Status and Prospect of Food Processing Industry: The Means of Rural Industrialisation in Nadia District
6.1. Introduction:
In view of the existing potentials and opportunities provided by the developed agricultural sector in Nadia district and challenges provided by the poor agricultural marketing coupled with poor storage system, which has been mentioned earlier in the previous chapters, faced by the economies of the region industrialization seems to be the best alternative for faster economic growth and rural poverty alleviation. Now the problem is to select the most beneficial industry in terms of resource requirement, comparative advantages, and creation of complementarity and linking with other sectors within the state and region, and the rest of the country so that Nadia district gains from the socio-economic development and process of globalization of recent years. Considering the present level of development of the agriculture based economy of Nadia, resource-based industries, particularly food, fruit, vegetable and some other agro-based industries such as the floriculture and herbal processing industries, appear to be the best alternative for attaining the most appealing objective, that is, poverty alleviation. Each of these industries will be analysed in terms of value added, employment, linkages within and outside the economy, poverty alleviation, markets and exports and comparative advantages.

Importance of Food-processing Industry as the means of Rural Industrialization:
The theme "Rural Industrialization" has recently emerged in the context of improving the living conditions of the rural people in developing regions. Like Nadia district, most of the developing areas are characterized by high rates of population growth which predominantly depend on agriculture as means of livelihood. Agriculture as a means has limitations in terms of inadequacy of arable land, irrigation facilities and natural calamities as flood and the system of land tenure. Even where agriculture can be developed, it is clear that it cannot absorb the additional labour force caused by rapid population growth without decreasing labour productivity. Although the agricultural sector is of prime importance in the improvement of the living conditions of the rural people, sustainable rural development
cannot be achieved by developing the agricultural sector alone and unquestionably the other sectors must be included in a meaningful integrated approach.

Manufacturing activities in rural areas are usually on a small-scale. In view of this, small scale industries in rural areas may help to diversify the rural economy and stimulate income-generating opportunities for rural people. There are number of positive factors that facilitate promotion and development of small enterprises in the rural areas. Large-scale industries usually absorb a large share of the investment but generate only a small number of employment opportunities, whereas, the small-scale industries employ a large proportion of the labourers employed in manufacturing in particularly developed countries. Moreover, in the rural areas there are people who are able to accumulate small amounts of capital and are willing to venture into some entrepreneurial activity. Small scale industry then provides a good starting point for the mobilization and utilization of both their talents and their capital. Employment opportunities available in urban centres are not sufficient to absorb the influx of rural labour in search of employment. The only solution would be for rural industries to create employment opportunities for local labour and thus reduce rural-urban migration. Large-scale industries very often depend on technology from industrialized areas and therefore, show a high degree of dependence. Most small-scale industries in the rural areas, on the other hand, can be developed with indigenous technology that is familiar to the people. It does not mean that modern technology could not be introduced to rural areas. In course of time, any useful, efficacious, cost effective and high productive technology will spread throughout the urban and rural areas (E.D.Setty, 2002).

In this context, the present study has considered the agro-based food processing industry as the best means of rural industrialisation over the vast areas of Nadia district. Where as lack of mineral resources, absence of energy stations have blocked the course of Nadia district in creating heavy industries, the high degree of agricultural development and stagnation in marketing facilities coupled with increasing unemployment problem which has necessitated the growth and development of agro-based food processing industry on the other hand.
Chapter VI: Status and Prospect of Food Processing Industry

Box No. 6.1. ‘Vision 2015’ for Food Processing Industry

The Government of India is lavishing on the growth of the processed foods sector. The government’s ‘Vision 2015’ has allocated an outlay of $20 billion for the sector, while simultaneously relaxing the regulations, governing licensing and excise. Other strategic initiatives by the government include the approval of 51 percent ownership of foreign retailers in joint ventures and the establishment of Mega Food Parks and cold chain facilities, including refrigerated vans. All these positive measures are expected to catapult the food processing sector into a higher growth trajectory that would almost double the country’s presence in the global food trade. These initiatives will also enable the industry to bring in stability in food prices, reasonable returns for farmers and other stakeholders, and create a projected 9 million jobs. The following specific targets would be to increase:

- The level of processing of perishables from 6 percent to 20 percent
- Value addition from 20 percent to 35 percent
- Share in global food trade from 1.5 percent to 3 percent, by the year 2015.

