
- Due to concentered efforts by government agencies like Planning Commission, Department of ISM & H, R&D agencies as well as private sector, it is getting a big boost on all fronts i.e. cultivation and concentration of medicinal plants, standardization and quality control in their processing and marketing, besides R&D for development of new therapeutic regimen and dosage forums.
- With the implementation of good Manufacturing Practices (GMP) becoming mandatory for ISM & H drugs, their quality control and standardization is likely to establish these products in the global market and allow better market shares in comparison with our competitors like China, South Korea, Vietnam & Thailand etc.
- Efforts to boost cultivation of a selected list of 25 medicinal plants with the help of National and State Medicinal Plant Boards and encouraging their conservation through the schemes of Vanaspati Van etc will ensure availability of assured quality of raw drugs and medicinal plants. The National Board has already announced the scheme to buy-back cultivated produce of 16 selected medicinal plants.

Threats

- With little efforts to encourage or strengthen our traditional and folk health care practitioners, our knowledge base in this vital field is shrinking. On the other hand piracy of their knowledge and taking unethical IP protection on their intellectual property by foreign as well as Indian Companies is posing a great threat to this sector.
- With unabated extraction of our valuable medicinal plants from our forests, these are getting severely depleted and this is already threatening the availability of many medicinal plants.
- The introduction of GMP even for village and small-scale manufacturers in this sector may uproot many of them if adequate facilities for the same are not provided in the public, cooperative and private sector.
- While encouragement to cultivation of medicinal plants is likely to ensure supply of raw drugs of assured quality, indiscriminate use of chemical fertilizers, insecticides and pesticides may also pose great problems of adverse effects with use of such drugs. Besides, drugs cultivated in specific geo-cultivation zones are likely to have modified properties, adversely affecting their quality.
- The entry of large companies in the private sector and even MNCs, marketing modified herbal products, may uproot many small-scale VI sector traditional manufacturers, particularly because they shall not be able to withstand their aggressive marketing and advertising campaigns.

7.2.3. Food processing Industries

Strengths

India has diverse agro-climatic conditions; it has a wide-ranging and large raw material base suitable for food processing industries. Presently a very small percentage of these are processed into value added products. Rapid urbanization, increased literacy and rising per capita income, have all caused rapid growth and changes in demand patterns, leading to tremendous new opportunities for exploiting the large latent market. An average Indian spends about 50% of household expenditure on food items. Demand for processed/convenience food is constantly on the rise. India's comparatively cheaper workforce can be effectively utilized to setup large number of low cost production bases for domestic and export markets. Liberalized overall policy regime, with specific incentives for high priority food processing sector, provide a very conducive environment for investments and exports in the sector.

Weaknesses

Processing level presently being extremely low, the wastage levels are very high resulting in colossal wastage of national wealth running in thousands of crores. Value addition to the raw produce in the country is only seven per cent, compared to 23% in China and 45% in the Philippines. The small scale and unorganized sectors today account for 75% of the total industry having only local presence without much access to knowledge, poor storage infrastructure, inefficient and costly transportation, non availability of standard technology and marketing network. Despite the existence of a strong and wide network of R&D institutions (CSIR labs, ICAR institutions, ICMR Establishments, Universities and Private institutions), their linkage with the users like farmers and entrepreneurs is not well established.

Opportunities

The growth potential of this sector is enormous and it is expected that food production will double in the next ten years and consumption of value added products will grow at fast pace. Economic liberalization and rising consumer prosperity is opening up new opportunities for diversification in food processing sector. Very good investment opportunities exist in many areas of food processing industries, the important ones being: fruit & vegetable processing, packaged, convenience food and drinks, milk products etc. India is already a major producer of food (first in cereals, livestock population, milk and second in fruits and vegetables), producing over 600 million tons of food products, and in case the immense untapped potential of growth is achieved, the country can emerge as the largest producer of major food items

Threats

The major threat in the food-processing sector is lack of awareness of the importance of indigenous products due to lack of knowledge. Small and marginal entrepreneurs are facing threat from big multinational brands. The marketing of their products also faces threats due to inefficient marketing network.

7.3 Role of NIRI

Keeping in view the above-mentioned features NIRI can act as a catalyst to promote the development of village industries to produce bioinoculants,herbal dyes and food products ensuring good quality, at reasonable cost. It is estimated that the world demand of medicinal and aromatic plant products is growing @ more than 7% per annum. There is ample scope for export of bioinoculants and food products. Therefore, KVIC can organize these sectors by giving newer technologies so that it's products can compete in domestic as well as international market. KVIC can also create a system for marketing / processing of these resources.

For this, the institute requires to take following action:

- Establishment of demonstration facilities for mass production of bioinoculants, herbal products and food products based on readily available technologies.
- Fixing quality standards and establishing laboratory facilities for quality control of bioinoculants, herbal products and food products.
- Develop awareness program among farmers and training program for small-scale entrepreneurs and traders.
- A good library to support the above activities.
- Initiate R&D liaison with some chosen R&D institutions for long-term development.

Herbal Products

There are several areas where KVIC can play a pivotal role starting from post-harvest collection, processing, manufacture, product development, quality control and standardization, besides R&D for developing new products,including those which involve Panchgavya.

Major Thrust Areas where KVIC could focus is:

- Help and support in the organization of post harvest collection, storage and processing with standardized procedures for village, block, taluka and cluster levels for districts where VI in this sector are likely to grow.
- Providing Quality Control and standardization facilities through its laboratories or the laboratories to be set up by NGOs/ institutions with KVIC support.
- Help in the development of newer products which can be marketed both nationally as well as globally in area of 'Panchgavyas' and comities.
- Help in the establishment of Brands like 'Sarvodaya' for Herbal drugs, food supplements and Organic foods for healthy living and positive health care.
- Help in the training of VI manufacturers in various aspects including GMP
- Initiate networking with VI units, NGO's, R&D labs and regulatory agencies to provide the necessary support to this sector.

7.3.1 Thrust Areas: Potential Technologies for Commercialization through NIRI (Phase-I)

7.3.1.1 Bio-fertilizers

Mass culture of:
Azotobactor

Rhizobia,
Blue green algae and *micorrhiza*

7.3.1.2 Bio-pesticides

Mass culture of:

Microbial biocontrol agents like Tricoderma, Aspergillus's and Bacillus

7.3.1.3 Food Products

Processing of Honey

NIRI has to set the quality of honey for the processors as per the Agmark, BIS and other international standards, which will also increase the shelf life of the product. R & D facilities have to be set up by NIRI for development of organic honey and other honey-based value added products. As marketing would be the key element of success for such a venture NIRI should evaluate the options of having marketing tie up for selling the product in domestic and international market. The entrepreneurs should be given the technical training from various institutes. Moreover, the processing methods for the commercial production of the honey need to be standardized.

Processing of Spices

NIRI would aim at production of unadulterated spices and should set up the laboratory facilities to check adulteration in it. The entrepreneurs would be given technical training on the new technologies of turmeric & chili powder production. As marketing would be the key element of success for such a venture, NIRI should evaluate the options of having marketing tie up for selling the products in domestic and international market.

Processing of Fruits & Vegetables

At present it has been proposed that tomato & mango processing be undertaken by under this sector. NIRI will review the present techniques of their processing and modify according to the need. It may set up a pilot scale plant for fruits & vegetable processing in Wardha. It will impart training on the preparation of the processed products with new technology and will identify the present packaging system and suggest improvement. It will also upgrade the hygienic and sanitary conditions of the workers, plant and machinery so as to ensure consistent quality of the finished product.

Mustard oil

NIRI will aim for the improvement in the crushing capacity of present Ghani and its extraction efficiency so that the percentage of oil content should be increased. A quality assurance laboratory would be set up to check the adulteration and certify oil quality as per Agmark. Training of Entrepreneurs on oil seed extraction, quality control etc will be given through experts. R&D work on utilization of mustard cake, (e.g. detoxification) for cattle, poultry feed could be done in the central laboratory at Wardha.

Food enzymes

Feasibility of papain extraction from papaya would be studied. Technologies for papain production thus finalized would be tried at pilot scale with quality analysis of the product extracted. Quality analysis will include shelf life studies, physicochemical parameters and

study of the type of packaging needed for the product produced at rural level. Application of Papain in different areas will be done for producing value added products.

Mushroom

Resource evaluation will be done for the non-conventional mushroom cultivation (NCMC). Mushroom cultivating areas will be identified & process evaluation will be done. Economic evaluation and Biomethanation of residue of NCMC will be carried out. The solid residues obtained from biomethanation after processing will be assessed for use as biomanure. Finally technical and economic evaluation of the integrated process biotechnology will be carried out.

Also, some additional actions that may be concurrently taken up by NIRI include:

- Development of a blend of bagasse, oil seed cakes with bioinoculants as a product
- Survey of traditional innovations followed by rural masses & tribals to identify new resources.
- Adoption of “Bio-Villages”.
- Development of process technology for value added products based on
 - De oiled cakes of tree born oilseeds (e.g. sal, mahua, Van tulsi etc.)
 - Tannin bearing materials, e.g. Harda, Baheda
 - Mahua flowers.
- To facilitate organized cultivation of high value herbal/aromatic plants, e.g. safed musli, Sarapandha, Allovera etc.
- To take up the publication of a periodical covering activities of NIRI.
- To develop central laboratory at Wardha for Quality Analysis of different food products and for R&D.
- To identify the major potential areas for processing of different food products.
- To develop linkages of smaller entrepreneurs and farmers with agricultural organization to provide resources & facilities for their produce.
- To develop a pilot scale plant for production and training of rural people and entrepreneurs.

7.4 Management of activities & linkages

To meet the basic objective of promoting biofertilizers, biopesticides, herbal products and food Industry, NIRI would require establishing comprehensive institutional linkages. It would require identifying various bioprocess technologies to be developed for application in different agro-climate zone through interaction with National Laboratories & institutions (ICAR/CSIR, IITs, CFTRI Mysore, and State Agriculture Universities). Well-defined MoUs should be drawn with them, with a provision for technology demonstration at NIRI. It will also be desirable to identify 3-4 consultants, who may help NIRI to absorb /orient the technology for mass application. The consultants would also help preparation of techno-commercial literature for popularization of the concept.

The Institute will identify entrepreneurs and NGOs in each of the agro-climate zones, who may be associated for mass propagation of the technologies. The institute will conduct periodic (every 6 month) technology demonstration workshops for representatives of these entrepreneurs and NGOs. The trained NGO representatives will then interact with local potential entrepreneurs, and help them establish production facilities on a small/ cottage scale. They may also refer technical problems faced by the entrepreneurs to the consultants through NIRI. Scientists at NIRI should also continuously interact with some identified

NGOs/cluster/CFC reps & monitor the progress, provide solutions to the problems faced. The training module for NGO representatives should also include (1) design of a business plan, (2) facilitation of finance through different agencies and (3) quality control procedures.

An outline of the organization & monitoring of activities for bioinoculant activities is shown in **Annexure II**.

7.5 Action Plan for Mission Project – I

7.5.1 Production of Biofertilizers & Biopesticides based on bacteria/fungi.

Following organisms will be handled for mass propagation

- *Azotobactor*
- *Rhizobia*
- BGA
- *Aspergillus*
- *Trichoderma*

The source of Technologies to be tapped are identified in **Annexure I**

	Activities	Time Schedule
1.	Collection of microbial cultures, specific to agro climatic zones / crops from various sources (contact State Agricultural Univ.)	0-6 months
2.	Training modules for NGO representatives training	4-12 months
3.	Central library facilities, development of awareness literature / reports	2-6 month
4.	Mass culture facilities at least 6 sites out of which 2 locations may be from Punjab, three from UP and 2 locations from Haryana (use of available facilities)	2-8 month
5.	Appropriate NGOs will be identified in the same locations for training of entrepreneurs & establishment of small industries.	6-24 months
6.	Maintaining interaction with cottage and small-scale entrepreneurs for setting up commercially viable production units and facilitating, financial aid for setting up unit providing scientific and technology assistance, marketing of the product and monitoring quality of the product.	6-24 months

7.5.2 Production of Healthy Organic Foods (Nutraceuticals), Herbal and 'Panchgavya' Products

Considering their national and global potential it is suggested that a model pilot project be established, with following major activities:

- Collection from wild/cultivation by specifically identified farmers who have ensured organic farming.
- Providing inputs like bio-fertilizers, biomanures and bio-insecticides/pesticides through units promoted by KVIC for organic farming.
- Providing post-harvest inputs like drying, grading, sizing, packing and storage on one hand and debulking, extracting, concentrating and distillation etc. on the other.
- Providing inputs for simple manufacturing viz. preparation of powders, oils, tablets, quaths and syrups for herbal drugs; simple herbal cosmetics processed organic foods like dalias, cornflakes, papads, badis, pickles, jams, jellies and chutneys etc. to be sold as health foods.
- Providing inputs for specialized formulations of herbal drugs and cosmetics ensuring standardization, quality control and GMP norms.
- Providing for R&D and know-how for developing newer products and dosage forms including those involving 'Panchgavyas'.
- Providing marketing management and information services at Regional/District levels.

These activities can be undertaken right from the village to block, district and regional levels. The details shall be developed during the first phase when feasibility studies shall be undertaken. A list of tentative budgets for equipment/chemicals/glassware, manpower requirement and infrastructure requirement is shown in **Annexure III and Annexure IV**

Annexure I

- 1) **Mass production and utilization of Biopesticides for the management of soil borne diseases of Paper, Cardamom and Beetle Vine**
Dr. Y.R. Sarma, Principal Investigator
Dr. M. Anandraj, Co-Investigator
Division of Crop Protection
Indian Institute of Spices Research
P.B. No. 1701, Marikunna PO, Calicut-673012 Kerala, India

- 2) **Development and Production of eco-friendly Biopesticide from *Aspergillus niger* for the management of soil borne diseases of crop plants**
Dr. Bineeta Sen
Ex. Head,
Division of Plant Pathology,
Indian Agricultural Research Institute,
New Delhi

- 3) **Biopesticides for the management of Tea pests**

Dr. L.K. Hazarika and Dr. K.C. Puzari
Department of Entomology
Assam Agricultural University
Jorhat 785013, Assam
E-mail: lkhazarika@ aau.ren.nic.in

- 4) **Use of Biocontrol agents for the management of pests of Cotton, Oil seeds and Pulses.**

Dr. S. Lingappa / Dr. K. A. Kulkarni / Dr. K.H. Anahosur
Professor & Head
Division of Agricultural & Entomology
Dharwad – 580 005

- 5) **Mass Production of Mycorrhiza Biofertilizer**

Dr. Alok Adoleya
Fellow & Area Convenor,
Centre for Mycorrhizal Research
Tata Energy Research Institute, Darbari Seth Block.
India Habitat Centre, Lodhi Road, New Delhi –110 003
E-mail: aloka@teri.res.in

- 6) **Production of blue- green algal biofertilizer**

Prof. S. Shanmugasundaram
Department of Microbial Technology
School of Biological Sciences,
Madurai Kamaraj University, Chennai

7) Biofertilizer: Production and development**K.V.B.R. Tilak & A.K. Saxena**

Division of Microbiology
Indian Agricultural Research Institute
New Delhi-110012

8) Mass Cultivation of Rhizobium**Subhash Chand and Vikram Sahai**

Department of Biochemical Engineering & Biotechnology
Indian Institute of Technology
New Delhi-110016

Reference:

- Entrepreneurs Workshop on Ecofriendly Technologies of Biopesticides and Biofertilizers for Crop Management, Dept. of Biotechnology, Ministry of Science & Technology, Govt. of India, New Delhi-110 003
- TCDC International Workshop on Application of Biotechnology in Biofertilizer and Biopesticides, Training manual, October 15-18, 1997, Department of Biochemical Engineering & Biotechnology, Indian Institute of Technology, Delhi, New Delhi - 110016

Annexure II
Management and Monitoring

Biotechnologist

Scientist 1

Scientist 2

Scientist 3

National Lab/Institutes
University

Annexure III

List of equipments / Chemicals /Glassware	COST (Rs.)
Laminar Air Flow	50,000
Autoclave	20,000
BOD Incubator	80,000
Shaker (2)	3,00,000
Electric Balance (2)	1,00,000
Oven	30,000
Freezer	50,000
Refrigerator (2)	50,000
Centrifuge	50,000
Water Distillation Unit	25,000
Growth chamber	3,00,000
Dryer	30,000
UV/vis Spectrophotometer	4,50,000
Muffle Furnace	20,000
Compound Microscope	60,000
Stereo Microscope	50,000
Photo micrographic camera	50,000
Colony counter	10,000
Misc. small equipments	20,000
Water Bath	10,000
EC meter	15,000
pH meter	15,000
Mixer & Grinder	15,000
A C (2)	1,00,000
Chemicals & Glassware's	5,00,000
Glass house	1,00,000
Miscellaneous equipment for food processed / herbal lab	10,00,000
Total	35,00,000

Total Area Requirement for Production units/ Laboratory/Workshop

Production for Bioprocessing	60 sq metres
Quality Assurance labs	80 sq metres
Microbial analysis lab	40sq metres
R&D Lab for food processing	100 sq metres
Cubicles for scientists/staff	70 sq metres
Total	350 sq metres

Annexure IV

Manpower Requirement

A Distinguished Biotechnologist will head the Bio-Processing Division. He will be assisted by three Scientific Officers / Technologists specializing in the three thrust areas.

Manpower:

Designation	No. Post	Qualification
1. Biotechnologist	1	PhD with minimum 5 years experience
2. Scientific Officer	3	B. Tech or M. Sc. in Respective field with 1-2 years experience
3. Quality Assurance Officer	2	B. Sc (Food Tech), B. Sc (Biochem) with 1-2 yr experience.
4. Lab Chemist	2	Graduate in Sciences for Lab
6. Attendant	2	10+2 With experience in relevant field.
Total	10	

Chapter 8

Rural Infrastructure And Energy

8.1 Introduction

Availability of proper infrastructure facilities and energy are critically important prerequisites for providing impetus to rural industrialization as well as for improving the quality of lives of the majority of the population in rural India. Water, sanitation, storage systems, transport, and communication are some of the important requirements for growth of any industrial activity besides adequate supply of energy, which is of paramount importance.

Depending upon the type, scope and location of the rural industry, the infrastructural facilities required and also the amount and quality of energy required vary from industry to industry. (and sometimes from location to location as well). Therefore, the solutions for infrastructure and energy related issues for a rural industry would normally have to be worked out individually. Thus site and situation specific strategies may have to be formulated and implemented while promoting rural industrialization. In addition, infrastructural and energy needs for promoting proper living conditions are to be catered.

The present status of the above mentioned essential facilities in most of the rural areas of the country is far worse than their 'pitiable' condition in urban and semi urban areas. For example, as per the 1991 census of India, only 55% of the total rural households in the country had access to safe drinking water. Similarly only 30% of the rural households reportedly had electrical connections. The situation was much worse in the area of sanitation as less than 10% of the rural households had toilets. A very large number of villages do not have motorable roads and, in fact, the condition of roads existing in the more privileged villages is pathetic particularly in the rainy season. This scenario is much worse than that in urban areas as can be seen from Table 1.

It may be very difficult (if not physically impossible) to bring these facilities in urban areas (with continuously increasing population due to migration from rural areas) to a satisfactory level. However, it may be possible to provide better infrastructural facilities in less densely populated decentralized rural areas at much lower overall cost to the economy/society. This may even help reverse the prevailing trend of rural to urban migration and thus release the pressure off the existing infrastructure in urban areas. In fact, an improvement in the infrastructure facilities such as water, sanitation, housing, food storage systems, transport, communication and energy would lead to an overall improvement in the quality of life of rural masses besides providing necessary support to rural industrialization activities.