An estimated investment of Rs. 100,000 crores is required to achieve the discussed vision, of which Rs.45,000 crores is expected to come from the private sector, Rs. 45,000 crores from Financial Institutions and Rs. 10,000 crore from Government.

The importance of the agro-based industry in the development of the rural areas is widely recognized and needs no emphasis. Their role lies in the fact that they can be started with small amount of capital owned and established by villagers. They provide vast employment potential at a comparatively low investment and yield quick returns. The development of the agro-based industries in rural areas would not only boost up village economy but also reduce time and cost of transportation and distribution (A. Rehman’ 88).

In developing countries, agriculture is the mainstay of the economy. As such it is of no surprise that agricultural industries and related activities count for a considerable proportion of their output of the various types of which agriculturally based activities like fruit and vegetable processing are among the most important. (F.A.O. Agricultural Services Bulletin’1997)

With the change in the overall ambience and scenario relating to food and agriculture, there is a perceptible shift in the emphasis from mere more production of agriculture, horticulture to improve productivity and expansion of agricultural marketing and finally the development of agro-based and processing industry. The changing cultural practice, life style and availability of technology or processing preservation and packing have made food processing much more relevant and a compelling need.

Micro Level Planning Based on Agricultural Potentiality : A Case Study of Nadia District, West Bengal
L.K. Wader and C. Murthy (2003) observed that processing is an important marketing function in the present day of agricultural commodities. A little more than 100 years ago, it was relatively unimportant function. A large proportion of farm products were sold in unprocessed form and a great deal of processing was done by the consumer themselves. The processing activity involves a change in the form of the commodity. This function includes all those essentially manufacturing activities which change the basic form of the product. Processing converts the raw materials and brings the products nearer to human consumption.

Agro-climatically Nadia is situated in a suitable zone in the Gangetic alluvial plains where soil is loamy and ideal for cultivation for a wide range of agricultural and horticultural crops. In West Bengal, Nadia district occupies second position for producing vegetable, third position for producing fruits, second position for producing spices and fifth position for producing betelvine (Seminar Report, DIC, 2009-10). So needless to say that there is huge potentiality coming up for different type of agro-based industries and food processing industries in this district. Apart from resources, a good communication facility with rail and road connectivity to Kolkata, technical institutions like Bidhan Chandra Krishi Viswavidyalaya, State Horticulture Research and Development station with training and research facilities can pave the way towards development of the above noted industries in this district. But the entrepreneurs could not get this opportunity due to lack of awareness coupled with low level of knowledge regarding modern production processes, market availability, technology etc. As a result, Nadia district has confined itself within some village industries like mustard oil seed crushing, wheat grinding, paddy husking and spice grinding sectors.

In the light of the above scenario, in the following sections attempts have been taken to study the scope and importance of food processing industries, the potentiality of agro-industrial crops and future prospect of agro-based food processing industries for the development of the rural sector in Nadia district in general and to study the location and patterns of agro-based food processing industries with their characteristics in particular. Nature of rural industrialisation in Nadia and different problems related with agro-based food processing industry and emerging trends have also been analysed. Therefore, some
measures are suggested to optimize the role of banks to accelerate the rate of economic development of the district.

6.2. Food Processing: A Compelling Need

Although the food industry and food processing are used interchangeably, there are some differences between these two terms. Generally, the food industry includes four activities: processing, packaging, flavours and additives, and storage and handling; food processing includes only processing activities. As the food industry includes two sectors of manufacturing and services, it is very difficult to analyse the effect of the food industry in terms of value added to the economy and employment generation. This study, therefore, focuses only on food processing industries.

A strong and dynamic agro-based food processing sector plays a vital role in diversification and commercialization of agriculture to ensure value addition to the agricultural produce and generates employment, enhance income of farmers and create surplus for the export of agro-based processed food. As discussed earlier in Chapter-III and IV, it has been experienced through the primary survey, that one of the most common problems of the agricultural sector in Nadia district is perhaps the low price of the farm produce for their traditional agricultural production through minimum supportive prices or similar measures. This problem could be solved largely if the surplus production of cereal, fruits, vegetables etc. are processed and marketed aggressively both inside and outside the district. Food processing adds value, enhances selling life and crop diversification, has the largest employment generation potential for solving the basic problems of agricultural surpluses or wastages and providing rural jobs, ensuring better prices to the growers.

Food processing involves any type of value addition to the agricultural produce starting from the post harvest level. It includes even primary processing like grading, sorting, cutting, seeding, selling, packaging etc.

The food processing industry has been identified as a thrust area for development. The industry is included in the priority leading sector. Most of the food processing industries have been exempted from the provisions of industrial licensing under industri...
(Development and Regulation) Act 1951 with the exception of beer and alcoholic drinks and items reserved for small scale sector, like vinegar, bread, bakery etc. As much as foreign investment is concerned, automatic approval even 100 percent equity is available for the majority of the processed food items.

**Box No. 6.2. Food Processing Industry: The Indian Perspectives:**

The food processing industry has enormous potential in India to built profitable business. The food processing industry ranks fifth in size in country in the year 2007-08 and employs 16 lakhs workers which consists 19 percent of the country’s industrial labour force. It accounts for 14 percent of the total industry output with 55 percent of G.D.P. The turnover of this industry is estimated to be Rs. 144,000 crores of which Rs. 111.200 crores persist in the unorganized sector. The industry has produced many new items like ready to eat food, beverages, processed and frozen fruit and vegetable products, etc. Indian consumer are being first introduced to more and more high quality food products produced by induction of latest technologies in various food processing sectors. State of art technologies has been introduced in food processing industries for improving the competitive edge. Economic liberalization and rising consumers prosperity is opening up new opportunities for diversification in food processing sector. Liberalization of the world trade may open up new vistas for growth.

Though India is the second largest producer of fruits and vegetables both in the world, but in case of per-head availability of the protective foods, she is far behind. By the year 2030, 84-106 million tones of fruit and 151-193 million tones of vegetables besides other edibles would be needed. So the production and supply of fruits and vegetables has to be increased and the product diversification and value addition of agricultural products has also to be increased on the other hand.

**6.3. Role of Horticultural Products in Rural Development:**

Despite over all progress in rural areas, poverty and unemployment are still the predicament of the large number of people in these areas. These programmes were insufficient to reduce rural poverty. The importance of the agro-industries in the development of the rural areas is widely recognized and needs no emphasis. Their role lies in the fact that they can be started with the small account of capital and owned and established by villagers. They provide vast employment potential at a comparatively low investment and yield quick returns. The horticultural product diversification and development of agro-industries in rural areas would not only boost up village economy but also reduce time and cost of transportation and distribution. Since the year of 2003 a new episode has been introduced by the food processing and horticulture department of West Bengal.
Bengal. It is the supply of flowers in the foreign market by the West Bengal State Food Processing and Horticulture Department. The State Food Processing and Horticulture Department has set in to export flowers in the foreign market since January, 15 of the year 2003. First it has been started in small scale through a business agency of Sharjah.

That agency at first, used to sell flowers of West Bengal in different hotels, restaurants, and in different public and private programmes. Even the flowers of the state have been supplied in the marriage ceremony of the Aamir of Sharjah. Later on when the flowers from state has attained a special place as ‘the flowers of Kolkata’, that agency has started to supply the flowers from West Bengal to different markets of different countries. In the markets of Soudi Arab, Oman, and thus flowers achieved a special place, in the map of the globe.

Till now, more than 90 thousand flowers have been sent to Saijah. Among them most of the flowers are Night queen and Gladiolus. Besides are Golden Rob, Red-Chaina, Tulip and its different varieties and Lady less. Interestingly these flowers already have earned 12 thousand dollars clearly. Meanwhile the flowers of the state has been sent to London, though not regularly, but on the basis of special order. Temporarily, though amount of exported flowers is Rs.30 thousand undoubtedly earning by pounds has added a new dimension to the export business economy.

**Floriculture in Nadia District:**

Flowers and plants have always been an integral part of human living. Besides their aesthetic importance, they are also useful in improving the quality of life. Ornamental plants play a very important role in environmental planning of urban and rural areas for abatement of pollution, social and rural forestry, wasteland development, aforestation and landscaping of outdoor and indoor spaces. Floriculture is also an important agri-business with potential for export trade.