Table 1 Availability of Electricity, Safe Drinking Water and Toilet Facilities to Households in India* (Census of India, 1991)

Facility	Percentage of households having the facility		
	Total	Rural	Urban
Electricity	42.4	30.5	75.8
Safe Drinking Water	62.3	55.5	81.4
Toilet	23.7	9.5	63.9
Electricity and Safe Drinking Water	30.4	18.7	63.6
Safe Drinking Water and Toilet	18.2	5.6	53.9
Electricity and Toilet	20.4	6.5	59.4
All the Three Facilities	16.1	31.3	50.5
None of the Three Facilities	24.5	31.3	5.4

* (Excluding J& K)

There are a good number of institutions and groups involved in activities leading to rural industrialization and there are some success stories also. However, the primary issue of developing and implementing action plans which ensure environmental and ecological sustainability and economic feasibility is usually not taken into account. Moreover, there continues to be an increasing trend of rural to urban migration thus indicating that the issues of employment generation, improvement in the quality of lives of the rural households etc. have not been holistically embedded in the planning of rural industries. In many cases these industries have at best served as suppliers of second-rate products, whose market is continuously dwindling in globalising economy. Most of the existing rural industries are also very inefficient with regard to energy and materials utilization.

Our rural areas have a very glorious past primarily due to the fact that the societies were able to devise, develop and effectively adopt appropriate methods and technologies and systems which not only provided solutions acceptable to the end user but also ensured the long term sustainability of the same. Moreover, for each site-specific situation, depending on the prevailing constraints an optimal solution was adopted. Thus, even for the basic need of drinking water, scores of different sustainable methods were prevalent in different parts of the country. With the advent of modern methods and wisdom of society, new highly energy intensive and unsustainable 'run of the mill' solutions have been evolved and implemented in the past seventy years or so in most of the urban areas. Many villages have also blindly started following similar models and, as a consequence, the infrastructure and energy situation has worsened. It is therefore necessary to promote sustainable alternatives while designing and executing strategies of intervention in rural areas. The age-old traditional rural practices and technologies (with necessary up-gradation / improvement using modern scientific and technological inputs) must therefore be duly considered in identifying suitable alternatives. During the period of transition from prevailing methods to sustainable ones, the conflict between centralized and decentralized systems would pose a challenge. It is therefore equally important to suggest suitable methods of transition, as it is to provide sustainable alternatives.

8.2 Review of Current Status

Brief SWOT analysis of the village industries (VI) sector with respect to infrastructure and energy is presented below to help identify thrust areas for intervention.

8.2.1 SWOT Analysis for Infrastructure in VI sector

Strengths

- Storage system
 - Food quality preserved for long time
 - Low cost decentralized system
 - Raw material locally available
 - Simple botanical pesticide formulation possible
 - Local self-sufficiency
 - New avenues for local employment

- Water Management
 - Deep concern for quality and quantity
 - Decentralized, low cost system
 - Local self-sufficiency
 - Alternatives already available
 - Can be implemented through community participation with minimum government support

- Housing
 - Locally available Materials
 - Environment Friendly approach
 - Low cost sustainable option
 - Some alternatives already available
 - New avenues for local employment

- Waste Recycling
 - Improved sanitation
 - Energy and material Recovery
 - Improvement in health and environment
 - Enhancing interaction among Industrial and village Community
 - Alternatives already available

- Transportation and Communication
 - Most of the villages are demanding such basic facilities
 - Modern communication system is available in nearby townships
 - Database on internet will improve Planning

Weaknesses

- Storage System
 - Diversity in material & design of storage structure and botanicals used.
 - Therefore, standardization is difficult

- Water Recycling
 - Difficulty in identifying the source of contamination
 - Due to highly mobile hydrogeological cycle, 100% guarantee about the quality cannot be given
 - No control on pollution of water bodies
 - Water ponds getting extinct due to neglect

- Housing
 - Need of annual repairing and maintenance in many low cost technologies

- Waste Recycling
 - Large variations in waste characteristics
 - Different designs for different industrial setups make it expensive

Opportunities

- Storage System
 - No botanicals based technology package is commercially available
- Water Recycling
 - People cannot afford expensive system
 - Need of masses as water shortage becoming endemic
- Housing
 - Massive need
 - Many low cost technologies give better indoor thermal environment
- Waste Recycling
 - No consultancy available on commercial basis
- Transport and Communication
 - Great opportunity for Industrial growth

Threats

- Storage System
 - Mindset of the people towards traditional technologies
- Water Management
 - No control over Industrial effluent and agro chemicals.
 - Unplanned govt.schemes and archaic rules (example work done by Tarun Bharat Sangh and Govt. action)
- Housing
 - Mindset of the people
- Waste Recycling
 - Tough job
 - Difficult to Motivate people
- Transport and Communication
 - Cultural invasion due to cyber/internet crimes

8.2.2 SWOT Analysis for Energy in VI Sector

Strengths

The main strength of the village industry sector is its small scale and decentralized nature. The demand of energy for this sector, whether thermal or electrical/motive, is low in concentration of demand and the intensity of demand is 'small' to 'moderate'. This gives rise to the following strengths of the rural energy sector:

- Renewable energy can be utilized ideally in small intensity, low-concentration demand sites, and that dovetails with the nature of the rural energy sector: clearly, therefore, rural energy sector provides an ideal platform for switch-over to renewable energy resources.
- Low-concentration, small intensity utilization of energy also has an environmental impact that is more easily assimilated by nature: thereby making the energy sector more environmentally benign.

Weaknesses

- The principal weakness of the village industry sector is the non-availability of conventional commercial energy supply, be it thermal or electrical/motive. Grid electricity is either not available in the area or even if connected to the grid, power supply is unreliable and irregular, owing to shortage of production over demand. Similarly, conventional energy sources such as fossil fuels have to be transported from far and wide, and the inherent shortcomings in infrastructure result in a short supply of these as well.
- Utilization of energy in VI sector is often inefficient in comparison with the organized sector, for want of the research and development input it deserves, and because of the poor awareness of the users about methods and technologies for improving efficiency or use of renewable energy.
- In many village industries, the connected loads are low and plant load factors would be poor for any conventional distribution system to handle, since the conventional systems are designed for high-concentration, high-intensity, continuous loads. Moreover, most often the economics of connecting such load centers with the conventional electrical grid shall not be favourable.
- Demand assessment of energy in VI sector is difficult to generalize, very little work has so far been undertaken in this area and hence there is little knowledge of energy demand in the rural industrial sector.
- Inter-sectoral energy interlinkages between the various sectors of village industries are also poorly understood.
- In the efforts to promote traditional as well as alternative systems, it may be difficult to standardize different designs for quality control and certification as a large number of designs using a variety of materials are used in these systems. Very little effort has been made in the past towards identification of suitable traditional systems and enhancing their appropriateness for end users. As the scope, nature and characteristics of the problems/requirements of the end user may vary substantially from one location to another, it is critically important to develop and disseminate site and need specific technological solutions.

Opportunities

- Increased awareness of the ill effects of centralized power generation and its environmental impact provides the opening for the decentralized alternatives to arise and strengthens their positions. In this respect, non-availability or unreliable supply of conventional energy resources in rural creates an opportunity for development of holistic alternative options.
- Government initiatives to promote rural sector (under its ministries of rural development and non-conventional energy sources) should provide the encouragement and the financial support for the establishment of the VI sector.
- International funding is also available in plenty for renewable and decentralized alternatives in energy sector. This should also provide impetus to the growth of this sector into a competitive one.

- Although individual industries are small in scale, the village industry sector is very vast. There are immense opportunities for the solutions developed to result in a paradigm shift. This would apply to the economic outlook towards village industries in general, and to the energy systems for village industries in particular.

Threats

- Many renewable energy interventions are capital intensive. Unless suitable financing mechanisms are evolved, a majority of end users would find these systems too expensive to invest into.
- Multinational corporate sector domination of global market would make it impossible for small-scale industries of the VI sector to survive and compete. There is the danger of the more successful of these companies getting taken over by the giants, while the less successful ones might perish under pressure.
- Improper thrust on the part of policy-makers might result in undue importance to short-term targets, losing sight of the long-term goal of evolving the VI sector into a competitive alternative. As in the past, if target numbers for short term take importance, then the thrust on actual extent of success of VI sector in penetrating the market would be lost, and the contribution of energy to this success might not get the priority it should get.
- Owing to extensive pressure of marketing strategies of present day commercial options it may be quite challenging to change the mindset of the end users for adoption of alternative technologies. Moreover, frequent changes in the policies and priorities also create considerable problems in long-term strategy formulation and implementation. In certain areas, another problem may arise due to intervention saturation/fatigue, i.e., users are not any more motivated to try alternative technological options due to past failures in adoption of new interventions.

8.2.3 Factors that Need Intervention

8.2.3.1 Rural Infrastructure

- Although waste management systems addressing the different scenarios are available, the methodology for their integration in a given socio-cultural-economic situation needs to be studied and bottlenecks (if any) should be identified. For example, in case of vermi-composting technology, special efforts will have to be made to identify and study the suitable endemic species of earthworms.
- Modern food storage systems (except cold storage) generally use chemical pesticides/preservatives and hence, are not desirable from the viewpoint of human health as well as environmental aspects. Efficacy of traditional storage systems (which do not require such pesticides/preservatives) is dwindling in the changing scenario of decreased seed diversity, nature of seeds (e.g. HYV, terminator seeds, etc.), pest resurgence etc. Therefore, an entirely new approach based on eco-friendly pest control system (i.e. storage structure-pest control technique matrix) needs to be developed through research and development.
- In the context of housing, special attention should be given on the utility of suitable alternative building materials (e.g. fly ash, bamboo, sarkanda, waste engine oil, thermal emission reducing materials for plastering etc.), techniques for fireproof huts etc. Brick kiln industry converts large agricultural area into wasteland. Technology package needs to be developed for regenerating such land for agriculture.
- In case of water management some work is available on the revival of ponds and other techniques for rainwater harvesting. Feasibility of such techniques should be carefully evaluated in the specific socio-political-geographical perspective. Work already done on the use of natural coagulants for drinking water treatment needs to

be reviewed and compiled. Efficacy of various natural coagulants vis-à-vis water quality needs to be studied.

8.2.3.2 Energy

- Energy supply to village industry from renewable resources needs highly reliable power packs of 10-100 kW to be available commercially. Technology for such power packs, although available, is yet to be a commercial success.
- Unlike commercial resources, renewable resources need a thorough supply-demand assessment prior to their choice for implementation. The methodologies for carrying out such assessment need standardization and documentation.
- Awareness of renewable energy alternatives and technologies for the efficient use of energy in the VI sector leaves much to be desired, and should be attended to.
- Development of energy alternatives for the VI sector should be done with a holistic perspective of overall rural development, understanding clearly the interlinkages between the various aspects. For example, use of biomass for providing electricity for VI sector should not deprive the local population of their regular source of cooking fuel. A methodology for feasibility study of rural energy projects needs to be developed and standardized so that integrated development of the rural sector is not compromised by projects of rural energy.
- Suitable financing and commercial funding mechanisms should be evolved to support energy projects in the Village Industry sector, since the Governmental support and other funding sources keep varying with change of policies and policy makers. The prevailing opportunities from time to time must be made best use of by all village industries, which necessitates that NIRI should have a financing advice cell, which should keep abreast of the policies and also be in touch with grass roots continuously.
- In order to guard the VI sector against multinational onslaught, the most suitable safeguard is the public awareness of the worth of the VI sector in all aspects: production by masses, economic dignity and equitability, decentralized and hence sustainable and environmentally benign. Improvement in quality and accessibility of VI sector products, combined with public awareness campaigns need to be undertaken to change the popular mindset that favors mainstream products and imported products over village industry products.

8.3 Thrust Areas

In the light of the above, the main **thrust areas** of energy and rural infrastructure may include the following:

- * Macro-level assessment of energy supply-demand scenario with a view to identifying the energy-intensive rural industries all over the country, their classification according to the intensity and magnitude of energy consumption and the possible areas of intervention for energy conservation and avenues for switch-over to renewable energy. The specific activities suggested under this area are as follows:
 - Energy demand assessment of major rural industries through available literature or through new field level studies.
 - Development of methodologies to identify the linkages of energy use in an industry with the overall energy scenario in a rural area.
 - Identification of niche areas for introduction of renewable energy technologies and adoption of energy conservation measures.

- * Micro-level assessment of energy demand-supply scenario for specifically identified rural industries in a specific geographical region, with a view to providing appropriate, case specific solutions/options for improving the energy efficiency of the units. The subdivision will provide necessary inputs for
 - Energy efficiency improvement in existing energy end uses in the rural industries and also ensure the same for upcoming industrial activities in villages. For the existing industry this would involve energy audit; testing of various devices; information about more energy efficient devices/systems and their financial implications in the long run; options with possible linkages with other end-uses like co-generation and waste heat recovery; information about sources of financial assistance etc. For the upcoming industry, it would be essential to provide details of various energy efficient options and provide assistance in the integrated energy management for the various end-uses in the industry.
 - To help village industries in satisfying the energy and environmental regulations of municipal bodies, state governments and the central government.

- * Case-specific solutions for transition to renewable energy options in existing and potential village industries. This will require the following services to be provided as desired by the client: Detailed information about technically feasible commercial options; techno-economic feasibility analysis of a few selected options; information about financial assistance.

- * It would be essential for NIRI to undertake the following thrust area activities prior to the aforementioned areas, in order to successfully carry out work in the above areas:
 - Development / standardization of methodologies for carrying out detailed micro-level energy resource assessment for any given area as and when required.
 - To evolve financial and management strategies / packages for large-scale adoption of appropriate energy solutions for the rural industrial sector.

- * In the area of water resources, the following activities need to be carried out:
 - To carry out detailed water auditing of selected industries and to develop water conservation and recycling systems for the same.
 - To develop appropriate technologies for water treatment for meeting the water requirement in selected industries.
 - To design rainwater harvesting systems and their integration in industrial water management systems.
 - To develop suitable lining materials for ponds, water filters for removal of arsenic, fluoride etc.
 - Identification and use of natural coagulants for purification of water and development of appropriate containers (pots) / filters to make their efficient and effective use.
 - To assess the performance of the water testing kits available commercially.

- * In the areas of sanitation and waste recycling, the activities can be listed as under:
 - Design, development and dissemination of solid and liquid waste management systems for selected rural industries.
 - Development of effluent treatment plants for selected rural industries
 - Designing sanitation systems for villages which couple waste recycling with energy generation.

- * In the area of rural housing and building infrastructure, NIRI may undertake activities in the following areas:

- To develop a comprehensive inventory of suitable building materials for different agro-climatic zones of the country.
 - Detailed assessment and evaluation of the present technological and commercial status of brick kiln industry and lime production industry as well as other mud based building materials.
 - Undertaking in-depth studies on the utilization potential of bamboo/sarkanda, fly ash, cow dung and clay based products, waste engine oil for plastering, etc
 - Promotion of appropriate low cost housing techniques.
- * In the areas of storage systems for raw and processed agro-products, the following activities would be useful:
- Detailed study of traditional systems of storing agricultural and dairy products and exploring the possibility of incorporating innovative design modifications to enhance their utility for current times.
 - Development of suitable construction materials for improving the durability of such storage systems (e. g. ferro-mud, bamboo-mud prefabricated panels).
 - Design, development and commercialization of appropriate storage systems for perishables such as onions, potatoes and gur-khandsari products.
 - Design and development of botanical pesticides based storage systems.
- * In the thrust area on transportation and communication systems, the following activities are suggested:
- Study and evaluation of currently prevalent modes of transport in the rural areas (such as cycle rickshaws, bullock carts, tractors etc) and to improve their efficacy and economy to the end user.
 - Improvement in the roads in rural areas and to encourage use of local materials and local skills in their development and maintenance.
 - Development and dissemination of alternative 'appropriate' modes of transport for rural areas.
 - Networking of villages through state- of –the- art technological options for communication.
 - Promotion of the use of low cost modern developments in computing and communications such as Simputer technology.
- * To promote entrepreneurial activities in the energy supply and infrastructure sector.
- * To provide education and training in the area of energy efficiency improvement (energy demand side management), renewable energy utilization and sustainable practices in infrastructure development. This would include:
- Development/preparation of teaching-learning resource materials for education and training of all levels of professionals involved with rural industries (i.e., technical, administrative, policy formulations etc.) in energy use and options for infrastructure development.
 - Conducting training programmes independently as well as participating in the training programmes of other sections of NIRI. The training may be conducted at the following levels:

Field Staff: Conceptual as well as practical understanding of the energy efficient operations of the major thermal, electrical and mechanical devices used in the rural industries; hands on experience in the operation of these systems; energy auditing of simple systems and practical experience in the use of necessary equipment for energy auditing; thumb rules for easy identification of highly inefficient systems, information about recent developments and available options for various end-uses.

Information about various commercially available renewable energy options, sources of financial assistance, long-term implications/holistic analysis of the use of sustainable technologies / energy efficient devices.

Methodologies for dissemination of information about recent developments in the rural areas and implications of existing undesirable practices in the area of energy.

Energy and environmental regulations at the local, state and central government levels.

Planners / Policy Makers: Information about latest developments in high energy efficiency technologies relevant to the rural sector; renewable energy technologies; technologies related to infrastructure development in rural areas, environmental implications of various technologies; financial problems at the field level – need for suitable strategies for implementation, regulations for better energy demand management; possible avenues for entrepreneurship development in the energy supply sector and rural infrastructure.

Existing and Potential Entrepreneurs: Information about energy efficiency of various technologies; various renewable energy options available commercially, sources of financial assistance, long term implications of use of sustainable technologies/energy efficient devices; possible avenues for entrepreneurship development in the energy supply sector.

- Launching of programmes for generation of awareness among the people in rural areas about the need for energy efficiency improvement and use of sustainable technologies for energy supply and infrastructure development.
- Establishment of a laboratory/facility for preliminary testing/evaluation of prototype energy equipment in certain important areas of large-scale application potential.
- To assess, analyze and evaluate the energy, environmental and infrastructural implications of activities to be undertaken by other divisions of NIRI through field level surveys.
- To carry out the necessary documentation and assist the management division of NIRI in the networking and creation of database in the area of rural energy and infrastructure. Specifically this would include :
 - Preparation of a comprehensive database on region-wise energy resource availability based on existing information as well as through further data collection wherever necessary to enable macro level energy resource assessment for any given region.
 - Preparation of a database of available information on the following aspects of different energy resource-technology combinations:
 - Resource availability
 - Technological appropriateness
 - Financial viability
 - Economic feasibility
 - Socio-cultural acceptability
 - Environmental sustainability
 - Preparation of a detailed task-technology matrix for rural industrial sector, in particular, and rural areas, in general, including detailed information on the constraints associated with the technologies or the applicability of the technologies under different conditions.
 - A detailed assessment and evaluation of potential incentives and barriers in the development and dissemination of energy efficient technologies and renewable energy technologies; Preparation of a comprehensive database of all successful

studies in the field of rural infrastructure and energy, and also of failures, along with identification and critical evaluation of the reasons for these failures.

- * Establishment of a network of individuals and organizations actively working in the country on energy, environmental, and infrastructure aspects of rural industries, for identification of problems/challenges at the field level; for development of solutions and dissemination.
- * Documentation of relevant traditional S&T base (at block/village cluster level) and scope of its improvement.

8.4 Proposed Mission Projects for Infrastructure and Energy Division

The following mission projects are proposed to be undertaken by the infrastructure and energy division:

- Development and implementation of appropriate measures for Energy demand management in Selected Rural Industries.
- Waste treatment / recycling in rural industries.
- Botanical pesticides based grain storage systems.
- Development and dissemination of renewable energy based 10-100 kW power packages for rural industries.

The objectives, expected deliverables, and the likely activities of the proposed mission projects are briefly presented in the following subsections.

8.4.1 Mission Project –I

Development and Implementation of Appropriate Measures for Energy Demand Management in Selected Rural Industries.