Inspite of such a large area, production value is very low. The quality of Bengal produce is poor and not acceptable in international market. The produce quality deteriorates further due to improper packaging, storage and transportation. Major contribution of research and development in this area has been in the form of raising varieties that are more attractive and flower life is longer. Gladiolus, Chrysanthemums, Jasmine, Marrygold, Tuberose etc.
are the floricultural products commonly known in Nadia district. Whereas Ranaghat block –I and II, Haringhata, Krishnaganj blocks produce a large amount of floricultural production. Floriculture is largely an export oriented trade and agro-industry. The trade is growing at the rate of 15 percent per annum. Cultivation of high quality varieties under protected conditions, proper tools and equipment, appropriate packaging and storage can create a niche for the floricultural production of Nadia district in the national and regional market.

The District Horticulture Mission:
The district of Nadia has been selected a model nursery for production of planting materials, upgradation of a tissue culture laboratory at State Horticulture Research and Development Station, Krishnanagar for the development of various types of medicinal and aromatic plants. This includes development of 750 hectare Mango orchard, 200 ha. Guava orchard, 200 ha. Banana orchard 100 ha. each of Litchi and Citrus (Lime) orchard, establishment of new gardens for cut flowers to the extent of 60 ha., another 60 ha. for the development of Tuberose and Gladiolas gardens, 70 ha. for other flowers, 30 ha. for development of turmeric garden, rejuvenation and replacement of senile gardens of Mango in 600 ha. Development of high-tech green houses along with normal green houses, 20ha. of shade-net cultivation which include 16000 sq. Metre for Betelvine cultivation, promotion of integrated pest management(1000 ha.), disease forecasting unit, establishment of leaf tissue analysis laboratory, adoption of organic farming to the extent of 250 ha., establishment of 80 vermi-composed centre, all these efforts and measures will be taken within a limited span of time in near future.

Besides all other programmes including establishment of marketing infrastructure for horticultural produce in the government and corporate sector are being implemented. Support for human resource development initiatives for training of supervisors entrepreneurs and gardeners, are also in progress. Farmers training and training of horticultural officers, as also pollination support through bee -keeping are also covered. The flori culture park which has started recently at Jagulia in Haringhata block will have two separate pack houses, one each for flowers and vegetables and one exclusive nursery.
for commercial seed production in association with a Bangaluru based farm applying from Denmark.

Demonstration are also being conducted for the cultivation of non-traditional and high value exotic vegetables like Gherkins, Broccoli, Brussel sprout, Baby corn and Capsicum Assistance of Bidhan Chandra Krishi Viswavidyalaya (BCKV) has been sanctioned for research and development activity. These include:

a.) Management of some heavy metal contamination in some urban and semi-urban vegetable growing area, 100 percent funding by APEDA which costs Rs. 2.64 lakhs.

b.) Project on export oriented vegetables production under low cost poly house 10 percent funding by APEDA which costs Rs. 2.64 lakhs where the project period is two years.

c.) Research and development project on cultivation of high yielding Gherkins, where self-help groups were awarded in BCKV during 2003-04. Total cost of this project is Rs. 3.54 lakhs.

6.4. Problems of Fruit and Vegetable Preservation in Nadia:

Horticultural development in any State is closely associated with the preservation industry as the surplus production of fruits and vegetables during periods has to be properly preserved and the products to be consumed during off season. Extension of acreage under these crops and proper attention to cultural treatments will depend, to a great extent, on the grower receiving adequate returns from these crops. The fruit and vegetable preservation industry promotes this cause considerably by processing the perishable commodities into preserved products, which can be transported at ease to different parts of the country and sold off in season, thereby ensuring the better returns to the growers.

In West Bengal almost all the preservation factories are located in Kolkata although the distribution of areas under fruits and vegetables are found in the various districts of West Bengal. Nadia District also suffers from lack of preservation and large scale processing system. A few numbers of regulated market, principle market yard and limited cold storage facility has made the preservation system very tough. Canning or other methods of preservation of this surplus crop will give adequate returns to the grower. It is therefore;
urging need for the area to have an industry for the preservation of surplus fruits so that wastages is prevented and the growers are ensured adequate returns and for that reason, it is better to draw the attention of the planners to locate industry at Nadia at any cost.

Table No. 6.1. Spatial Distribution of Horticultural Crops in Nadia:

<table>
<thead>
<tr>
<th>SI NO</th>
<th>Name of the crop</th>
<th>Production in MT</th>
<th>Major Growing Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tomato</td>
<td>100232</td>
<td>Chakdah, Haringhata, Nakashipara, Krishnaganj, Ranaghat-I</td>
</tr>
<tr>
<td>2</td>
<td>Cabbage</td>
<td>199730</td>
<td>Do</td>
</tr>
<tr>
<td>3</td>
<td>Cauiflower</td>
<td>201257</td>
<td>Do</td>
</tr>
<tr>
<td>4</td>
<td>Peas</td>
<td>24529</td>
<td>Do</td>
</tr>
<tr>
<td>5</td>
<td>Sweet Potato</td>
<td>14757</td>
<td>Do</td>
</tr>
<tr>
<td>6</td>
<td>Mango</td>
<td>50125</td>
<td>All Blocks</td>
</tr>
<tr>
<td>7</td>
<td>Banana</td>
<td>378860</td>
<td>All Blocks</td>
</tr>
<tr>
<td>8</td>
<td>Jack fruit</td>
<td>17400</td>
<td>All Blocks</td>
</tr>
<tr>
<td>9</td>
<td>Litchi</td>
<td>8996</td>
<td>All Blocks</td>
</tr>
<tr>
<td>10</td>
<td>Coriander</td>
<td>4590</td>
<td>All Blocks of Tehatta and Sadar Subdivision</td>
</tr>
<tr>
<td>11</td>
<td>Garlic</td>
<td>1940</td>
<td>Do</td>
</tr>
<tr>
<td>12</td>
<td>Onion</td>
<td>24000</td>
<td>All Blocks</td>
</tr>
<tr>
<td>13</td>
<td>Black cumin</td>
<td>1000</td>
<td>All Blocks of Tehatta and Sadar Subdivision</td>
</tr>
<tr>
<td>14</td>
<td>Turmeric</td>
<td>1815</td>
<td>Do</td>
</tr>
<tr>
<td>15</td>
<td>Red Chilli (Rabi)</td>
<td>7621</td>
<td>Do</td>
</tr>
<tr>
<td>16</td>
<td>Red Chilli</td>
<td>3343</td>
<td>Do</td>
</tr>
<tr>
<td>17</td>
<td>Betel vine</td>
<td>13 lakh mote</td>
<td>All Blocks of Tehatta Subdivision and Chakdaha</td>
</tr>
</tbody>
</table>

Source: District Industrial Centre Report-2010-11, Nadia.

Similarly vegetables, particularly tomato, cabbage and cauliflower and brinjal are produced in large quantities in Nadia during the winter season. During the short period of maturity of the tomato crop, the price of tomato comes down around Rs. two to three per kg. So that sometimes the cultivators don’t even harvest their crop, as they have to work for the whole day to harvest on field which is worth about Rs. 140 to Rs. 120 under NREGA scheme. Cost of transportation also cost a bit. A good amount of crop is thereby allowed to go waste. Preservation of this surplus crop will give better returns to the growers and also preserve a nutritive food for future use and better nourishment.
From the perspectives of the horticulturist, one is able to help the industry by evolving strains of fruits and vegetables of the proper types and suitable qualities; one can stand processing properly, and by encouraging their cultivation by the growers. For this purpose government has undertaken a scheme for the improvement of vegetables in Nadia District as well as in the state; and scientists are on the selection of tomato, brinjal, radish, pea, carrot, cauliflower, beet, cabbage, lettuce, lady’s finger, ‘parwal’, and pumpkin, at Kalimpong Research Station on the Himalayas (4,000 ft.) and at the Horticultural Research Station, Krishnanagar in the plains. The qualities of these crops, satisfying the needs of the industry, will be taken into consideration, while making selections, if they let us know their requirements. Similarly distribution of suitable types of fruits plants to the growers can be undertaken. It is considered that by such co operative efforts the horticulturist can be of great use in solving some problems of the fruit and vegetable preservation industry, as the crops are the basic materials for the industry.