Objectives

- To identify energy intensive rural industries in the country.
- To undertake a detailed energy demand and supply analysis of selected rural industries
- To identify areas/avenues of intervention for energy efficiency improvement and energy conservation in the selected industries.
- To develop technological solutions for energy efficiency improvement in the selected industries and to implement these.

Expected Deliverables

- A comprehensive categorization of rural industries in the country as per their energy and materials intensity, waste generation, contribution to GDP and overall potential.
- Ten most energy intensive rural industries identified and their energy consumption details (with process/stepwise breakup), details of types and amounts of different by-products, wastes and their current status of treatment and/or recycling made available for formulation of suitable intervention strategies.
- Areas of energy efficiency improvement and energy conservation identified in the selected industries and appropriate technological measures identified/developed
- Detailed feedback on the monitoring of the energy efficiency improvement and other energy conservation measures implemented in the selected industries made available
- Detailed action plan for future efforts in this area.

Suggested Approach

To begin with, a detailed assessment of the different types of rural industries shall be made in order to select some (3-5) rural industries for detailed study, evaluation and intervention. For each selected industry, the following activities should be undertaken.

- Detailed energy and environmental auditing in five representative units from a selected geographic region of the country in each capacity range (size)
- Development and evaluation of potential intervention options in each industry in respect of the following.
 - (a) Energy efficiency improvement
 - (b) Renewable energy utilization
- Selection of viable intervention options and assessment and evaluation of their financial implications for the industry.
- Identification of about five pilot units (in each capacity range) desirous of sincerely adopting the interventions.
- Implementation of the selected interventions in all the identified units as per a suitably framed schedule.
- Monitoring and performance evaluation of the new interventions made in each industrial unit for a period of six months.
- Experience sharing with all stakeholders in a two-day workshop
- Planning and strategy formulation for medium term performance monitoring and evaluation of existing interventions and expanding the scope of the initiative to other rural industries/units.

8.4.2 Mission Project – II

Waste treatment / recycling in rural industries

Objectives

- To study the nature (physico – chemical characteristics) and quantum of biodegradable waste generated in selected industries around Wardha
- To carry out characterization of solid and liquid waste and identify suitable technologies for its utilization.
- To study and identify suitable endemic earthworm species for vermi-composting.
- To develop low cost blower system for aeration and mixing the waste mass in composting system.
- To design and develop suitable integrated waste management system(s) for selected rural industries.
- To conduct pilot scale studies in a couple of industries and evaluate the techno-economic viability of the developed waste management systems (shelf life of organic manure, packaging and marketing mechanism etc.).

Expected Deliverables

- Suitable integrated waste management system for selected industries.
- Suitable machine/equipment/method for aeration and mixing the waste mass in small scale composting system
- Identification and culturing of suitable endemic species of earthworms for vermi-composting.

Suggested Approach

I Year

- The nature and quantum of biodegradable wastes generated in the selected industries will be studied.
- The characterization of solid and liquid wastes (i.e. BOD, COD, PH, TS, SS etc.)

II Year

- In case of vermicomposting, R & D work on identification and culturing of suitable endemic species of earthworms will be carried out.
- For small-scale aerobic composting units, techniques for improving the efficiency of the system will be studied. Special efforts will have to be made to design and develop equipments for providing aeration and turning the waste biomass.
- Appropriate integrated waste management systems comprising of anaerobic, aerobic and biotech systems for each selected industry will be developed.

III Year

- Installation of appropriate integrated waste management systems (as above) in identified industrial units will be done.
- Monitoring and performance evaluation of the installed systems will be carried out for a period of 8-10 months.
- Experience sharing with the state holders in a workshop will be done and future plan will be made.
- Training programme on ‘operation and maintenance’ of waste management systems for the industrial staff will be organized.

8.4.3 Mission Project – III

Botanical pesticides based grain storage systems

Objectives

- To prepare state-of-the-art report on the use of botanicals for grain storage system and identify research gaps.
- To collect and compile information on traditional grain storage systems (i.e. storage structures and pest control methods)
- To study the bio-efficacy of selected plants under laboratory conditions as well as in selected traditional grain storage structures for both local and HYV seeds.
- To study synergistic combinations of some plant products to increase the efficacy to cover a wider spectrum of pests in stored grains.
- To design botanical formulation based grain storage systems for family/community level
- To prepare technology package, manual etc. for industrial applications.

Expected Deliverables

- State-of-the-art report on Botanicals for Grain Storage System and identification of R&D gaps.
- Document on traditional grain storage system and bottlenecks in adopting these in the current scenario.
- Suitable botanical formulations as VI Product.
- Design of family/community level grain storage system
- Technology package and manual for industrial applications

Suggested Approach

I Year

- Carrying out Literature survey and preparation of state-of-the-art-review.
- Collection and compilation of detailed information on different types of storage structures and pest control methods being used in different agro-ecological regions.
- Collection of raw materials of selected plants and extraction of bioactive constituents.

II Year

- Chemical characterization of plant extract
- Collection of nuclear cultures of insects and their rearing
- Designing and setting up of bioassay experiments
- Undertaking bioassay experiments for selected plants for storing cereals.

III Year

- Preparation of synergistic combinations of already identified bioactive plant parts and testing their bio-efficacy against dominant pests.
- Working out suitable physico-chemically stable and efficient formulation and its evaluation
- Evaluation of the final product under field conditions. Developing technology package based on the experimental findings
- Organizing training programmes for the beneficiaries through Networking of regional institutions/organizations

8.4.4 Mission Project - IV:

Development and Dissemination of Renewable Energy Based 10-100 kW Power Packages for Rural Industries

Objectives

- To design and evaluate different renewable energy resource technology combinations for providing electrical power in the range of 10 – 100kW.
- To identify niche areas (villages, rural industries etc.) for dissemination of these packages.
- To identify competent individuals/groups/NGOs/entrepreneurs motivated to take up their development and dissemination.
- To select two villages and two to three industries for initial intervention, assessment of their electrical power requirement, and sizing of the systems to be installed.
- To design power packages for selected applications and locations and their performance characterization.
- To install the renewable energy power packages at the selected locations and to undertake a detailed performance evaluation of these systems.

Expected Deliverables

- Design details of suitable renewable energy based power packages alongwith their performance characteristics.
- Techno-economics of these packages.
- Niche areas identified in villages/rural industries for installation of such packages.
- Design and hardware details of the actual systems to be installed.
- Renewable energy based power packages installed at selected locations.
- Results of performance of the installed systems analyzed for mid course corrections (if required) and for future planning.

Suggested Approach

Initially it is envisaged to undertake a detailed study for assessment and evaluation of potential technological options to provide renewable power in 10-100 kW range. The following activities shall then be undertaken under the above mentioned mission project.

- Use the information obtained in the Mission Project 1 to identify industries (with specific locations) with a perceived need for renewable power in the range 10- 100 kW.
- Use MNES/REC/Ministry of Power/Planning Commission inputs to identify the villages which are not likely to be electrified for next 15-20 years.
- Identify individuals/groups/NGO's/SSI's and others motivated to take up development, installation, operation and maintenance of renewable energy based 10-100 kW power packages as stand alone systems in villages/industries.
- Facilitate mutually advantageous interaction and/or collaboration among experts dealing with resource assessment, technologies, financing, community participation and local/state/central regulations etc. for (i) identification of appropriate technological options (ii) identification of niche areas, and (iii) Preparation and implementation of a realistic action plan.

- To select two industrial and two remote unelectrified village sites with strong needs for electrical power.
- Energy resource assessment and design of power package for each of these four sites and their evaluation.
- Presentation of the results in a workshop/brain storming/group discussion for the representatives of the developers/users/financers/ government officials, state electricity board(s) etc.
- Finalization of the designs
- Installation and commissioning of the renewable energy based power units.
- Experience sharing with all stakeholders and preparation of action plan for future efforts in this direction.

8.5 Mechanism of Launching, Execution, Management and Monitoring of Mission Projects

Some suggestions for launching, execution, management and monitoring of the mission projects are presented below.

8.5.1 Launching

NIRI may invite brief inputs from potential individuals/groups of individuals/NGO's etc. on each one of the mission projects and after careful screening may request about five of them to submit their detailed proposal along with cost implications. One of them can then be selected for execution of the project with the help of suitably formed expert committees.

8.5.2 Execution

Though day-to-day operation of the project shall be looked after by the project operator (selected above), NIRI officers will regularly interact with the project team as per a decided structured plan. NIRI officers will not only make sure that the project proceeds as per agreement/contract but will also closely monitor the execution to look for any mid-course corrections.

8.5.3 Management and monitoring

For each mission project a committee comprising of members from NIRI, KVIC, project team and experts shall be made which will assess and evaluate the progress from time to time and make recommendations for modifications/alterations, if required.

8.6 Institutions for Networking

As mentioned earlier, it is envisaged that NIRI would work in close collaboration with various institutions appropriately selected for each project. In fact, to the extent possible, it should prefer drawing upon the outside expertise rather than trying to execute all its activities through its own staff. An indicative list of some such institutions for infrastructure and energy division is presented in Annexure-I.

8.7 Interaction with other sections of NIRI

Energy being a critical ingredient for most of the industries, and availability of adequate infrastructural facilities being an essential prerequisite for their establishment, it is anticipated that energy and infrastructure section will have to study and analyze the relevant aspects of each and every project proposed (or to be undertaken) by other sections of NIRI. Specifically, for each project, the energy demand and supply issues as well as generation and treatment /recycling of wastes will have to be seriously evaluated. At the same time, the other groups may help in obtaining reliable data on the present energy consumption and corresponding efficiencies of energy utilization in various rural industries in their respective domains.

8.8 Manpower and Infrastructure Requirements

8.8.1 Manpower Requirement

The manpower requirements for the infrastructure and energy section of NIRI are given in Table 2.

Table 2. Manpower requirements of Infrastructure and Energy Division

Sl. No	Name/Level of the Post	No. of posts	Minimum Qualification	Minimum Experience	Expected Deliverables Specific	General
1.	Scientist /Engineer	04	Ph.D/ M. Tech. in Energy/ Mechanical/ Electrical engineering Ph.D/ M. Tech. in Energy/ Mechanical/ Electrical engineering Ph. D. / M. Tech. in Civil engineering Ph. D. / M. Tech. in Chemical/Biochemical engineering, chemistry	(i) Two years experiences in the area of energy efficiency improvement, energy and environmental auditing (ii) Two years experience in the area of renewable energy utilization (iii) Two years experience in water resource engineering, buildings, road (iv) Two years experience in the area of biogas technology, grain storage	(i)Plan and execute activities in the area of energy auditing in rural industries and also development of interventions for energy efficiency improvement (ii) Plan and execute activities to promote renewable energy utilization in rural industries (iii) and (iv) Plan and execute activities in the area of infrastructure and undertake R&D work in selected areas	HRD Programs Interaction with other groups Database development and sharing
2.	Technician/Mechanics	02	(i)Three year Diploma in Mech./Electrical (ii) B. Sc. (with chemistry and biology)	Two years in relevant area		To assist in execution of projects, technology development
3.	Attendants	02	Secondary Education			To assist in day-to-day operation.

8.8.2 Equipments Required for Laboratory/ Day to day Operation

A list of equipment which may be required for day to day activities of the infrastructure and energy division of NIRI are given in Annexure-II.

8.8.3 Space Requirement for the Laboratory

As an initial estimate, about 350 square meter covered floor area on ground floor of a building would be sufficient for establishing basic laboratory facilities of the section.

8.8.4 Other Infrastructural Requirements

- (a) Electrical Energy
- (b) Telephones
- (c) Internet Facility
- (d) Clean drinking water
- (e) Room coolers / AC's
- (f) Photocopier, scanner, PCs, Printer
- (g) Audio Visual facility

8.9 Future Plans

8.9.1 Vision of Activities to be undertaken in NIRI after Initial Three Years

It is proposed to continue with the various activities listed under thrust areas even after the initial three years of operation of NIRI. It is critically important that initiatives taken be pursued with full sincerity and perseverance to ensure their long-term success.

8.9.2 Proposed strategy for Resource Generation

Energy and infrastructure section of NIRI can generate resources through the following activities:

- Conducting energy and environmental audit(s) of rural industries
- Testing energy equipment developed by rural entrepreneurs.
- Developing waste treatment/recycling units for rural industries
- Becoming an equity shareholder in upcoming/new rural industries in the area of energy and infrastructure.
- Conducting relevant HRD programmes for professionals from rural industries.
- Undertaking research and development work as solicited by the client(s).

Annexure-I**List of Important Institutions / Government Organizations / NGO's / Manufacturers etc. for Linkage Building**

- IITD, IITB, IITM, IITK, IISc, JNU, NSIT, IARI, CBRI, CRRI, CIAE, PAU, TNAU, MKU, State Agricultural Universities, Institute of Soil Biology and Biotechnology, Indian Grains Storage Institute
- Ministry of Agro and Rural Industries, MNES (and its State Level Offices), ICAR (and its different organizations)
- State Level Renewable Energy Agencies such as NEDA, OREDA, DEDA, MEDA, REDA, MPUVN, GEDA etc.
- IREDA
- Rural Electrification Corporation, Ministry of Power, Central Electricity Authority, Petroleum Conservation Research Association, Energy Management Centre, National Thermal Power Corporation, Rajiv Gandhi Drinking Water Mission, HUDCO
- KVIC Institutions
- Tata Energy Research Institute, Sardar Patel Renewable Energy Institute, Action for Food Production, Development Alternatives, Centre for Science and Environment, Gandhi Peace Foundation, Tarun Bharati Sangh, Centre for Science for Villages, Sulabh International, Laurie Baker Group.
- Manufacturers and suppliers of renewable energy equipment, building materials, telecommunication systems, computers and softwares etc.
- International funding agencies such as World Bank, UNDP, USAID, CIDA, SIDA, SDC, GTZ etc.
- Individual experts in specific areas of intervention of NIRI

Annexure – II

List of Instruments/ Equipment Required

S. No.	Name Of Equipment/Instrument	Approx. cost (Rs.)
1	Temperature Indicator	4000/-
2	Infrared Thermometers (Set)	180000/-
3	Thermal Insulation Scanner	30000/-
4	Microscanner	16500/-
5	Conductivity Meter	7000/-
6	Ph Meter	12000/-
7	Anemometer	56000/-
8	Hygrometer	60000/-
9	Ultrasonic Flow Meter	250000/-
10	U-Tube Manometer	5000/-
11	Digital Manometer	27000/-
12	Digital Stop Watch	3000/-
13	Pyranometer	30000/-
14	Used Lube Oil Test Kit	1000/-
15	Non-Contact Techometer	2500/-
16	Power Analyser	72000/-
17	Nanovip	23500/-
18	Luxmeter	2300/-
19	Clip On Digital Watt Meter	5500/-
20	Clip On Digital Power Factor Meter	4400/-
21	Clip On Ampere Meter	3200/-
22	Digital Multimeter	2200/-
23	Frequency Meter	1300/-
24	Box Type Solar Cooker (4)	8000/-
25	Parabolic Concentrator Cooker (2)	12000/-
26	Parabolic Concentrator Cooker (Large Size)	80000/-
27	Solar Water Heating System	40000/-
28	Data Logging Facility	100000/-
29	Bod Incubator	70000/-
30	Refrigerator	15000/-
31	Autoclave	10000/-
32	Rotary Vacuum Evaporator	30000/-
33	BOD And COD Meters	50000/-
34	Multichannel Temperature And Moisture Probe	40000/-
35	Gas Chromatograph	450000/-
36	Microscope With Photographic Facility	50000/-
37	Colony Counter	10,000/-
38	Laminar Flow	40000/-
39	Automatic Unit for NPK Content Determination of Manure	600000/-
40	Biomass Grinder	10000/-
41	Micropipette	10000/-
42	Heating Mantles (Different Capacity)	10000/-
43	Dynamometer (120 Kw@1000-10000rpm)	300000/-

44	Flue Gas Analyser (CO, HC, Nox, Sox)	500000/-
45	Smoke Meter	250000/-
46	Portable Water Testing Kit	7000/-
47	Portable Air Quality Testing Kit	20000/-
48	Portable Blower	5000/-
	Total	35,00,000 (approx)

Chapter 9

Rural Crafts and Engineering

9.1 Historical Perspective

The story of Indian Handicrafts comes from one of the oldest civilizations of the world. The vast cultural and ethnic diversity has enabled a variety of motifs, techniques and crafts to flourish on this land.

For centuries Indian handicrafts have been distinguished for their great aesthetic and functional value. In ancient times, the *shilpis* conceptualized the intricate designs and patterns, which were crafted with great effort into the templets and the objects associated with them. Apart from the templets, other handicraft items too have gained immense popularity.

Handicraft items that were patronized by the Mughal royalty show a remarkable refinement of workmanship. In these crafts the designs were very often influenced by the court paintings and miniature art derived from Persian or indigenous sources. These designs are evident in the Indian carpets, brocades, papier mache, stone inlay and so on.

Traditionally, the artists prepared the designs on paper, which were subsequently executed by the craftsmen. The designs were assigned to different craftsmen according to their abilities and skills. Thus, the designer or master craftsman visualized the complete design indicating the details of form, color distribution and proportion to be realized by various specialists.

The rules of iconography were written down in the ancients' scriptures, namely the *Shilpa Shastra*. The master craftsman would first visualize the image in a particular representation, according to the rules of iconography laid down in the scriptures on stone craft, and prepare initially a model in wax or clay. Craftsmen would later cast this, while the master craftsman executed the finer work. This combination of design ability and technical skills was a part of our craft tradition. There are however, many crafts where the craftsman both designs and executes the products himself.

9.2 Tradition of Indian Handicrafts

Excavations have found inroads into very ancient times. Excavations of tools help us understand the nature of production and the aesthetic standards of the period to which they belong.

The particular period and appeal of a handicraft item can be gauged from the number of industries, technique of production, types of goods produced and materials used. This state reflects the aesthetic sense of the people, curvature of objects, lines, space, light and shades. An examination of the visual arts, such as sculpture, paintings and terracotta unveil the element of art. Not all crafts were produced for daily needs.

Tools used today reflect the traditions of the early age, as old as the Stone Age. The rural and tribal artisans use processes and techniques inherited by them from their forefathers in the creation of their crafts. Though the tools used in that age were mainly for survival purposes, the making of these tools required considerable amount of skill.

The discovery of several spindles, and a piece of cotton stuck to a silver vase, revealed that the spinning and weaving of cotton was known to the Harrappans, nearly five thousand years ago. References to weaving are found in the Vedic literature on the method of spinning, the various materials used.

The foundations of the Indian textile trade with other countries began as early as the second century BC. A hoard of block printed and resist-dyed fabrics, mainly of Gujrati origin, found in the tombs of Fostat, Egypt, are the proof of large-scale Indian export of cotton textiles to the Egypt in medieval times.

In the 13th century, Indian silk was used as barter for spices from the western countries. Towards the end of the 17th century, the British East India Company had begun exports of Indian silks and various other cotton fabrics to other countries. These included the famous fine Muslin cloth of Bengal, Bihar and Orissa. Painted and printed cottons or chintz was extensively practiced between India, China, Java and the Philippines, long before the arrival of the Europeans.

Before the introduction of mechanized means of spinning in the early 19th century, Indian cottons and silks were hand spun and hand woven, a highly popular fabric, called the khadi. Fabrics that use mill-spun yarn but which are hand-woven are known as handloom.

Today cotton is an integral part of textiles in India. Nearly four million handlooms are engaged in weaving fabrics of nearly 23 different varieties of cotton.

The Rigvedic literature being religion based describes mainly such objects of art and crafts as were directly or indirectly associated with the religious rituals. Though, the artistic inclinations of our ancestors are not revealed, we can peek into their life-styles. The ancient objects were at times described in terms of the supernatural to create awe toward them.

Many types of vessels, pots and pans are referred to in Rigveda. The general term used for pot in the Rigvedic literature is *Patra*. It soon acquired a generic connotation and began to be used for pots of all specifications.

The most popular material used for making vessels, especially those meant for offering sacrifices and worship, was wood, while clay pots were made for domestic uses. References to metal pots too have been found. Leather too is mentioned as having been used for making vessels.

Rigveda is silent on the various techniques in the making of these vessels and other objects. But it does have references of different materials in use. Ironically, wooden vessels in those days were used to drink and store alcohol. But they were also considered auspicious as they were used to perform yajnas.

Besides wood, metals were very popular, and ornaments and vessels were made out of these. Interestingly, the scriptures also mention the use of gold and silver. Earthen ware being the simplest to make, failed to make it to the scriptures because wood was considered auspicious and metal exotic.

9.3 Present Perspective

The Indian planner and politician is yet to see the Indian craftsmen as a talent bank that constituted the engineers and technologists of India's past and who even today posses

tremendous capability to bring about rural industrialization and without whose participation nothing significant can be achieved.

The **dumping of the economic philosophy** of Mahatma Gandhi, which saw **every individual, an economic power horse** is the major reasons for the present morass the country finds itself in.

Villages at present do not offer a model of either physical, intellectual or professional development. Lack of infrastructure, roads, electricity, education, health or employment in the rural areas is forcing people to move to the cities. In villages they cannot dream of any form of growth and advancement.

The trend can only be reversed only when the talented poor start contributing to the growth by their active involvement in the growth process. Implementation of the programs should be increasingly based on approaches and methods, which involve the poor themselves in the process of education, entrepreneurship, infrastructure development and economic growth. This is possible through a process of social mobilization, encouraging participatory approaches in institutional development and empowerment of the capable and the talented. This should be done through inter linking.

9.4 India's Handicrafts Industry

India's handicrafts industry might be classified as a cottage industry, but its importance to the country's economy cannot be underestimated.

It employs more than five million artisans -- mostly in the small-scale sectors of carpets, gem and jewellery manufacturing -- and is a growing source of foreign exchange earnings.

The industry is labor-intensive and decentralized -- spread over urban and rural areas. Many artisans work in their chosen field on a part-time basis only.

9.4.1 Handicraft products

The different handicraft products of India which are famous in the national as well as international market are as follows:*Antiques, Decorative items, Furniture, Garments, Home Furnishing, Home Products, Jewellery, Toys & Dolls, Decorative items, etc*

Antiques

The history of Indian art unravels a breathtaking variety of artifacts that reflect the varied and intense moods of Indian Heritage. Timeless pieces of art have held the eye captive with its fascinating colors and designs. Today these bear a reflection of the glorious Indian traditions. It is for this very alluring beauty that they have come to be treasured over centuries.

Furniture

Sofa sets, dining tables and chairs, garden chairs, shelves, bookstands... the list is endless, as is the variety available. Different materials like wood, cane, bamboo, metal etc. are used to make furniture, and with each state having its own distinct style. The magnificent artistic skills of the artisans reflect the wide range of ethnic patterns. Furniture that was once exclusive to the royal palaces today adorns the drawing rooms of the houses belonging to

common man, thanks to the exquisite workmanship of our craftsmen. Interior decoration with these pieces is bound to offer elegance.

Home products

One can feel the vibrancy of Indian ethnicity come alive in the myriad home products available, which are carefully crafted by the artisans. There are numerous choices in materials available in each category of products. The diversity in the range of products is overwhelming. From flower pots in gardens to flower vase in drawing rooms, from candle-stands to cutlery in the dining rooms, from combs and photo frames to bed sheets and pillow cases in bedrooms and more.

Jewellery

Jewellery has been part of the Indian civilization since ancient history. Ornaments made of gold, silver, copper, ivory, pottery and beads have been discovered in civilizations as ancient as the Harappa and Mohanjodaro. The Indus valley goldsmith knew how to make moulds for metal and terra cotta ornaments. Gold jewellery from these civilizations consist of bracelets, necklaces, bangles, ear ornaments, rings, head ornaments, brooches, girdles etc. This art has been perfected with modern styles and further materials used. Besides gold and other metal jewellery, stones, conch shells, wood, plant seeds etc. are used. Ethnic patterns, with intricate motifs are much in demand for their absorbing styles.

Toys and dolls

Indian toys and dolls are distinct in their vibrancy and colors. The bright lac painted toys, a favourite with most children, has birds, animals, airplanes, wheeled animals etc. crafted out of them. Wood is one of the commonly used items for this craft. Here too there are variations like the 'cherai toy', which are wooden toys touched with sawdust. Cloth, papier mache and terra-cotta too are used to make toys and dolls. There are dolls representing deities too. Figures of Gods and Goddesses are carved out of wood and are then formally decorated. These are called Tirupati dolls. Another captivating craft is the leather puppets of Andhra Pradesh. Interestingly, these are about five feet high, translucent and dramatically painted in vegetable dyes. Typical rural styles are used to paint these. Grown ups too shy to admit a liking for these toys can use them as decorative pieces. They make fantastic showpiece items. Pith or Indian cork has been used in Assam to make toys and dolls since centuries. These toys are painted to give them a bright look.

Wall hangings

Indian walls are perhaps the brightest in the world, with a wide range of artwork available in a wider range of materials. As each state has a unique cultural identity, there is an incredible range to choose from. Wall hangings are made in jute, coir, cloth--- with appliqué work, thread work, embroidery, patch work etc. in wood, metal, papier mache, glass and a range of other things. The themes and designs vary from state to state. From geometric designs to floral to images of gods and goddesses, all are included. Wall hangings are symbol of welcome and hospitality in the Indian context, besides whetting the craving for the aesthetic.

Decorative items

India is the home of a remarkable variety of traditional crafts. Century old skills continue to produce some of the most artistic and exciting pieces of art, which are admired and

collected not only by connoisseurs in India but around the world. The ethnic appeal in the vibrant colors is irresistible, whether it is leather ware, pottery, metal craft or textiles. An inspiring range of products is available from timeless creations, which include crafts in wood, papier mache, wood, metal, glass and a variety of other materials. They have remained coveted for their ability to transform homes into places of beauty.

9.4.2 Handicraft materials

The generally used items of handicraft materials are as follows: Cane & Bamboo, Coir, Gems, Glass, Ivory, Jute, Leather, Metal ware, Papier-mache, Pottery, Stone Craft, Textile, Woodcraft and more. India is a treasure trove of the most exquisite handicrafts available. Various raw materials have lent themselves to an array of exotic items. The amazing diversity in Indian cultures and traditions ensures variety in the transformation of every single material to a handicraft item.

Cane and Bamboo

Tripura is famous for its bamboo work, made from split bamboo, so finely done that they acquire an ivory look. The best-known places for basketry and mats are Assam and Bengal. Assam, a state with abundant raw materials, has a large variety of beautiful products like baskets, mugs for rice beer, hukkas, musical instruments, floor mats, fishing devices and handles. Baskets and mats from Bengal and Tripura look similar. Elegant screens made from split bamboo are a specialty in Tripura. Mizo baskets, made for storing rice is woven with four long bamboo splints at the corners. Arunachal Pradesh excels in cane and bamboo work with bamboo bridges and cane belts.

Orissa has some outstanding items, like articles made from what is known as the golden grass. Manipur has unusual type of baskets, with dome shaped lid made out of bamboo. Tamil Nadu is famed for its kora grass mats. Extremely delicate, and indeed the most aristocratic of mats in the world, are made in Kerala. Square bamboo box made here is perfectly gorgeous with black and white design.

Coir

Coir industry occupies a unique place among the rural traditional cottage industries in India. The state of Kerala, also known as the 'land of coconuts', is the largest producer of Coir in India. It accounts for more than 75% of the total production. The preparation of Coir is a lengthy process. The coconut husk is immersed in water for about a month. Later the softened husk is beaten to separate the fibre from the husk. This is then woven into Coir. Coir-foam, rubberized coir is used to make mattresses and pillow-covers. These have gained popularity due to their softness and durability. Floor mats, carpets and durries too are made. Other handicraft items like bags, wall hangings, dolls and animal figures etc. are made. The jewelry made out of Coir is fascinating because of its intricate and delicate designs.

Gem

Gem cutting has been defined as an art of artificial diamond making. In India, the traditional gem processing involved cutting and polishing of natural stones. There was then, no attempt at calibration or following standard sizes. Modern gem processing has since come a long way, while traditional gem polishing has remained confined within a few communities for generations. Exports in gems amounting to Rs 31 crores, in 1990-91, represented less than a third of the world market demand. It has since, increased rapidly and it is believed that India will secure a sizeable chunk of the market. Indian cottage industry employs around 1,55,000

workers in the country. The export market for this product includes Middle East Europe, USA and the Far East. The exports from south India exceed exports from other parts of the country, Tiruchirapalli being the main centre. Gems are used to make exquisite jewellery items in both traditional and modern designs, which are popular around the world.

Glassware

Glass articles like bowls, tumblers and bottles for precious things, like Indian scents, were made traditionally. Other items like phials, bottles, jars and lamp chimneys are attractively made in a wide range of shapes.

Engraving on glass has also reached new heights, which is reflected in the delicate foliated designs. Glass bangles continue to be in vogue, with innumerable colors and patterns. Ferozabad, in Uttar Pradesh, has an entire community devoted to producing glassware and tableware in tasteful designs. Glass beads on the other hand are a specialty of Varanasi. The tukli technique in Patna involves decorative items on glass, with gold or silver pieces to fill the entire picture. In the south too, elaborate paintings on glass have gained popularity.

Ivory

The Ivory carvers of Bengal and Jaipur are known for items such as the 'ambari hathi' (or processional elephant), models of bullock carts, caskets, book covers, sandals, palanquins and frames for the European market. In Orissa, tradition calls for offering ivory inlaid furniture to the temple of Puri. Miniature shrines with delicate pillars and intricate low relief floral work, caskets depicting scenes from myths and legends, and images of gods and goddesses including Christian icons and symbols have been traditionally made in Kerala and Karnataka.

Rajasthan has been famed for its ivory items, which include, hand-fans with charming figures for handles, and centre pieces for the dining table with ornately carved receptacles shaped as flowers and half-opened blossoms. Ivory craftsmen of Gujarat make human figures and statues of deities in excellent quality. Punjab's highly decorated elephants and figurines depicting characters from folk or heroic tales are superb.

Uttar Pradesh is famous for its Hindu and Buddhist figures of deities, dancing poses and decorative plaques. Kerala has an amazing tradition of painting on ivory. The state with its profusion of temples with carvings could not but specialize in figures of gods and goddesses of superb workmanship. Scenes from Ramayana and other epic stories and statue of St. George on a giant charger, killing the dragon with his spear are some of the fabulous works in Ivory. The work on the doors of the Amber palace in Jaipur and the exquisite inlay in the Mysore palace doors and the Golden Temple at Amritsar, proclaim the architectural decoration with Ivory.

Jute

Jute as a natural fibre, it has many advantages over synthetics. It has been recognized as environment friendly as it is biodegradable. Known also as the golden fibre, it is the cheapest of all the natural fibres. It is used extensively in the manufacture of different types of traditional packaging fabrics and blended yarns.

A luxurious range of jute home decor products is available to suite different life styles. Cushion covers, tablemats, table covers, tea cosies add a touch of class to the interiors. Exquisite jute floor coverings are till date unmatched in their elegance. Jute garments are available for all occasions, in hand printed, embroidered and tie and dyed variety.

A wide range of the most endearing stuffed toys is made of jute woven fabrics. These are washable and safe for children to play with. Christmas gifts and decorative items with colourful embroidery look absolutely attractive when made with jute.

Leather

The most popular leather products in India are footwear and handbags. The footwear comes in a variety of traditional embroidery, brocade or textile designs. Bright colors and individual designs are used. The all time favourite, kholapuri chappals of Maharashtra, are soft and comfortable to wear.

A particular type of thickish shoes, called mojadis are made in Rajasthan. They are decorated with silk, metal embroidery and beads. Jaipur has the most fancy and sophisticated footwear. Jodhpur, on the other hand, has good embroidery in potent patterns and bold shades. 'Kopi', a rather unusual and attractive object, is a water bottle made in Bikaner from camel hide. Bikaner and Jaisalmer have decorative saddles for horses and camels.

Handbags in batik style with the cracks, bold curves, and traditional motifs are made in Bengal. The high raised leather seats with geometrical patterns or motifs, called pidis, are immensely popular. Leather items of Kashmir are outstanding, as they are very ornamental. The red leather embroidered with gold and silk is unique in Madhya Pradesh. In Hoshiarpur, Punjab, appliqué work is done with colored leather pieces. Leather with metallic gold or silvery finish is done in Karnataka. Fascinating articles are also made out of crocodile and snakeskin, such as wallets, pouches, handbags, and especially a wide range of belts.

Metal ware

Iron beams of Konark Sun temple in Orissa and the iron pillar at Qutab Minar in Delhi are evidence of the phenomenal skills achieved by Indians in the field of metal ware.

Metal craft has also been an integral part of Indian culture. The 'lotas' or water pitchers are found in almost all parts of the country. The 'urli', bell-metal vessel in Kerala is a basic element of its culture. The metal based lamps in various shapes and designs are part of the Indian traditions and rituals. In Ladhak, decorative kitchen stoves are made purely by hand. In South India, metal icons, especially of bronze, are believed to absorb the charged energy of the Divine and are stored in the inner sanctum of a temple where the icon is installed.

Moradabad, in Uttar Pradesh, has almost become synonymous with metalwork. It is specially noted for its coloured enamelling and intricate engravings in niello. Delhi too is an important centre for art metalwork. The 'paildar' or the pie-crust designs, laboriously made, is a speciality of the place. 'Koftgari', technically known as damascening, offers a wide range of products, both for utility and ornamental purpose. Metal-wire inlay work has panels and pictures depicting attractive scenes. This work is found mostly in Uttar Pradesh and Kerala. Kashmir is famous for metal engraving. It is done on walking sticks, nutcrackers, cutlery, knives etc. Rajasthan does an outstanding work in silver. Spice boxes, caskets and cigarette cases are made of silver with intricate designs.

In fact metal craft has an amazingly wide range of products with a variety of possibilities like E.P.N.S., metal casting, metal carving, inlay work, enamelling etc. Also, it is a craft widely popular in India, thus proving to be a treasured artwork.

Papier mache

The craftsmen of Kashmir turn a variety of utility items, of papier mache, into fabulous decorative pieces. The items are brass lined to improve their scope for utility. Designs in the shape of flowers and birds, and the heart shaped Kashmir chinar leaf add life to the objects. Bright and ethnic colors like peacock blue, dark green, brown etc. are used. Gold and silver are used on larger articles. Figures and objects like the Kashmiri houseboat are depicted.

In the south life size figures are made to portray everyday scenes of life. The dancing dolls thus made are very popular. Gwalior, in Madhya Pradesh, has a papier-mache centre but largely for toys. Ujjain in the same state specializes in figures of deities. Puppets made out of papier mache are very popular throughout India. A wide variety of designs and styles inspired by varied cultures of different Indian states make excellent decorative pieces.

Pottery

Harrappan and Mohanjodaro cultures heralded the age of wheel-made pottery. Well-burnt black painted red wares characterized these. The phase of glazed pottery started in the 12th century AD, when Muslim rulers encouraged potters from the Middle East to settle in India. Glazed pottery of Persian models with Indian designs, dating back to the Sultanate period has been found in Gujarat.

The terra-cotta objects are made by hand or on the wheel, and firing them in an open oven. The surface is rubbed and polished, with a wood or stones while it is still wet.

The first pottery unit run in India was by Sir S Deb, in Calcutta. It established the success of high-class pottery made out of local clay. Porcelain factories were set up in Gwalior and Calcutta in first decade of 20th century.

Today, the pottery industry is run on both cottage and modern lines. Hundreds of small and big factories all over the country keep this age-old tradition alive.

Stoneware

Art of sculpture and architecture is the poetic expression of stone craft. Small-scale sculptures of deities, modeled on classical prototypes, continue to be made in many parts of India. In Tamil Nadu such sculptures are made in granite. In Karnataka, exquisite figures carved in relief in black stone, with details engraved in fine lines, come out in greyish-white against the black surface. Softer stones are used in Orissa, which are easy to carve.

The Taj Mahal is an exquisite example of marble works in India. Floral, trellis, creeper and geometric patterns are carved on the white marble surface, and semi precious stones of different colors are set into it. The Makarana marble is used to make utensils in northern-India, as dishes made of curds or lime stay fresh in these.

Stone monuments are present all over the country, and there are a large variety of stones present. In India traditional stone carving seems to be centered on temples. Made in a variety of stones, ranging from soft-brittle sandstone and patchy red stone to hard granite, the craftsmen carve replicas of the shore temples at Puri, Bhuvaneshwar and Konark. The magnificent Lion Capital –India's national emblem-carved out of chunar sand stone which is still shining after 2300 years, is an example of the technological skills of The Mauryan era.

The tradition of intricate lace screen in stone also points to the mastery achieved by stone carvers, thus transcending limitations of the hard material. The fully carved jali-worked facades of buildings in Jaisalmer in Rajasthan, are most intricately done. The artisans in Gujarat are engaged in the art of cutting and polishing semi-precious stones. In Bihar, the black stone is used to make every day utensils. Red sandstone is widely available in Rajasthan and many everyday articles are made out of them.

Textiles

Indian textiles are as diverse as its culture. The distinctive styles were developed through cultural influences, geographical factors and trade influences. The distribution of deserts, lush forests, mountains and rich river valleys as well as the integration of cultures brought together by mingling of tribes has greatly influenced the development of different styles. Interestingly, people in Bengal, eastern part of India, and Kerala, southern part of India, use white as the dominant color. Meanwhile, the desert belt, stretching from Kutch and Kathiawar in Gujarat to Rajasthan and parts of Haryana, has an incredible mix of numerous vibrant colors.

The handloom cloth is unmatched in elegance and style. Designs in Handloom cloth are either woven in or printed after the cloth is woven. History testifies that the cotton muslins in India were so fine that the Romans called the material *textalis ventalis* or 'woven air'. The cloth was also called 'evening dew', as it was indistinguishable when spread over grass; or 'sharbati', because of its cool feel on the skin. It continues to be produced today in places like Ponduru in Andhra Pradesh and Madhubani in Bihar.

The tradition of printing on woven cloth too is of great antiquity in India. Printing is done by using wooden blocks, by covering portions of the cloth intending to be coloured with wax, clay, gum, raisin etc. The cloth is subsequently dyed and the colors do not penetrate the covered areas. Fabrics are decorated with embroidery and appliqué work too. Indian cloth is also famous for works like 'chikan' and 'zari'.

Woodcraft

Since time immemorial, wood has been used for a wide range of domestic items. In Himachal Pradesh water pitchers and bowls are made out wood. In Kashmir, walnut wood is used making trays, fruit bowls etc. Storage receptacles are made in wood in many regions. Gujarat, in particular, has a rich tradition of woodcarving. Here, in addition to small chairs and tables, the swing, without which no traditional home is complete, is made. Wood lacquering is popular in Karnataka and Maharashtra. Traditional woodwork like painted cradles, boxes and ganjifa and the set of playing cards, are painted with religious and mythological figures.

Wood inlay, which developed and flourished with the Mughal influence, is done with bits of ivory, plastic, horn, metal pieces or other types of wood into carved surfaces of wooden items. This is found in various parts of the country such as Gujarat, Rajasthan, Uttar Pradesh and Delhi. The Mughal designs of Uttar Pradesh such as the fretwork, jali or the anguri work are also very popular.

Rare woods have special uses. Ebony and rosewood are carved into trinket boxes in Uttar Pradesh, while in Karnataka they are inlaid with ivory. Hand fans made here from thin slivers of sandalwood spread aroma in the room. In Gujarat inlay has become appliqué work and mosaic designs are built up from strips of different kinds of wood first glued together and then thinly sliced. Their architecture too is famous. It is elaborate and elegant with its

projected balconies, decorative windows and doors. The beautiful traditional homes of Kerala, built with teakwood are brilliant pieces of architecture. These retain their quality for decades together.