**Box No. 6.3. Status of Nadia District as Agri Export Zone for Vegetables:**

West Bengal has substantial marketing surplus for traditional vegetables. Considering the potentiility of vegetables exports from the region, the Agricultural and Processed Food Exports Development Authority (APEDA), with the proposal of the State Government for setting up the of Agro Export Zone, has declared Nadia District as a part of AEZ. The zone covers the districts of Nadia, Murshidabad and 24 Paraganas. The project would entail an investment of around Rs. 28.80 crores out of which Rs. 3.65 crores will flow from the Central Government Agencies, Rs. 3.60 crores from the State Government Agencies and private sector will put around Rs. 21.55 crores. In the next five years it is expected that there would be an export of Rs. 152 crores from this zone. Around 10000 famers are also likely to benefit from the setting up of this zone.

**Present Status**
The MOU for setting up this zone has been signed on 16th December, 2002 and Agri Export Zone has already been notified by DGFT on 15th January, 2003. Regular training programmes are being conducted for farmers. The main emphasis of these training is on improved cultivation practices, integrated pest and disease management, low cost preservation, organic farming and use of modern technology like poly houses. The State training center at the Horticulture Research Station at Krishnanagar, Nadia is being developed as the training center for both the farmers and resource persons. About 22,000 hybrid vegetable seeds kits were distributed to the farmers zone under Area Expansion Programme. Demonstration is also being conducted for cultivation of high value exotic vegetables like gherkins, brocoli, brussel sprout, baby corn and capsicum etc. Assistance of Bidhan Chandra Krishi Viswavidyalaya is being taken up for research and development activities. Different research projects have been undertaken by BCKV. These are:
I. Management of some heavy metal contaminated in some urban and semi urban vegetables growing area. 100 percent funding by APEDA. Total cost Rs. 2.61 crores.

II. Project on export oriented vegetables production under low cost poly house. 100% funding APEDA. Total cost Rs. 2.64 lakhs. Project period is 2 years.

III. APEDA has approved the proposal of Rs. 675.000 lakhs for setting up of the centre for perishable cargo (CPC) at International Airport, Kolkata in July 2005. i.e. during 2005-06. Out of this advance of 20 percent i.e. Rs. 135.00 lakhs was released in December 2005. The project is likely to benefit export of pineapples, mangoes, litchis and vegetables apart from other products.

IV. Blue Bells Agri Products (P) Ltd. Setting up a unit for processing tomato puree, pickle, squash, pineapple etc. The unit is being set up at Nadia with an investment of Rs. 206.00 lakh.

V. Haringhata Sambhunath Mutipurpose Cold Storage (P)Ltd. At Surendranagar, Nadia. Investment of Rs. 361.22 lakh.

VI. M/s Shibsankar Multipurpose Cold Storage at Bethuadahari, Nadia is being set up with investment of Rs. 24.29 lakh.

6.5. Emerging Trends in Food Processing:

In recent years considerable effort have been directed to develop many packages of post harvest practices in India as well as abroad to minimize post harvest losses in fruits and vegetables which have been discussed below. If the process of rural industrialisation has to be achieved through the development of agro-based food processing industry, authority of Nadia district must attain these modern trends with the advancement of industrial technology and machineries.

1. Harvesting Stage and Method: Methods of harvesting are important in determining post harvest losses in fruits and vegetables. Considerable efforts have been directed in determining the optimum stage of harvesting of various horticultural crops. But this information has yet to be trickled down to the farmers. Department of Horticulture and Department of Agro-based Food Processing Industry and District Industrial Centre of Nadia district- all have to be more effective regarding this concern. During harvesting, efforts shall be made to ensure that no physical damages takes place as any injury or bruises to the fruits will accelerate their deterioration during transport and storage, bruised
fruits will have lower consumer acceptance. Proper harvesting tools should be there to ensure minimum damage to the fruits and vegetables.

2. 

**Packing:** Packaging is very important factor in determining the extent of physical and psychological damage during post harvest chain. In India variety of gunny bags, bamboo baskets, wooden boxes, animal carts and tractor trolleys or trucks are used to carry harvested materials to the markets. Recently plastic crates and cardboard boxes have emerged as ideal materials for transportation and marketing of fruits and vegetables. Nylon netted bags have emerged as suitable material for marketing of small size fruits like ber and lichi.

To avoid physical injury of fruits like mango and lichi, major horticultural products of Nadia district, which are sent for long distances are packaged properly with paper cuttings, rice straw and newspaper. Use of cardboard or polypropylene molded trays is also being tried for long distance transportation. Air tight cling film wrapping has been found successful in extending the shelf-life of fruits. In Nadia, packaging station are not available like other developed states in food processing industry namely Himachal Pradesh, Punjab and Haryana where various operation like sorting, grading, treating with sulphur dioxide and cooling, have not yet become popular.