The soft toned elegant walnut wood and the fine deodar wood are found in Kashmir. The lattice- work and the Khatamband works are famous. The fragrant sandalwood in Karnataka is used for carving out intricate pieces that captivate the eyes. The red sandalwood of Andhra Pradesh is used to carve idols, deities and dolls.

The woodwork of the north-eastern tribes is locally known as kumisyng. The huge log drum is noteworthy in this region. The woodcarvings of the tribal areas of Madhya Pradesh, Bihar, Orissa and Rajasthan include doors, window frames, "marriage-litters", wedding pillars, tobacco cases and pipes.

9.5 Craft concentrations

Major craft centres exist in India. The following is a representative list.

Product	Areas
Art Metal ware	Moradabad, Sambhal, Aligarh, Jodhpur, Jaipur, Delhi, Rewari, Thanjavur, Madras, Manpad, Beedar, Kerala, Jagadhari, Jalesher
Wooden Art ware	Saharanpur, Nagina, Hoshiapur, Srinagar, Amritsar, Jaipur, Jodhpur, Jagdalpur, Bangalore, Mysore, Chennapatna, Madra / Manpad, Kerala & Behrampur (WB)
Hand printed and Textiles Scarves	Amroha, Jodhpur, Jaipur, Farrukhabad, Bagru and Sanganer, Agra, Sringer
Embroidered Goods	Kutch (Gujarat), Jaisalmer, Baroda, Lucknow, Jodhpur, Amritsar, Kullu, Dharamshala / Chamba and

India has been earning considerable foreign exchange through crafts.

India's Countrywise Exports of Handicrafts (Rs. In Millions)

Country	'92-'93	'93-'94	'94-'95	'95-'96	'96-'97	'97-'98
Australia	293.8	389.8	504.2	548.7	605.7	766.8
Canada	522.7	770.3	1089.8	1167.5	1282.8	1651.1
France	725.5	976	1261.5	1600.6	1838.7	2214.7
Germany	1716.6	2557.8	3486.4	3640	137.9	4850.7
Italy	370.6	596.5	979.1	1066.6	1369.2	1833.4
Japan	495.8	670.3	906.5	921.5	1337.3	1914.1
Netherlands	371.5	588.4	892	893.5	1179.3	1482.5
Saudi Arabia	511.2	731.4	1016.2	1164.2	1249	1570
Switzerland	173.1	248	366.7	323.7	418	535.8
U.S.A.	4512	6208.8	7783.1	8387.2	9708.1	11612
U.K.	1755.4	2213.3	2766.7	2487.7	3603.7	4607.5
Others	2671.8	3751.4	5306.8	8002.5	8956.1	10020
TOTAL	14120	19702	26359	30203.5	35685.8	43059

There is a strong need to resurrect and harness this economic work horse available in rural India by appropriately organizing, educating and empowering by adequate marketing mechanism, management and financial support to this important sector.

It must be appreciated that poverty can effectively be eradicated only when the poor start contributing to the growth by their active involvement in the growth process

9.6 SWOT Analysis

This SWOT analysis is first focused on the Handicraft Sector, New & Emerging Crafts, and Human Resource Development and then at KVIC

Handicraft

Strengths

- Large contribution in national economy in terms of export.
- Huge demand in global market for Indian handicrafts products.

Weaknesses

- Middlemen orientation: Artisans for export order are not organized and they are bound in their struggle for survival to moneylenders, traders or middlemen for credit and raw materials, and therefore become obliged to sell their products to them at a minimal price.

Opportunities

- Expanding national and international market.

Threats

- Dependence on foreign designs
- Separation of design and crafts

Emerging Crafts

Strengths

- Is not institution bound. Craftsmen are developing in the field with self-innovation and mutual transfer of skill.

Weaknesses

- Potential of market unknown.
- No proper system of technical and marketing support in place.

Opportunities

- High demand in the urban market, ready to absorb products with prices, which are competitive and cost effective.
- The crafts men get ready customers as the prices in the organized sector are very high for this hand made product.

Threats

- Fast changing technology and non-availability of proper support for sustenance of these crafts may force the craftsmen to forgo this trade.

Education programme for craftsmen (HRD)

Strengths

- Large base of technical/nontechnical institutions in India
- Huge bank of informal technical and design know how among rural craftsmen.

Weaknesses

- No proper curriculum/degree for formal education of craftsmen reducing their innovation and design skill over the period.

Opportunities

- Collaboration with foreign and national institutions for handicraft promotion.
- Application of science and technology in the research and development of designs and methods of handicrafts.

Threats

- Extinction of various crafts form and designs .
- No spread of knowledge to new artisans.
- No innovations in technique and designs resulting into fall out in the market.
- Disenchantment of children of craftsmen and their movement towards a babu culture.

KVIC

Strengths

- Ecological and Human concerns occupy a prominent place among the key focal issues faced by the world today. Mostly all products of Khadi are Eco-friendly sighting good potential. Some of the key points are long product life, uniqueness in texture, converts waste into wealth, recycling nature.
- KVIC plays a vital role in uplifting the economic condition of the Rural Indian folk with 4969 registered institutions, 30129 cooperatives, 7.85 lakh individuals. 15 million artisans are engaged in the production of Khadi and village industry products across the length and breadth of the country and 70% of them are women.
- The range of Khadi products are diverse and varied.
- The present infrastructure (the marketing and administrative network) set up of the Khadi sector in India is a great resource for further development of the village industry.

Weaknesses

- The role of khadi and village industries in the context of the new paradigm of development has been questioned. In particular, the effectiveness of the programme in terms of its employment generation capability, resource use efficiency and sustainability has been questioned.
- Unfavorable and untimely access to credit, both short term and long term, remains a perennial problem facing the rural artisans involved with KVIC.
- There is a difficulty in launching of the proposed programmes. The constraints are: non-availability of funds in time, administrative delays, inability of the units to furnish financial security. This has resulted in closure and in sub-optimal functioning of the institutions/units, high dropouts among the new entrants, low employment growth and inefficient use of public resources.

- Inadequate linkage between production and marketing. Passive marketing strategy has resulted in accumulation of stocks, untimely payment to institutions/units whose rebate and investment get locked for years, adversely affecting the economics of production. MIS not in Place.
- With no continuous up-gradation of their products and technological improvements and existing training methods and practices not effective KVIC is unable to face stiff competition from organized sector.
- Another area of concern is the high raw material to output ratio. For some units, the ratio is as high as three-fourth (ratio must be <25%) – implying high input prices, or dominance of production of lower count khadi items, or both.
- Low wage payment to workers. As per secondary statistics the annual earning of a worker could be anything between Rs 4800- Rs. 25000 in 1996-97.
- Stagnation in design inputs reduces market appeal.

Opportunities

- The world is moving towards natural and eco-friendly products. More and more people are becoming conscious of responsibility towards the environment and ecology and products like plastic, etc. are highly looked down upon and greater demand is being generated for biodegradable and eco-friendly products. The KVIC Sector produces a wide range of such products, which are having distinct eco-friendly characteristics.
- Marketing in itself is a significant factor to accelerate the economic development of the country. KVIC is all India organization with a production of about Rs. 5,000 crore of KVIC product, has immense potential to enter into global market. The present trend of international market is most favourable for KVIC Products, as most of the KVIC products are environmental friendly. "Near to nature", "back to basic" and "Green-is in" are new signs of global awareness, and hence, KVIC products enjoy a preferential market all over the Globe.
- Women struggling to enter the economic mainstream can use craft to become wage earners, provided they are shown how to get access to the market. Their inherent skills in embroidery, weaving, basketry etc. are a natural means to social and financial independence.
- The handicrafts sector is a home-based industry, which requires minimum of expenditure, infrastructure or training to set up. It uses existing skills and locally available materials. Inputs required can easily be provided and these are more in terms of product adaptation than expensive investment in energy, machinery or technology.
- Despite many adverse conditions, the traditional professional craftsman has a unique earning power that can be adapted to many new usages and markets. Existing skills and raw materials enable handcrafted products to be competitive in both price and aesthetics.
- Also, income generation through craft does not (and this is important in a rural society) disturb the cultural and social balance of either the home or the community.

Threats

- Mass-produced goods are steadily replacing utility items of daily use made by craftspeople, destroying the livelihood of many, without the concomitant capacity to absorb them into industry. A mind-set that restricts anything handcrafted to the Government Emporia, the Crafts Museum and an occasional craft bazaar, will only

- succeed in the increasing marginalisation of crafts and their producers in the absence of design inputs both for product development and brand identity promotion.
- The idea that craft should be purely decorative bric-a-brac, and that tourists and the urban elite are its only target customers is highly unfortunate. The current much-used terms 'exclusive' and 'ethnic' are singularly limiting and inappropriate when marketing skills and products with a potential producer base of 23 million! Public awareness of the cost-effectiveness, functionality and range of craft products is limited by their being sold only in exclusively 'crafty' outlets.
 - With ever-increasing competition from mill-made products and decreasing buying power of village communities due to prevailing economic conditions, artisans have lost their traditional rural markets and their position within the community. There is a swing against small-scale village industries and indigenous technologies in favour of macro industries and hi-tech mechanized production.
 - Traditional rural marketing infrastructures are being edged out by multinational corporations, supported by sophisticated marketing and advertising. The change in consumer buying trends and the entry of various new, aggressively promoted factory produced commodities into the rural and urban market, has meant that craft producers need more support than ever if they are to become viable and competitive. Craft products will have to be developed differently, marketed and promoted in innovative and varied ways, if they are to compete and survive.

9.7 KVIC's Contribution to this Sector

The KVIC implements several projects, both departmental and institutional, for technology development, transfer of technology, substitution of alternate raw materials, product diversification, quality control, and standardization and testing of tools, equipment and new machinery. For craftsmen involved in different handicrafts, the programmes include strengthening the existing RDTCs and Craft Institutes like Institute of Hand Printed Textiles at Jaipur, Institute of Carpet Technology at Bhadohi and Cane Development Institute at Agartala.

With a view to reducing technological obsolescence, improving competitiveness and raising the level of earnings of artisans and craftsmen engaged in this sector, several programmes are being implemented. Ten tool rooms and training centres and specialized institutes, three PPDCs, five PDTCs with five sub-centres, one service and training centre for electronics, four regional testing centres, 20 field testing stations, two footwear training centres, 27 SISIs, 31 branch institutes and 37 extension centres are providing technological assistance and other common facilities to the small scale sector. Besides, modernization programmes are run for 20 industries on all-India basis and for 38 industry groups on State concentration basis.

9.8 Scope For Improvement In KVIC's Contribution and Inputs

The khadi and village industries programme holds great potential for generating gainful employment opportunities for the rural poor, arresting migration of rural unskilled workers to urban areas and for promoting the strategy of sustainable development. It can also be a viable and effective social safety net to enable the poor to ward off the adverse impacts of structural adjustment and economic reforms on their well being. However, this potential cannot be realized without addressing some basic weaknesses with regard to the design and implementation of the programme and without making it fiscally sustainable.

Handicrafts Sector: The Key areas in handicrafts that could contribute towards a faster pace of rural industrialization are production and marketing. Schemes for training and

design development and for production and marketing assistance should be given encouragement. Considering the importance of this sector from the point of view of employment and exports it should provide an integrated development thrust to this sector with a view to enlarge the production base, thus enhancing the opportunities for employment and income through crafts as an economic activity and to give necessary inputs for quality improvement and effective marketing support both internal and overseas. Efforts should be made not only to preserve the traditional richness of the crafts but also to engage the hereditary skills of the crafts persons to suit modern requirements.

Expansion of untapped area: Despite the vast range of KVI products, in the handicrafts area KVIC has adopted very few crafts, even those in the fag end. The in-demand handicrafts product still remains in the private area dominance resulting into exploitation of artisans. There is a big scope to rope in these items and give the artisans their due margin.

Marketing and exports: In spite of the vast domestic and international market, marketing remains a problem area for rural handicrafts. Mass consumption labour intensive products are predominantly being marketed by the organized sector. There should be a greater emphasis on improving the quality and marketability of these products with consumer preference instead of merely depending on rebates and subsidies. Other institutions could be roped in with the idea to explore the scope of creating a brand name for the products.

In India it has been observed that private sector people carry out most of the exports of handicrafts. Direct exports from artisans, cooperatives and State Handicraft Development Corporations are negligible. The private exporter creates a demand in the handicraft sector which stimulates manufacturing activities but provides the artisan just enough to meet the cost of raw materials and other consumables and to sustain their living and manufacturing activities. Most of the exporters have become considerably rich while the condition of the artisans has remained unaltered.

There is a scope for other support institutions to take up exports of handicrafts in a big way. This would promote high volume-low value products to big importer-wholesalers and stores chain. To enter this segment, India would need to increase its capacity to mechanize, standardize, and supply raw materials to the artisans.

Self help groups or associations of artisans at the places of concentration of crafts need to be promoted and encouraged to take up export orders. This would benefit the artisans at the grassroots level and their exploitation would be reduced.

Providing Finances: To provide access to the capital market and to encourage modernization and technological up gradation, leading to expansion of employment opportunities, the artisans primary need is timely availability of credit. Financial institutions and government programmes could be linked with the craftsmen to help them go for innovations and fulfill business needs. The programmes of intensive development of KVI through area approach with tie-up with DRDA, TRYSEM and ongoing developmental programmes relating to weaker sections like Scheduled Castes, Scheduled Tribes and Women could be extended throughout the country. New craftsmen that other wise would be left behind could also join the stream.

MIS: The existing monitoring mechanism of KVIC is very weak, as it does not help generate realistic picture of employment, production, and number of functional units and utilization of government assistance. An urgent need to develop an appropriate MIS to get market information feedback from the private sector on the desired product mix, output

quality, demand pattern and respond to the changes by reorienting production pattern of the units.

Production and employment bear a direct functional relationship. The primary task of the Khadi Commission under the new regime should be to closely monitor the flows of input and output. This will automatically ensure generation of employment opportunities.

Research and Development: R & D in KVI sector should be strengthened by collaborating with research institutions with respected command areas of production finishing/packaging processes and development of new tools and implements. Training to artisans and technicians should be imparted more effectively than being done at present. Constant technology up gradation by assessment of needs of the units in response to changes in market demand should be promoted. A greater degree of awareness to produce goods and services conforming to national and international standards should be created with support from quality counseling and common testing facilities.

Promotion of entrepreneurs: To support first generation entrepreneurs through training with built in the curricula of vocational and other degree level courses. Additional employment opportunities would be generated through training of multi-disciplinary 'barefoot' managers to suit the special requirements of this sector. Involvement of traditional and reputed voluntary organizations should be encouraged.

9.9 Thrust Areas

It emerges from the above analysis that there is a need to focus on the following broad areas.

9.9.1 Manpower Development in Handicrafts:

There has been an alarming depletion in development of manpower in the area of Handicrafts. In the ancient times there were well-structured institutions to look after these areas. The following HRD systems were prevalent in ancient India that had brought the crafts to it the heights that we see today in spite of over 200 years of neglect.

- Hereditary system
- Apprentice system
- Guilds
- Schools
- Ashramas
- Learned assemblies

After independence the whole approach has been in realigning the whole system by bringing into focus the field of science and technology, and handicrafts have since then suffered. There is again a need to focus on setting up an institution, which will take care of the different aspects of HRD like imparting knowledge, vocational training, market orientation etc.

9.9.2 Upgradation of Design and Technology of Handicrafts

Instead of seeing handicrafts as a proper profession we tend to see it as a home grown vocation or a mere hobby. This is one of the vital reasons for the stalling of the sector. There is a need to convert the concept of 'craftsmen' to 'designers' and hands on engineers, and to promote them as entrepreneurs. The advancement in technology with design of

modern tools, engineering processes has to be linked up with their methods to standardize the products and to get them within international quality standards. Design catalogue and product manifests need to be created and upgraded as per the consumer and market needs.

9.9.3 Integrating rural crafts and infrastructure development

As of today the handicraft products have been mainly moving around products catering to household needs or as decorative items. Use of handicrafts in the infrastructure development is obsolete and rests in the hands of modern engineering fields. Steps should be taken to integrate rural crafts with infrastructure development; looking at its immense potential, this would be a big thrust forward for the sector.

9.9.4 Employment generation:

To help more people join this sector, proper training and financing support systems need to be formulated. Backward artisans needs to be linked up with the Government programmes like JRY, SITRA, TRYSEM etc. and linking them with financial institutions like banks to help them avail timely credit in business.

Out of these thrust areas following time bound mission projects have been carved out to demonstrate the efficacy of NIRI in bringing about a step increase in the quality and marketability of select items.

9.10 Mission Project 1

Up gradation of Systems for Cane, Bamboo & Wrought Iron Furniture

Mission statement: *To develop state of art Cane and Bamboo & wrought iron furnitures, set quality standards, design of new product range in this area and bring about technology up gradation of the tools and processes used for manufacturing the same.*

a) Introduction to the mission statement:

The use of cane and bamboo for making different handicraft products has gained much popularity for its bio-renewable growth property, as a good replacement for timber (felling of which results in depletion of natural resources). Thus in Handicrafts section, use and promotion of this material is termed as 'Eco-friendly'. This material is available in abundance in our country, especially in the North-eastern part of India and millions of artisans have given form to this tribal art and are involved in making products out of cane and Bamboo (mostly furnitures) as a source of livelihood. There is a huge national and international market for the cane and bamboo furnitures. Considering the above criteria there is an immense potential to be tapped in this sector. Although some of the South Asian countries have well developed technologies and India has also plunged into it, the technology in this sector is still highly localized. In the numerous processes of manufacturing of cane and Bamboo products simple hand tools are used. These have been passed over the generations and have undergone little modifications. Even the processes involved in finishing the product, in some regions, are highly primitive. There is a scope for technology up gradation in the area of tool design, process improvement and product design in the furniture range to give the necessary thrust to this sector.

On the other hand wrought Iron furnitures have recently become popular with a sturdy and different look. It is again an eco-friendly material, which is light, cost effective and lasts for the lifetime. The property that it can be drawn into thinnest of rods and sheets gives it a big advantage. It has an upcoming market not only in homes, gardens but in offices as well. Although it has not been taken up by a sizable number of rural artisans due to lack of proper training, but its potential can definitely be explored.

b) Objectives:

- Designing tools for the easy processing of cane and bamboo to manufacture furniture products.
- Development of Quality standards for manufacture of cane bamboo wrought Iron furniture products.
- Development of detailed design manifest of export quality products.

c) Expected Outcome

Designing of tools for the easy processing of Cane and Bamboo to manufacture furniture products.

It is much easier to craft Bamboo with simple hand tools than timber but due to some properties of Cane and Bamboo appropriate tools have to be made available to the artisans. Due to high Silica content of bamboo it is highly abrasive by nature and tools wear out easily. Therefore the tool material needs to be chosen accordingly. In Bamboo there is a

difference in the density of its grain structure, which needs a particular mode of cutting action, and the tool has to be designed accordingly. In India for the basic processes of cutting in Cane and Bamboo, still robust Knives are used instead of well designed saw. For furniture making care has to be taken that the mesh are not split, nodes do not have bulges which are well processed with curved tools. But the practice here is of using heavy knives. Thus keeping in mind the different properties of cane and bamboo and the processes involved in furniture design a tool range needs to be designed.

At present it is a big challenge in the wrought iron furniture section to suit the manufacturing requirements in the rural context with limited supply of electricity etc. The extent of adoption of this sector across rural area is less. Thus mechanisms need to be evolved to allow the rural artisans to practice it.

The expected outcome is as follows:

- Save cost
- Save Time and drudgery on part of the artisans
- Pathway for new technology
- Reduce wastage
- Resulting in quality products
- Improve living standards of the artisans

Development of Quality standards for manufacture of Cane Bamboo and Wrought Iron furniture products

There is no uniformity in the processes involved in the cane and bamboo furniture manufacturing followed in different parts of India. Some of them are still highly primitive and based on availability of materials in the local area. Thus quality standards in accordance with the ISO 9000 need to be developed for the above material and product range to make its place in the global market.

Processes involving wrought iron furniture are evolving with time. The setting of quality standards in the process can take this section to its great heights.

The expected outcome is as follows:

- Give rise to products, which can compete with the national and international market
- Better finish.
- Increased durability.
- Decreased Processing time.

Development of detailed product design manifests for export quality products

The furniture range in cane, bamboo and wrought iron has got a place in a niche market section and holds a great future. The following are the areas where the inputs are needed.

- Products designed keeping in mind customers changing needs.
- Catalogues of design to improve marketability.

9.11 Mission Project –2

Craft and Rural Engineering

Development of HRD and Empowerment Systems for Rural crafts and Engineering

Mission Statement: *Human Resource Development in the Handicraft and Rural Engineering through Formal Education System*

a) Introduction to the Mission Statement:

With no formal education and HRD system in place, the handicrafts sector is facing the stalling effect with no transfer of skills on a broader basis, no design up gradation, no process awareness about the developing science and primitive processes still rule the market. Since independence hardly any effort has been there to give professional inputs to this sector, which is one of the forerunners in providing foreign exchange to the country, and is now facing demise in the absence of appropriate education systems. Thus the process of development of manpower in this sector through a formal education system would enhance the standards and improve the scope of contribution of rural areas to national development.

b) Objectives

- Develop curriculum for different levels of craft and design education.
- Development of mechanisms for rural infrastructure development through craftsmen and rural engineers.
- Development of mechanisms for marketing, brand image development and brand image promotion for facilitating sales

c) Expected Outcome

- HRD programmes for development of crafts and empowering craftsmen
- Craftsmen playing a role in teaching process
- Designed teaching programmes for certificate, diploma and degree level
- Forecasting potential for new and emerging crafts and developing strategies for it.
- Finding out the scope for handicrafts in rural infrastructure.
- Mechanisms for improving marketing strategies and brand promotion.

d) Strategy of implementation

Development of curriculum for different levels of craft and design education

It is proposed that in the first phase a curriculum development Center for craft and design education be setup.

- To record working of master craftsmen, hold workshops of design educationalist to develop curriculum for different levels of craft and design education. Twenty sets of detailed recordings of master craftsmen will be made in 2 years.
- To hold interdisciplinary workshops of Indian & foreign craftsmen. 8 workshops will be conducted over a period of 2 years.

- Approaches will be worked out to empower the master craftsmen as teachers and as groups for setting up of interdisciplinary craft centers. Workshops will be conducted to determine approaches.
- Forecasting the potential of new and emerging crafts and development of strategies for the same. A team of two professionals will make a detailed report on 5 emerging crafts.
- Monographs will be developed detailing the methodology of introduction of programmes on crafts and how craftsmen can play an important role in the teaching process. The teaching programmes will be so designed so that equivalence with existing ITI Certificate, Diploma and degree levels programme does not pose any difficulty without sacrificing the creative and innovative zeal.

Development of Strategy for Rural Infrastructure Development through Craftsmen and Rural Engineers

- A group will be set up for the same and a detailed system study done using four villages. One district Wardha or near Wardha will be taken up for this study.

Development of Mechanisms for Marketing, Brand Image Development and Brand Image Promotion for Facilitating Sales

- A group of graphic designers, advertisers & marketing experts will be set up to develop Khadi brands both for textiles and other products like soap honey, cosmetics, etc.

9.12 Role of NIRI- Regular Activities

9.12.1 Strategy for Implementation

NIRI should act as facilitator for the development of human resources in crafts and promoting crafts as a vehicle for rural industrialization.

- Implementation of these activities should recognize both traditional crafts and new and emerging crafts. Many new crafts have emerged without any formal patronage on the part of government. The emergence of new crafts is inevitable as creative people must always see the potentialities and respond to the inherent challenges.
- Avoid differentiating crafts and engineering and see the two as one continuum. The modern engineering education is based on analytical science, it is also possible to have an education system which is synthesis based, empirically determined and where creativity, innovation, design and hands on experience is the key of success.
- Recognize that in crafts, the scientific understanding of material processes, product functions and emotional needs of user and culture are highly internalized by the craftsman engineer and he can create an optimal design by manipulating scores of variables in one go. His method of working is through manipulations of patterns and is principally right brained.
- Enable flowering of the potential of craftsmen to become teachers and impart education to others.
- Recognizes the importance of formal diplomas, degrees to promote the areas of art, craft and design in India, as has been done in the west.
- Give due importance to the evaluation and development of a plan of up gradation of knowledge, skills, creativity, innovation, quality, value and productivity. Known experts from industry/academics can be teamed up with craftsmen to enhance the level '0'(level

of the year 2001, the year of implementation) to level 1(level '1' may indicate 10% rise in productivity, quality etc. after a year) with an increase of 10% of each cell within a stipulated time period (of say one year). These cells could be individuals, cooperatives, or industries

- Chalk out a plan of action for up gradation of each cell till these reach level '10' (in say 10 years) and further on and on. Cells with a higher rating will be used to upgrade cells with lower rating by providing suitable level of interaction and incentives. Level '10' indicates 100% rise in productivity, consistency and top most quality worldwide as compared to level '0' of the year 2001(or which ever is the year of implementation).
- The modules for up gradation from level '0' should develop in a planned and systematic way and pass on to the rural areas of the country.
- Sustained effort by NIRI and its collaborating institutions is vital for progress of rural industries for a quantum leap within 10 years.
- Detailed videotapes of craftsmen working on specific products from beginning to end. Hold workshops of educationists to develop curriculum for different levels of craft and design education.
- To hold interdisciplinary workshops of Indian & foreign craftsmen.
- Approaches will be worked out as to how the master craftsmen can be empowered as teachers and as groups for setting up of interdisciplinary craft centers.
- Forecasting potential of new and emerging crafts and development of strategies for the same.
- Development of curriculum for different levels of education viz. certificate courses, diploma level courses, and degree programmes which are on equivalence with other existing programme in these categories.
- Short-term quality enhancement program with better tools, better designs and awareness of defects.

9.12.2 Manifests for quality assurance

A group will be setup that will prepare detailed manifests for setting up industries for producing export quality crafts. 10 products will be taken up and managed by 2 professionals. These would include products with a plurality of material and processes involved in manufacturing. This will be taken up in the following prioritized areas.

- Glass, ceramic and pottery
- Wood, cane, bamboo & wrought iron crafts
- Tools and implements for artisans
- Domestic appliances and communication products

9.12.3 Integrating rural crafts and infrastructure development

- A group will be set up for the same, and a detailed system study done, using adjoining villages around a district. One district near Wardha will be taken up for this study.

9.13 Manpower Requirement

Position	No.
Master Craftsman	4
Design Scientist	2
Video Developers	1
Apprentice Helpers	4

9.13.1 Qualifications

Video Developers

M. Des. Visual Communication and basic degree in fine arts / engineering / architects

Design Scientist / Curriculum Developers

M. Des. Industrial Design / Master in fine Arts, experience in curriculum development.

Facility Required

Facility	Cost
Laboratory Requirement Working benches for 4 Master craftsmen together with their equipment & raw material Average cost Rs. 2,00,000/= per master craftsmen	Rs. 8.0 lakh
Curriculum Development Center Video Recording Suites, Printed Documentation stations, Craft Studios 2 Nos.	Rs. 8.0 lakhs
Central Workshops A central workshop will be set up for fabrication and integration of precision contemporary engineering into crafts	
Electronics Oscilloscope, signal generator, power supply etc	Rs. 10 lakhs
Mechanical Lathe, milling machine, sheet cutting, TIG welding etc	Rs. 20 lakhs
Total	Rs. 45 lakhs

Space

Central workshop	250 sq mtr
Curriculum Development Center	100 sq mtr
Craft Studios	200 sq mtr
Total	550 sq mtr.

9.14 Link Institutions

9.14.1 All India Handicrafts Board

The All India Handicrafts Board was originally set up in 1952 to advise the Government on problems of handicrafts and to suggest measures for improvement and development. The Board was also required to study technical, marketing, financial, organizational, artistic and other aspects of handicrafts and to formulate plans on these lines. Its function also included advice and assistance to the state Governments for planning and executing schemes for the development of handicrafts.

9.14.2 State and Union Territories

Each State and Union Territory has a department looking after the development and promotion of handicrafts. Many states including, Arunachal Pradesh, Daman, Diu, Delhi and Goa have public sector corporations for marketing handicraft products. A few state corporations dealing with small-scale industries and other products have taken up marketing and export promotion of handicrafts. Besides taking up direct exports, these corporations are also expected to guide and help private exporters.

9.14.3 Central Corporations/Bodies

1. The Handicrafts and Handlooms Export Corporation of India (HHEC) is a subsidiary of the State Trading Corporation of India, and came into existence in June 1962. The corporation's policy in the field of direct exports is designed to develop new markets and expand traditional ones and to introduce new products suitable to the needs of the consumers abroad. The Corporation undertakes and executes wholesale orders, conducts retail sale operations through retail shops abroad, and participates and sells in major exhibitions of the world. HHEC also helps private exporters by affiliating them as business associates. It undertakes a number of publicity and promotional measures for the export of handicrafts and handloom products.
2. The Central Cottage Industries Corporation Pvt. Ltd. is a registered society, which had taken over from the Indian Cooperative Union. It runs the Central Cottage Industries Emporium (CCIE) at Janpath, New Delhi the premier sales organization in Indian handicrafts. The CCIE has branches at Bombay, Calcutta, Madras and Jaipur. CCIE has grown by leaps and bounds in the last few years.
3. The All India Handloom Fabrics Marketing Cooperative Society Ltd., (56-58 Mittal Chambers, 5th Floor, Nariman Point, Bombay, India), is sponsored and supported by the All India Handloom Board. This Cooperative runs handloom houses in Bombay, Delhi, Madras, Calcutta, Ahmedabad, Chandigarh, Hyderabad, Ernakulam, Vadodara and Vishakapatnam. It also has branches abroad in Lagos, Singapore, Kuala Lumpur, New York, Mauritius and Hamburg.

9.14.4 All India Associations

India has All India Organizations for three of its most popular handicrafts items; hand printed textiles, carpets and zari. These Associations serve as a platform for consultations among the manufacturers and exporters on one hand and the Handicrafts Board on the other. The Board uses these Associations to disseminate information useful to crafts.

1. All India Carpets Manufacturers Association; Post Box No. 63, Bhadohi, District Varanasi, Uttar Pradesh, India.
2. All India Federation of Zari Industry; Safe Deposit Chambers, Surat, Gujarat, India.
3. All India Textile Hand printing Industries Federation, 1106 Prasad Chambers, Swadeshi Mill Estate, Mumbai, India.

9.14.5 Social - Voluntary Organizations

A number of social organizations including non-profit making registered societies and cooperatives support the field of handicrafts. Their principal aim is to provide work to the poor craftsmen. Many of them run training cum production centres, while others are concerned with marketing. Certain voluntary organizations are running Regional Handicrafts Training Institutes for Women, under the All India Handicrafts Board.

1. Handicrafts Teacher's Training College (The Arts and Crafts Society), Adarsh Nagar, Worli, Bombay, India.
2. Regional Training Institute of Handicrafts (Bharat Sevak Samaj), Dharwar, Maharashtra, India.
3. Regional Handicrafts Training Institute for Women, (Andhra Mahila Sabha) Vidya Nagar, University Road, Hyderabad, India.
4. Regional Handicrafts Training Institute for Women, (Karma Kutir) 32 Ballygunge Palace, Calcutta, Bengal, India.

9.14.6 Export Promotion

1. The All India Handicrafts Board: (West Block VII, R.K. Puram, New Delhi-110022). This board acts as a Commodity Board for handicrafts and has an Export Section with a Deputy Director (Exports) in charge. The Board collects and disseminates information, arranges exhibitions, sponsors sales and study teams, and invites foreign buyers. The regional offices of the Board handle registration and process requests for any specific export promotion measures.
2. The Gem and Jewellery Export Promotion Council: (D-15, Commerce Centre, 4th Floor, Tardeo Road, Bombay- 400001) The council aims at providing facilities and incentives regarding the exports of pearls, precious and semiprecious stones, diamonds and synthetic stones; to assist in improving and modernizing of the jewellery craft of the country.
3. The Handloom Export Promotion Council: (123, Mount Road, Madras- 600006) It superintends the export promotion of Indian Handlooms in the country.
4. The Handicrafts and Handlooms Export Corporation of India:(Jawahar Vyapar Bhavan, Annex-I, Tolstoy Marg, New Delhi 110001). A government of India undertaking, it supplements the export efforts of the private sector, besides exporting directly. It undertakes various export promotional and developmental measures such as publicity and Indian participation in foreign exhibitions, and invites reputed

- designers for advice and assistance. It also has branches, showrooms and warehousing depots abroad.
5. The Indian Institute of Foreign Trade: (Ashoka Bhavan, 93 Nehru Place, New Delhi-110024). Besides training courses for export executives, this Institute carries out surveys of various markets and publishes them.
 6. The Trade Development Authority of India: (Bank of Baroda Building, 16 Parliament Street, and New Delhi-110001). Handicrafts and garments are included in its trade promotion activities among other items. It also has offices in New York, Frankfurt and Tokyo. Besides inviting buyers, it arranges buyer- seller meets in selected markets.
 7. The Export Credit Guarantee Corporation: (Head office: Express Towers, 10th Floor, Nariman Point, Bombay-400001). It provides export credit intelligence and issues, covers against risks. It also has branches in Delhi, Calcutta, Chennai and Cochin.
 8. The Export Inspection Council: (14/1-B Erza Steet, World Trade Centre, Calcutta-700001). This Council has especially been set up to ensure the quality control and Pre-shipment Act. The Council has also set up a number of Export Inspection Agencies.
 9. The Federation of Indian Export Organization: (Allahabad Bank Building, 17 Parliament Street, New Delhi-110001). It is a non-profit servicing institution, set up jointly by the Government, industry and trade. FIEO is an apex forum coordinating and supplementing the institutions. It also gives special attention to the export promotional activities of small sector including crafts.
 10. The Trade Authority of India: (Pragati Maidan, New Delhi-110001) The TFA is an autonomous organization established by the Government of India as a company. Started in March 1977 it has today become a highly effective organization giving a new orientation to the country's trade promotional activities. It unifies policy direction, controls and implements programmes of India's participation in fairs and exhibitions, both in India and abroad. Handicrafts continue to receive the special attention of the TFA.

9.14.7 Foreign Imports Council

Many of the developed countries are trying to help others, specially the third world countries. There exist special cell/ organizations, which promote trade imports from other countries to theirs. Most of these offer some or most of the following services:

1. Statistical information about their countries and markets.
2. Information on sale opportunities.
3. Information on import requirements and procedures.
4. Information on marketing techniques and business practices.
5. Listing of wholesalers, agents, importers, distributors etc.
6. Arrangements for contracts when visiting the market.
7. Trade fairs and exhibition assistance.
8. Publication concerning the markets.
9. Names of buyers seeking suppliers of a special product in specific quantities.
10. Training programs.
11. Free advertising of products in weekly trade information bulletins; also circulation of product offers to importers.
12. Seminars on trade promotion.
13. Establishment of regional / national trade promotion centres and show rooms for product display.
14. Product test centre.

9.14.8 Private Handicrafts Promotion Association

1. Bengal Bratachari Society
191/1, Bepin Behari Ganguly Street, Calcutta 700 012, West Bengal
2. The Indian National Trust for Arts and Cultural Heritage (INTACH)
71, Lodi Estate, New Delhi 110 003; Phone - 4631818, 4632267, 4632269

9.14.9 Training Centres

1. Government Schools of Art
2. Ashutosh Museum of Indian Art
Centenary Building, Calcutta University, College Street, Calcutta-700073, W B
3. College of Arts
20 - 22, Tilak Marg, New Delhi-110011; Phone - 3383612
4. Himachal Academy of Arts, Culture and Languages
Himras Bhawan, Cart Road Shimla 171 001 Himachal Pradesh; Phone - 6330;
Gram: HIMACADEMY
5. Indira Gandhi National Centre for the Arts
Central Vistas, Janpath, New Delhi 110001; Phone-3389246, 3389539, 3389045,
3384901; Telex - 03163443; Fax - 91-11-381139
6. The Jammu & Kashmir Academy of Art, Culture & Languages
Lal Mandi, Srinagar -190001, Jammu & Kashmir; Phone - 73425, 74558
7. Kalakshetra Foundation, (An International Centre for Arts)
Tiruvanmiyur, Madras-600041, T.N.; Ph-411169, 411836; Telegraph Kalakshetra
8. Kalidasa Akademi
University Road, Ujjain 456010; Phone - 51843, 50487, Kerala
9. Shri. J. J. School of Art
78, Dr. D.N. Road, Fort, Mumbai 400 001, Maharashtra; Phone - 2621652
10. Private Schools of Art
11. All India Fine Arts and Crafts Society
Rafi Marg, New Delhi 110 001; Phone - 3711315, 3323529
12. Artists Handicrafts Association
Cholamandal Artists Village, Indambakkam, Madras-600041, TamilNadu; Ph:
412892
13. Birla Academy of Art and Culture
108-109, Southern Avenue, Calcutta-700029, West Bengal; Phone - 467843, 469802

Chapter 10

Management And Systems

10.1 Introduction

A wholesome growth of rural industries is possible only by pursuing a holistic vision and simultaneously harnessing the advances in science, technology, and management skills, and blending them with our traditional wisdom and the unique socio-cultural ethos of our country.

Even though there is availability of traditional knowledge base and skills in the rural areas, there is a serious deficiency in management of resources to convert the available knowledge and skills into commercialisable products. The requirements of information systems, marketing and finance are central for the success of rural industrialization programmes. Proper need identification, innovation and utilization of modern S&T is essential.

The issues of sustainability and indigenous capability building in design need to be considered. Services are equally important element of an economy and are inherently local, however elements such as quality standards, common brand, mass purchasing to economize on raw materials, and training can be centralized. Marketing (customer awareness, brand, access to distribution channels and right price realization,) seems to be the weakest area for village industries. NIRI is expected to provide support on these issues.

It is envisaged that Management and Systems group of NIRI will be engaged in pursuing the following activities:

- Analyze the present model of industrialization and understand why KVIC is not able to effectively compete in various areas.
- Conduct HRD programs for different categories of personnel
- Promote and foster rural entrepreneurship
- Suggest holistic measures of success of rural industrialization program
- Develop an appropriate model for rural financing
- Document and disseminate success stories of experiments such as
 - Lijjat Papad
 - Amul
 - Sulabh International
 - Mysore Sandal Soap
- Prepare a database of various NGOs and other organizations interested in rural industrialization
- Develop an MIS/GIS for rural industrialization
- Develop an appropriate model and policy for marketing, distribution, and advertising for enhancing the market for rural based products

10.2 Review Of Current Status

A brief review and SWOT analysis of typical KVIC sponsored rural industries is presented below.

Table 10.1: Key KVIC Statistics (1998-99)

Parameter	Value
Production	Rs 5112.37 Crores
Sales	Rs 5601.01 Crores
Export	Rs 24.69 Crores
Employment	58.29 Lakh persons

It is interesting to note that KVIC provides employment to a large number of persons spread across a number of villages.

The KVIC has broadly grouped various village industries under seven heads for the purpose of implementation of various programmes.

- Mineral based
- Forest based
- Agro based and food
- Polymer and Chemical based
- Engineering and Non-conventional Energy based
- Textile based, and
- Service based.

Table 10.2 gives typical industries under each category and their sales for the year 1998-99.

Table 10.2 Sales statistics of Typical KVIC Industries

Industry	Typical Break up	Sales (In Rs Crores)
Mineral Based	Cottage Pottery, Lime	769.05
Forest Based	Cottage match/agarbatti, handmade paper, Shellac, Bamboo/Cane, Katha etc	392.28
Agro Based and Food	Beekeeping, Ghani Oil, Processing of Cereal & Pulses, Fiber	1890.78
Polymer & Chemical Based	Cottage Soap, Leather, Rubber goods, Polymer	1162.54
Engineering & Non-conventional Energy	Bio-gas, Carpentry/ Blacksmithing, Household, Electronics	620.0
Textiles	Polyvastra, Textiles	118.53
Service Industry	Laundry, Plumbing, Type of vulcanizing, Masonry	-
Total Sales (Rs Crores)		4953.18

It is seen that Agro based and Food industry (about 38 % of total sales) occupies a major share of the KVIC followed by the Polymer based (23 % of total sales) and Mineral based industry (15 % of sales).

Some desirable features of the tiny rural industries:

- Openness to market.
- Inexpensive labor.
- Since owner is entrepreneur, he can combine both managerial and technical roles.
- 'Management of change' is easy to implement.
- Technology transfer is easy.
- Flat organizational structure.
- Provides a vital support to large-scale industry.
- It caters as a catalyst in regional development by removing the industrial imbalance.

However, a close look also reveals that there are a number of weaknesses:

- Poor quality consciousness.
- Inadequate financial strength.
- Unprofessional work culture.
- Inadequate trained manpower.
- Lack of proper management orientation.
- Inadequate R&D support.

It is easy to appreciate that:

- There is a need to review the performance of KVIC from productivity point of view. At present, the productivity of KVIC sector is dismally low (may be around 1/15th that of the organized sector!). A scientific study on layout, material and financial productivity needs to be done. It is seen that many of these tiny industries do not employ scientific techniques for managing productivity.
- Issues such as managing inventory, managing the shop floor, concern for quality etc need to be given serious attention.
- There is a lack of proper management orientation.
- Though there is a vast potential available for export, this is not being tapped properly. The export occupies less than 0.5 % of sales.

10.3 SWOT Analysis

In order to understand the existing marketing, finance and management functions of a typical KVIC unit, a SWOT analysis is done. The basic objective of this exercise is to understand the strengths and weaknesses of the existing set up and to exploit the opportunities that may exist. The competitiveness of developed countries stems largely from the strength of SMEs. Information technology has increasingly gained attention for its potential contribution to productivity improvement in the group of companies. Enhancing the capabilities of SMEs along with the tiny sector through integrating IT, therefore, is of crucial importance for facing the hyper-competition.

The management should view computerization as a means to add more value to services and products rather than to cut manpower costs. Moreover, cost cutting is not the only way to compete. By providing more value to customers and clients through IT applications, they may reinforce their positions in the market.

Strengths

- Huge rural base
- Goodwill about products
- Availability of Skilled 'Kari gars'
- Traditional knowledge base
- Quality products (Lijjat, Mysore soaps etc.)
- Flexibility in operation of tiny industry

Weaknesses

- Poor marketing and advertising of products
- Absence of cost consciousness about product/service
- Improper pricing
- Inadequate infrastructure
- Improper distribution system owing to poor logistics
- Lack of professionalism
- Lack of coordination between production, marketing and distribution
- Low morale of employees/karigars
- Lack of proper MIS/GIS and Absence of use of IT
- Poor documentation
- Lack of appreciation of modern management concepts
- Inadequate training to staff in attitudes, and skills
- Lack of customer focus in major KVIC outlets
- Although there are a number of agencies and institutions available for Small and Medium Enterprises, such institutionalized support is not available for KVI sector.
- Limited financial capacity for pursuing IT.

Opportunities

- Huge rural market services (such as transportation, construction, education, health care) still untapped
- Rapidly growing and potentially prosperous urban markets
- Export potential for certain class of products such as textile, herbal products, ayurvedic medicines etc.

Threats

- Onslaught of multinationals
- Depletion of skills due to non-transmission of knowledge from generation to generation
- Fast changing markets and competition.
- Pure commercial interests might take over whatever little role space KVI sector has
- Competition from other countries (such as China, Korea, Japan etc.) that have set up facilities for mass manufacturing
- The pace of IT technological change is so rapid that many tiny units may have difficulties in catching up with new equipment

Thrust Areas Identified

Based on the above SWOT analysis of the KVI sector, the following thrust areas for NIRI may be identified,

- **Special HRD programmes:** Currently the organized sector has access to a variety of such programmes. However the tiny sector may not have such access. We feel that KVIC in general and tiny sector in particular, needs to be sensitized towards such special programmes. These programmes may include themes such as: quality, productivity, man-machine studies, good housekeeping, rural entrepreneurship, finance, cooperatives etc. It is envisaged that NIRI will play a catalytic role in conducting such programmes.
- **Marketing Strategies:** It is felt that as of now, there is no well planned marketing strategy for VI products. The sales and distribution link is also weak. In order to compete with the formal sector, it is imperative that a formal strategy be developed which will dwell on how to establish the brand name and equity for KVI sector products and channellise the products into the market.
- **Quality and Productivity:** As of now these issues are not given the importance they deserve. We feel that for right market penetration, KVI products must have good quality and the entire sector must tackle seriously the issue of enhancing the productivity levels. NIRI may conduct several comparative studies (for example: comparison of productivity of formal vs informal sector, productivity in other developing countries, in similar sectors) for benchmarking purposes. *At present there is not much awareness about quality, and allied issues.* Though there is a vast Science, Technology and Management (S, T & M) expertise available for organized sector, such knowledge base is not available for the tiny sector. Hence NIRI must venture into development of appropriate quality systems and strategies to satisfy customer. This will require a focus on customer relationship.

In this context, it is envisaged that NIRI will

- Conduct specialized HRD programmes
- Suggest how to enhance productivity
- Develop mechanisms to impress the importance of quality amongst industry
- Conduct studies on competitiveness of Tiny industries

10.4 Role And Mission Of The 'Management & Systems' Group

The mission of the group is spelt out as follows:

To provide professional management approach and develop appropriate systems in marketing, finance and MIS to support the cause of rural industrialization. The group will also help in developing management systems & procedures for smooth functioning of NIRI.

In order to realize this mission, the group is expected to:

- Assist NIRI in finalizing its mandate and domain of activities of NIRI.
- Suggest the infrastructure needed for NIRI: type of facilities, equipment, machinery
- Design training programs for NIRI staff as well as for outside participants

- Select a prototype product and suggest the marketing strategy, infrastructure needed for this product.
- Extend help in collection and compilation of case studies
- Suggest an architecture for the MIS / GIS
- Help in deciding the manpower requirements of NIRI

The Management & Systems group of NIRI should act as a facilitator and as a support service to other groups. The role of the group needs to be appreciated as a catalyst in propagating the alternative model of development both at the institute level and at the generic level.

The challenge lies in developing an appropriate model, which will foster the cause of the rural industrialization and promote a holistic and all round development of rural India.

10.5 Important Considerations in Various Functional Areas

Based on the brainstorming workshop held at IIT Delhi during 20-21 July 2001, following considerations emerged relevant to various functional areas.

MIS

- MIS is in an evolving concept. The MIS should be in place before the institute starts. The architecture must include aspects such as: basic purpose of MIS, mechanisms for collection of data, monitoring and corrective and feedback mechanisms etc. The MIS must be organic and need based.
- MIS should cater to the needs of; Internal operations, Customers, Suppliers, Karigars and other stakeholders in the system.
- The proposed information system may be built after understanding the existing information system in place.
- To contain the software development costs, institute should adopt open-systems architecture for MIS. The software should be compatible with the regional languages.
- MIS must also capture the people dimension. The knowledge about community, individual karigars, and their skill levels, networking with others etc. must also be captured. This will also help in marketing.
- MIS should facilitate decentralized decision-making.
- MIS should also guide a rural entrepreneur on: where to locate a unit, what type of material is available, sources of finance, directory of products etc. Information kiosks should be made available.
- There is an open architecture available for GIS. This should be exploited for developing the artisans' network.

The MIS / GIS being envisaged for this sector would greatly benefit from the inclusion of qualitative, human data within its scope. Towards this purpose, it is proposed that the NIRI project should:

- Access the vast 'Peoples of India' data-base, available with the Anthropological Survey of India (MHRD, Department of Culture)
- Facilitate the migration of this data-base from source to the IIT-D
- Analyze the database for research solutions to the problems of development and human resource capital building in the artisan and craft sector.

A feature of the 'People of India' data-base which uniquely qualifies it for NIRI's documentary and development task is the quality of its data which:

- Cover the entire human surface of India with special emphasis on rural and marginalised groups.
- Provide detailed district-level information not available elsewhere
- Demonstrate patterns of occupational diversification amongst artisan groups
- Document the socio-economic context within which community knowledge systems and rural skills and technologies operate; and
- Demonstrate rural-urban community linkages over time and space.

Human Resource

- Formation of Human Capital is an important issue. The institute must dwell on this. The HRD programmes must be evolved to take care of this.
- There is a pressing need to change the mindset of people. The HRD programmes should be designed to incorporate these aspects.
- KVIC should also be given orientation on modern management concepts.
- HRD programmes should also include:
 - Modern Methods of Management
 - Financing, Rural Entrepreneurship
 - MIS
 - Quality Issues, Production Management
 - Workplace Improvements and Good Housekeeping Practices
 - Motivation, work ethos, Value system
 - Empowerment
 - Customer Satisfaction
 - Sustainable manufacturing
 - Affordable Information Technology Solutions for Tiny Industry
 - Marketing, Sales, and After Sales Service
 - Insights into Cooperative Movement
 - Waste management, recycling etc.
- HRD enabling environment should be provided.

Marketing

- Currently there is no focus on marketing for KVIC products. The Unique Selling Proposal (USP) for Khadi and Village Products must be identified and accordingly brand positioning must be done.
- Marketing strategy should be developed for KVIC as a whole and for an individual product produced by a karigar.
- MIS / GIS must be utilized for marketing the products.
- Marketing strategy must give regards to: Product, Pricing, Place, Promotion etc.
- For marketing, the entire supply chain must be looked at. MIS must also cater to these needs.
- NIRI must evolve 2-3 innovative distribution strategies for pushing the products. Modern concepts such as Network Marketing could be explored. The LIC model could also be studied for evolving incentive schemes.
- We must be compatible to the model of co-evolving that is both the so called mainstream products and KVI sector product should co-exist and develop their niche markets.
- The concept of flexible pricing can be introduced for certain class of products.

- Outlets such as petrol pumps can be exploited to market certain set of products.

10.6 Mission Projects

In line with the analysis done, and the proposed mandate of NIRI, the following mission projects are identified for this group. The specific deliverables are also highlighted for each of these programmes.

Develop Case Studies on Cooperative Management Practices to be launched in Dec '01

The model of Amul or Lijjat papad is a demonstration of success through cooperative movement employing the concept of trusteeship implicit in the Gandhian model of industrialization. NIRI must study, document, and disseminate such information and try to implement the same. The mission project will identify a few case studies and document the same.

a) Objectives

- To compile and document successful case studies about VI /Cooperative movement
- To use this material as a resource material for conducting training programmes
- To use these cases as a platform to spread awareness about VI sector.

b) Methodology

The cases will be developed by closely interacting with the successful VI. These cases will be disseminated through web, books and publicity material.

c) Expected Deliverables and Its Impact

NIRI is expected to document about 3 to 4 case studies every year. It is expected that through these cases, rural entrepreneurs will be encouraged about this model of industrialization. These cases will also serve a catalytic role in spreading awareness about KVIC amongst institutions such as IITS, RECs management institutes etc. These cases will also help in consolidating the model of cooperative movement.

Development of MIS / GIS (to be launched from Jan 2002)

At present, as revealed by the SWOT analysis, there is no strategic focus on proper MIS or GIS. Because of lack of proper information system, the marketing, distribution and production functions are isolated. There is no deliberate information strategy as such.

In light of this, we feel that a mission project on developing an MIS/GIS will help in giving a professional outlook to the organization. Following are the objectives and methodology to be adopted for this purpose.

a) Objectives

- To develop an MIS for KVI sector products
- To develop a GIS which will facilitate the marketing function

b) Methodology

The proposed system will be developed by closely interacting with KVIC. A state-of-the-art open system architecture will be adopted.

c) Expected Deliverables and Its Impact

NIRI is expected to develop the MIS/GIS. The expected duration for this project will be about 2 years. It is expected that through these, an information model will be developed emphasizing on integration of various business functions.

As an internal mission project, we also envisage to build a Management Information System for proper working of NIRI. The group will suggest the design and the architecture of this system.

Brand promotion, Image development & Marketing Strategies (to be launched from Mar 2002)

At present, as revealed by the SWOT analysis, there is no strategic focus on marketing. The marketing function is not executed in a professional manner. There is no deliberate distribution strategy, no conscious effort for brand promotion and establishing the brand equity of 'khadi'. In light of this, we feel that a mission project on developing the brand strategy, may be with reference to a typical brand ('Sarvodaya') be worked out. It must be borne in mind that VI products must be able to compete and create their niche segments in society based on the quality and service. Following are the objectives and methodology to be adopted for this purpose.

a) Objectives

- To develop a marketing strategy for an identified prototype product
- To develop a generic framework for marketing based on this strategy
- To use this strategy as a platform to spread awareness about VI sector.

b) Methodology

The strategy will be developed by closely interacting with KVIC. A product such as a soap, or a herbal based product may be identified.

c) Expected Deliverables and Its Impact

NIRI is expected to develop the strategy for 1 or 2 products every year. It is expected that through these, a marketing model will be developed emphasizing on brand promotion, distribution and advertising which will try to eliminate the existing weaknesses in KVIC.

10.7 Institutions / NGOs with Whom Networking Can Be Established

There are a number of institutions and NGOs working in this area. The group feels that a networking strategy needs to be evolved to share and learn from their experiences. Following are some of the institutions with which networking can be established.

- Institute of Rural Management (IRMA), Anand
- National Rural Management Institute, Ahmedabad
- National Informatics Centre (NIC)
- Govt. polytechnics for technical training of SMEs

- SEWA (Self Employed Women's' Association): This is actively doing excellent work for women including financing
- National Innovation Foundation
- Sristi
- Honeybee Network
- National Dairy Development Board and other Similar Boards in Horticulture, floriculture
- APEDA & other similar councils that promote exports of food
- Relevant Ministries (such as Textiles, Agriculture, Housing)
- Departments such as Food Processing (these are relevant **only** to shape policy environment, Not for Grants)
- IITs, IIMs, Regional Engineering Colleges and Local Polytechnics.

10.8 HRD Programmes

It is envisaged that Training and Human Resource Development would be an essential activity of NIRI. The institute should design, develop and deliver well structured HRD and training programmes at various levels to:

- Promote rural entrepreneurship
- Improve productivity, quality control, marketing, management practices in VI sector
- Enhance creativity and innovation, and
- Create an awareness in the society about the need for sustainable development and rural industrialization

These programmes will be delivered through a series of training workshops, which will be interactive, and modern pedagogical tools will be employed. Every year there will be about 3 to 4 such programmes. The location may vary. It is expected that through these programmes KVIC and entrepreneurs will appreciate various issues related to VI sector and the ways to manage them. The first programme is slated to be in Oct/Nov 2001 with a focus on 'Modern methods of management'.

Such training programs could be in the areas listed earlier in Sec 10.5.

10.9 Facilities Required

Based on the envisaged activities of NIRI, Table 10.4 gives the projections about the facilities needed.

Table 10.4: Facilities Required

Facilities	Break-up	Initial Cost	Recurring Budget (As a % of Initial cost)
Computers and allied facilities	Computers- Pentium III (10 numbers) Printers Desk-jets (3), Scanners (2) CD Writer (3), Server- P5 (2 nos, 1 for administration and the other for MIS)	Rs 600,000	30 %
Communication	Telephone, Fax, LAN, Cables / DSL / ISDN	Rs 100,000	50 %
Other Facilities	Photostat Machine (1) Overhead Projectors (2)	Rs 175,000	30 %
Lab Equipment	Manuals for ISO 9000, BIS standards etc.	Rs 75,000	
Miscellaneous	DVD player / audio / video cassettes for conducting training programmes LCD Projector (1) Audio / video cassettes	Rs 550,000	20 %

Space Required

In line with the facilities required and the proposed set of activities, the following space requirements are visualized.

Table 10.5: Space Requirements

Labs	Space	Remark
Computer Lab	120 sq. m	Be able to house at least 10 terminals
Simulation Lab	100 sq. m	Be able to simulate shop floor, quality and productivity related items
Testing Facility	80 sq. m	For quality control / assurance
Meeting / Training room	70 sq. m	For small meetings and training programmes (to accommodate 10-12 people)
Documentation room	30 sq. m	To house Photostat / scanner & other facilities

Manpower Required

The manpower requirements as projected are given in Table 10.6.

Table 10.6: Manpower Requirements

Functional Area	Qualification	Desired Skills	Number Required
MIS	MCA / MCS / MCM	Basic concepts of MIS, knowledge of Networking, focus on GIS and open systems will be desirable	2 at SSO-II, 1 at SSO-1
Marketing	MBA	Specialization in Marketing	1 at SSO-II, 1 at SSO-1
Finance	M. Com / MBA	Background in Finance, MBA will be desirable	1 at SSO-I level
Accounts	CA / M. Com	Background in Accounts	1 at SSO-II level
Operations Management	BE (Industrial Engg / B. Tech / MBA	Specialization Operations	1 at SSO-II, 1 at SSO-1
Lab. Assistant	ITI	Ability to operate projectors, DVD etc	1
Attendant	Secondary Education	General assistance in lab up-keep	1

10.10 Vision of the Activities to be undertaken by NIRI

NIRI must evolve as a professional, commercial and accountable organization. The institute must generate adequate resources to be ploughed back. These resources can be generated through: short-term courses, training programmes, profit earned through marketing of various products, and royalties through brand promotion etc.

It must be noted that the basic issues involved in rural industrialization are:

- Moving from village mode to industry mode. This has important implications for issues such as: productivity, quality, logistics, service etc. These issues must be tackled in a professional manner. The tiny sector must be geared for this kind of paradigm shift.
- KVIC must move from the traditional mode of working into 'marketing' mode. The implication is that the whole organization needs to be reengineered. Currently there is no awareness about concepts such as 'Stock Turn over' etc. This must be incorporated by design.

The model of rural industrialization may be built around the three tiers: village, block and district level. The structure could be vertical. This must utilize the concept of People Industry Network. One can visualize clusters of industry / villages and then propagating industrialization. The concept of industrialization must be based on Gandhian model of sustainability.

We envisage that by dwelling on the thrust areas of NIRI, the cause of rural industrialization will get a fillip. These areas will also help in realizing the dream of self-sufficiency by empowering the rural entrepreneurs and craftsman through the model of rural industrialization.

It must however be remembered that:

- The resources required for the industrialization will be mainly local and would involve local people;
- The rural industrialization will help in value addition at various stages through local and rural industrial base;
- The model of rural industrialization must keep into account the vast human resource base available in the country.

10.11 References

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Chapter 11

NIRI Infrastructure & Manpower

11.1 Introduction

As already mentioned National Institute of Rural Industrialization (NIRI) will be setup at the existing premises of JBCRI, Wardha. The various goals / objectives / activities of NIRI have already been explained. At present a large part of infrastructure at JBCRI campus is in dilapidated condition. Hence, the campus of NIRI has to be planned afresh. In the present chapter, the various aspects of creation of Infrastructure facilities for NIRI are discussed.

11.2. Infrastructure Development at NIRI Campus

11.2.1. Details of Architectural Requirements of NIRI Campus

The total plot area of the JBCRI campus is approximately 14 acres. There is an existing road, named Maganwadi Road, which divides the plot into two parts - the North campus and the South campus. Most of the existing buildings and other structures will have to be demolished. Of course, the heritage building will be revamped and a few other structures may be retained and assimilated in the new plan. Necessary arrangements will also be needed to simultaneously carry out the other activities at the campus along with the renovation work.

A. Requirements of Various Sections

The consolidated requirement for various laboratories as detailed in chapter 5-10 are given in annexure I.

In addition, following facilities would serve the institute as central facilities:

- **Common room / Committee room (capacity – 50 people):** area 70 sq meter.
- **Seminar Hall** – for conducting seminar / training programs with a sitting capacity for about 100 persons of area 150 sq. metres.
- **Central Library** to be located in the heritage building after renovation
- **Administrative Office:** Including director's office, accounts, administration and stores purchase office, canteen, security office etc. total area: 380 sq. metre.
- **Accommodation:** Including hostel for trainees (50 people), visiting scientist / craftsmen apartments & essential staff (2 cleaners, 2 security staff and 1 care taker) residences. Total area: 1200 sq meter.

B. Site Plan

The Maganwadi Road divides the plot into two parts, e.g., the North campus and the South campus. It is suggested that the North campus should house the Research laboratories, administrative offices, etc., whereas, the south campus can be used for residential and other purposes, e.g., hostel, guesthouse, staff residences etc.

No open space should be left as vacant, unused land. They should be made into parks or gardens, and where feasible could be used for the time being for harvesting agricultural crops.

The original heritage of the premises would be preserved and the following historical landmarks are suggested to be restored:

- Gandhi Smriti Bhawan (Heritage Building)
- Mahatma Gandhi used the two storied main building during 1934-1935 as his residence, when he formed the All India Village Industries Association. Regarding this building it is suggested to restore the outer form to the original as far as possible. The utilization of this building as a whole can be planned as the NIRI library and a permanent exhibition commensurate with its historical importance.
- Any other structures, which could be restored and utilized effectively in the new campus, can be considered for retention.
- The **statue of Jesus Christ** – this statue was presented by a Swiss sculptress, Madame Clara Kuien. This needs to be suitably placed and restored.

C. Additional Design Features

As far as possible, the following **design features** would be incorporated while planning the new campus of NIRI:

- Energy conservation
 - Efficient use of day lighting
 - Energy efficient luminaries
 - Passive Solar Architectural Design for improved comfort condition during summer and winter.
- Renewable Energy Utilization
 - Solar hot water system (for canteen, mess, guesthouse, hostel)
 - SPV lanterns as emergency lights
 - Community solar kitchens (as in Pondicherry)
 - Community toilets connected to biogas plants (depending on availability of resources)
 - Biomass gasifier for power generation (depending on availability of resources)
 - Windmill for water pumping (depending upon wind availability and water table depth).
- Rainwater harvesting
- Waste recycling and waste minimization
 - Waste recycling, separation of sewage and wastewater, effective recycling of wastewater for secondary uses, e.g., gardening / in toilets.
 - Paper recycling (possibly to a nearby handmade paper plant)
 - Recycling of plastics, glass, metal wastes to nearby recycling plants / outlets.
 - Organic waste composting, bio-gas generation
- Construction materials and technology
 - Cost effective construction technology
 - Use of local resources (both material and man-power)

11.2.2. Creation of Infrastructure Facilities At NIRI Campus

A. Methodology

A Committee has been formed for the purpose of taking decisions regarding the creation of new infrastructure and planning of manpower development

The above committee has been empowered to take the following decisions in connection with setting up of NIRI campus at Wardha:

- Selection of architect for carrying out the various activities involved in the planning and construction of the new campus.
- Activities involved in the restoration of Gandhi Smriti Bhawan at JBCRI campus.
- The committee will take decisions regarding the finalization of various details regarding the new campus, approval of the estimates, preparation of tender documents, call of tenders, selection of the contractor, supervision of the construction work and payment of the construction costs to the contractor as well as the architect.

The Committee has also been authorized to invite expert members as when needed for specific activities during the project.

B. Brief Details of the Progress Made so far

I. Design of NIRI Campus

The first step in the design of NIRI campus is to appoint an Architect. The committee advertised in the newspapers calling for architects to submit their resume for the proposed campus of NIRI. In response to this advertisement, 58 architectural firms submitted their resume for pre-qualification of architects for the above-mentioned project. Out of these 58 architectural firms, the committee short-listed 10 firms. The criteria for selection were company's experience on similar projects in rural environment and their expertise in energy efficient, low cost building technology. The committee requested the short-listed architects to make a presentation on the conceptual design of the proposed project on September 3 and 4, 2001. The short listed architects were supplied with the following documents to enable them to prepare the conceptual plan:

- Brief write up on the details of National Institute of Rural Industrialization (NIRI) and requirement of space / facilities in various laboratories.
- Site plan showing position of trees.
- Contour map of the site.

The Committee will finalize the name of the architect by middle of September 2001. Subsequently, the detailed design of the campus would be done through extensive discussion between the Architect and the Working Committee at IIT Delhi.

II. Restoration of Gandhi Smriti Bhawan (Heritage Building)

Gandhiji arrived at Wardha at the request of Shri Jamnalalji Bajaj and stayed at his guest house, built for Cotton Commission Agents, in his farm situated near village Sindi (Meghe) in 1934, and stayed here till he shifted to Sewagram Ashram. The building being the first residence of the Father of the Nation at Wardha, is a monument which should be restored and preserved.

The building is a quadrangle with a chowk within it. On the east side of the chowk there is a rasoda, Kasturba's kitchen and store. The southern wing of the building has first floor with Mangalore tiled roof. Rest of the building is load bearing, single storied structure with Jack Arched roof. To facilitate the activities of the office, some additions, such as brick panels to verandha were made later.

The Committee noted that there was an urgent need for the restoration of Gandhi Smriti Bhawan existing at the JBCRI campus. For this purpose, the committee decided to contact architects who have already worked on JBCRI campus and also have an in-depth knowledge of the existing campus as well as its historical significance. Hence, with the help of KVIC the committee contacted two architectural firms from Wardha. After going through their proposals, the Committee decided that the proposal of M/s M.K.Pathak & Co. was more in tune with the requirement of the project and also regarding its feasibility of implementation within the given time frame. The total scope of work was divided into Phase-I and Phase-II. The Phase-I was proposed to be completed by last week of September 2001. The Phase-II would be completed by March 31, 2002. After restoration this building will house the library and allied services, meditation hall, Gandhi museum, and possibly a Committee room. The renovation of this building is under progress at present.

Proposed Restoration

The two rooms on the south side of this building shall be joined to form a hall proposed to be used as Reading room. The remaining rooms can be used as Stack rooms, Store, Duplicating room etc. Presently, the Shahabad stone floor of the entire building has sagged. It is suggested to replace this flooring by providing polished Kota stone of muddy colour laid over 15 cms. thick cement concrete 1:4:8 over rammed strata.

The entire building needs re-plastering to inside, as well as outside surfaces. The internal plaster shall be of Neeru finish and the external plaster shall be sand faced. The flooring over jack arched roof area shall be finished with I.P.S laid to proper slopes. The doors and windows are to be replaced and relocated suitably. The central chowk is suggested to be maintained as a green lawn.

In order to provide ample floor area for central library and allied facilities, it is also proposed to construct first floor over the present terrace of the northern and western wings of the Heritage building.

A plinth protection of 2m high concrete strip shall encircle the building. The building would be painted externally with cement colour.

11.2.3. Budgetary Requirement for Infrastructure Development

As has been mentioned earlier the total carpet area of the buildings to be constructed in the NIRI campus in the first phase would be approximately 4500 sq. m. Funds are also required to develop the total campus with landscaping and provision of furniture and other utilities. The estimate of funds required for this activity is approximately 2.5 crores.

The work plan for construction activity is as follows:

- Restoration work for Heritage Building including additional construction on first floor.
 - Phase I September, 2001
 - Phase II November – February, 2001
- Short listing and final selection of architect for the main buildings and preparation of conceptual plan of the campus. August – September, 2001
- Preparation of detailed architectural and structural plan of the campus October – December, 2001
- Finalization of contractor and initiation of new construction. – December, 2001
- Demolition and clearance of old structures – Feb, 2002.
- Completion of Phase I, Construction of core buildings – December, 2002.
- Completion of Phase II, Interior fittings, peripheral facilities and services, landscaping etc. – June, 2003.

Besides civil construction, infrastructural development includes equipping the various laboratories. As indicated in Annexure-I the total budgetary requirement for laboratory equipment is Rs. 273 lakhs. However, the amount available with us is Rs. 150 lakhs. While all attempts will be made to identify existing equipment in JBCRI which could be used in NIRI, it is evident that some of the equipment would have to be procured after the end of this project unless additional grant for the purpose can be given. The total budgetary provision for infrastructural development, staff salary and other expenditures to be incurred at Wardha is Rs. 700 lakhs. The detailed breakup of this expenditure over the three years duration of the project is given in Annexure II.

11.2.4 Manpower Development at NIRI

As discussed in Chapter 4, Governing Board will monitor the functioning of NIRI for a period of 3 years to rejuvenate the activities of the institute. The Governing Board will interact with the Director and Deputy Directors towards the successful implementation of the objectives of NIRI.

11.2.4.1 Manpower Requirement

1. An executive committee consisting of the Director and six Deputy Directors, who are heads of six different divisions (e.g. Khadi and Textile Industry, Chemical Products, Bio-processing, Rural Infrastructure and Energy, Rural Engineering and Crafts, Management Information System, Marketing and Finance), will be formed

for overall management of the institute. These positions will be filled on a five years contract basis by inviting selective distinguished scientists/ technologists to contribute to this mammoth task.

2. 4-6 Scientists / Technicians / Master Craftsmen working on different projects will assist each / Deputy Director. These positions will be filled by the candidates who have desired expertise / qualification and strong motivation towards working on rural technology and development. Some of these could also be on deputation from different CSIR labs / KVIC / IITs / RECs / NGOs etc.

The consolidated requirements for various sections is given in Annexure I.

11.2.5. Resource Generation:

1. Scientists and technicians of NIRI should be engaged in consulting work related to rural technology for product and process development. Some monetary benefit (in the form of consultancy fee) for the staff of NIRI can be given for this activity.

NIRI would also generate fund through specific training programs offered to the entrepreneurs, artisans, labourers involved in rural industry.

Chapter 12

Challenges and Strategies for Implementation

To work towards strengthening rural industrialization, in these times of globalization and mega mergers of multinational corporations, is like swimming against the strong current of a turbulent river. We are well aware that it is going to be a Herculean task. Numerous hurdles are likely to obstruct the progress of work. It has been our endeavour to foresee these, as far as possible, and evolve an implementation strategy that has an in-built mechanism to respond to these hurdles.

The most important of these hurdles is the attitude of cynicism prevailing in the society today, especially towards the practical feasibility of Gandhian ideas. All the people involved in this task of strengthening KVI sector need to be informed, through suitably designed workshops, about the importance of these ideas, not only for India, but for the whole world in the context of increasing concerns for the sustainability of development based on heavy industrialization.

We see this project as the harbinger of a national movement of “Sustainable Development through Holistic Technologies”, and creating awareness throughout the country, especially among youth undergoing training in S, T & M institutions, of the need for this change is of paramount importance. At the international level many concerted efforts in this direction have already been made, the most spectacular among these being the UN Conference on Environment and Development (UNCED) held at Rio in 1992. The Rio Declaration, which was signed by most nations of the world, including India, can be an effective starting point for educating the people at large about the need for exploring an alternative model of development. In fact, many of the “principles” of the Rio Declaration [UNCED (1992)] like: eradicating poverty and decreasing the disparities in standards of living as an indispensable requirement for sustainable development (principle 5); eliminating unsustainable patterns of production and consumption (principle 8), form the core of Gandhian model of development. We propose to organize series of programmes at Wardha and in prominent S, T & M institutions to motivate the best brains in the country to contribute to this gigantic task. Even a moderate success in this direction would go a long way in overcoming the important hurdle of all round cynicism.

Another tricky hurdle is the degeneration in the work ethics, especially in the public sector establishments. To prevent this we need to ensure that all the people working for NIRI, be they the senior scientists or laboratory attendants, are committed to the mission of the institute and see it as something of crucial importance to them personally and to the nation. Besides the HRD programmes mentioned above, this would need active involvement of the staff in planning of the work to be undertaken in NIRI so that their commitment to the tasks is high. As mentioned in Chapter 4, this participatory planning and decision making approach should be the hallmark of execution of all the projects and activities in NIRI. As a first step in this direction, a workshop on developing the strategy for implementation of the DPR is being scheduled at Wardha from Sept 29 to Oct 2, 2001, followed by a consultation with rural artisans and craftsmen on Oct 3 and 4. Another workshop on using modern management techniques in KVI sector would be held towards the end of October.

To keep up the motivation we also need to put in place suitable administrative procedures and appraisal mechanisms that nurture a supporting environment where dedication to work is respected and rewarded; skills are valued more than bookish

knowledge; cooperative working is valued rather than personal aggrandizement, and people are encouraged to express their opinion freely since dissent is not treated as disrespect. These principles will form the basis for various rules and regulations to be framed for the staff of NIRI.

Another important challenge is to ensure that the institution does not get fossilized with passage of time and become an isolated island. The institute should foster innovation and creativity to be able to keep up with changing times. Since one of the main tasks of the institution is to build linkage with other S, T & M institutions in the country, this process itself should ensure that the scientists working for NIRI remain in touch with the latest developments. However, to further ensure this constant 'rejuvenation' of NIRI, it is proposed to invite distinguished experts as also 'young scientists and technologists' from various institutions (including NGOs) to spend some time at Wardha as 'visiting senior scientists (technologists) / young scientists (technologist)' and contribute to specific projects being executed at that time.

An important requirement for wide spread propagation of rural industrialization is to create mechanisms to empower the artisans and craftsmen who have learned their skills in the traditional way of *guru-shishya parampara*. This would need a multi-pronged strategy, as discussed at length in Chapters 4 and 9 whose implementation would receive the highest attention and priority. NIRI administration will recognize these craftsmen and artisans as the most important 'clients' attending to whom with respect, is their bounden duty.

Project Implementation

The overall responsibility for the implementation of the project is that of the four-member core group. The core group is assisted by seven sectional coordinators (see Appendix III) who shall oversee the functioning of their respective sections to ensure fulfillment of various targets and milestones laid down in the DPR. The core group shall invite/select a project coordinator at Wardha who shall oversee the activities in the NIRI campus for the duration of the project. The core group shall invite/select expert teams for the implementation of various "mission projects" and devise mechanisms to assist and monitor these on continual basis.

Reference

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ANNEXURE-I

**CONSOLIDATED REQUIREMENTS OF INFRASTRUCTURE / EQUIPMENT /
MANPOWER**

Section	Manpower Requirement		Space Required M ²	Cost Of Equipment In Lakhs	Running Expense per year (Lakhs)****		Remarks
	Scientist	Support Staff			Salary	Consumables	
Khadi & Textile	4	6	600	36.32+10.68*	20	10	*For Phase II
Rural Chemical	4	6	400	45.00	20	10	
Bio-Processing	4	6	350	35.00	20	8	
Rural Infrastructure & Energy	4	4	350	35.00	18	8	
Rural Engg. & Crafts	7**	4	550	46.00	24	12	**With 4 Master Crafts-Men
Management & Systems	6	2	400	15.00	20	6	
Hostel Guest House And Visiting Faculty Apartment	1	5	1250	20.00***	10	10	*** Excluding Normal Furniture
Central Library	2	3	Heritage Building	15.00	10	6	# About 15 Lakhs Estimated for Renovation & First Floor Extension
Administration & General Facilities	4	8	600	15.00	22	8	
Total	36	44	4500	273.00	164	78	

(**** After completion of Project)

ANNEXURE-II**DETAILS OF PROJECT BUDGET AND PROPOSED EXPENDITURE**

Duration of project = 3 years (May 2001-April 2004)

Total Allocation for the project = **Rs 835 Lakhs**

Out of this allocation:

- a) Budget for Infrastructure and Manpower
Programme development at NIRI Campus, Wardha = **Rs 700 Lakhs**
- b) Budget for consultancy to IIT Delhi = **Rs 135 Lakhs**

The details of proposed expenditure for three years for development of NIRI Campus under budget head (a) are as follows:

TABLE I

S.No	Expenditure during three years (Rs in Lakhs)	
	Item	Amount
1.	Salaries (for the regular and visiting personnel at NIRI)	150
2.	Recurring expenditure for regular activities and mission projects	
	(a) Cost of material expenditure (consumables)	60
	(b) Contingency Expenditure	45
	(c) Travel Expenses	45
	Total	150
3.	Building Construction and Landscape Development	225
4.	Furniture and basic Infrastructure	25
5.	Lab Equipment	150
	TOTAL EXPENDITURE	700

TABLE II
YEAR-WISE DISTRIBUTION OF EXPENDITURE

	Item of Expenditure	Proposed Expenditure Rs in Lakhs			
Non Recurring					
S no.		I Year	II Year	III Year	Total
1.	Building Construction	80	120	25	225
2.	Furniture & Basic Infrastructure & Services	10	15	-	25
3.	Lab Equipment	50	100	-	150
Recurring					
4.	Salaries for Regular and Visiting Staff	30	50	70	150
5.	Expenditure for Regular Activities and Mission Projects				
	A) Cost of Material	10	20	30	60
	B) Contingency Expenditure	10	15	20	45
	C) Travel Expenditure	10	15	20	45
	TOTAL	200	335	165	700

Annexure-III

Faculty Members Associated as Project Consultants

Core Group

Prof. P. L. Dhar
 Prof. R. R. Gaur
 Prof. R. B. Chavan
 Prof. Rajendra Prasad (Convener)

Project Coordinator at Wardha:

Dr. Narendra Mehrotra

Section wise Working Groups

Khadi and Textile Industries

1. Prof. R. B. Chavan (Convener)
2. Dr. Ravi Chattopadhyay
3. Shri R. P. Tiwari

Rural Chemical Industries

1. Prof. A. K. Gupta (Convener)
2. Prof. Rajendra Prasad
3. Prof. R. C. Maheshwari
4. Prof. V. K. Srivastava
5. Dr. K. K. Pant
6. Dr. A. N. Bhaskarwar
7. Dr. S. N. Naik

Bio-Processing based Industries

1. Prof. S. N. Mukhopadhyay (Convener)
2. Prof. Subhash Chand (Co-convener)
3. Prof. R. K. Baisya
4. Dr. (Ms) Santosh Satya
5. Dr. (Ms) Satyawati Sharma
6. Dr. S. N. Naik

Rural Infrastructure and Energy

1. Prof. T.C. Kandpal (Convener)
2. Dr. (Ms) Santosh Satya (Co-convener)
3. Prof. R.R. Gaur
4. Dr. Sangeeta Kohli
5. Dr. M.R. Ravi
6. Dr. Sanjeev Jain
7. Dr. P. M. V. Subbarao

Rural Crafts and Engineering

1. Shri L. K. Das (Convener)
2. Prof. P. L. Dhar
3. Dr. Naresh Bhatnagar

4. Shri S. K. Sud
5. Dr. Sudipto Mukherjee
6. Dr. S. K. Saha
7. Dr. Sunil Pandey

Management and Systems

1. Prof. S. G. Deshmukh (Convener)
2. Prof. P. L. Dhar
3. Prof. Arun Kanda
4. Prof. Sushil
5. Dr. K. Momaya
6. Dr. M. P. Gupta
7. Dr. S. S. Yadav

NIRI Infrastructure and Manpower

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2. Prof. V. B. Deshpande
3. Prof. R. R. Gaur
4. Prof. P. L. Dhar
5. Prof. R. Prasad
6. Prof. R. B. Chavan