3. 

**Regulating Respiratory Activity:** Fruits and vegetables are living entities and respire to produce carbon dioxide and water. Excessive respiration causes early softening and spoilage. Therefore many attempts have been made to regulate respiratory activity to extent the shelf life of fruits and vegetables. Use of hormones and growth regulators (Gibberellic Acid, Kinetin and Vitamin K, 2, 4-D) along with suitable packaging to control moisture have been found to extend the shelf-life of fruits and vegetables.

Use of ethylene scrubbers also retards senescence in fresh fruits like, banana, apples, guava, spota etc. and there by helps in retarding senescence and spoilage. Depending on the storage temperature, the formulation extends the shelf life of Mango, Guava, Capsicum and Banana, which are also the major horticultural products of Nadia, for 4 to 45 days. Therefore, training through Entrepreneurship Development Programme training
throughout the year over the different blocks of Nadia district by the District Industrial Centre is needed to spread these scientific knowledge to the cultivators and entrepreneurs.

4. **Controlling Physiological Loss and Moisture:** The use of waxes and emulsions result in decreased respiratory activity due to the control supply of the oxygen. This also results in the reduction of psychological losses in weight. The emulsion can also act as a carrier to fungicidal and bactericidal compounds and there by further enhancement of storage life. A number of ready to use formulations are available in trade which can be used successfully for preservation of fruits and vegetables. These coatings are based on waxes, starch, sucrose esters and glycosides. Very recently, in the year 2011-12, a multipurpose modern cold storage cum preservation station has been installed in Dhattanla-Nokari region (block-Ranaghat-I) to provide these kind of services to the cultivators to sustain the market value of the products over the year.

5. **Use of Chemical Substances for Controlling Fungal and Bacterial Rot:** A number of fungi like, Altenaria, Fusarium, Rhizopus, Pencillium, Sclerotinia and bacteria. Eriwna and Pseudomonas cause spoilage in fresh fruits and vegetables. In order to extend the shelf life of fruits and vegetables a number of chemical substances like Sulphur dioxide, Chlorine, Dichloran, Biphenyl, Osidum-o-phenyphenate, Thiobandaozle, Benomyl, Bavistin, Imidazoll etc. have been successfully used for controlling the spoilage. From these substances some easy to use formulations like, ‘Grape-Guard’ have also been developed which have proved useful in extending the shelf life of different vegetables. Bidhan Chandra Krishi Visyavidyalay (BCKV, Mohanpur) may take the oppertunity to introduce these advanced knowledge and facilities to the cultivators of Nadia district.

6. **Refrigerated Storage:** Nadia district is suffering severly so far as the storage facility is concerned, as mentioned earlier in detailed in the Chapter no IV. The district contain only 29 ware houses and the total number of cold storage in this district is only 2 at present. Lowering the storage temperature also lowers the rate of respiration rate and also prevents the growth of fungi and bacteria. Therefore, low temperature has been found to be most useful to prolong the storage period for fruits and vegetables without spoilage. However, certain tropical fruits like banana, mango and spota require scientific low temperature
ranging from 10 percent to 14 percent to avoid problems of ripening. Also it is essential that during low temperature, the fruit should not be allowed to freeze to chilling injury. Desiccation is another problem at lower storage temperature and therefore proper packaging are essential for obtaining adequate benefits from this type of storage.

In most of the developed states and even in other districts namely Barddhaman, Hugli and Maldah refrigeration chain has been established which ensures quality vegetables even after long period of storage. This considerably helps in stabilizing the market price and to provide adequate returns to the farmers for their produce. Where as in case of Nadia the number and storage capacity both has not increased since 1999 onwards and the total cold storage capacity has dramatically reduced from 12300 metric ton in 1999 to only 4000 metric ton in the year of 2009-10.

7. Evaporative Cool Storage: Besides mechanical refrigerated cold storages which can be maintained at any desired temperature, evaporating cool storages have emerged as alternative storages where cooling effect is obtained by evaporation of water. By increasing the surface area for evaporation, it has been possible to lower down the temperature upto 15 percent centigrade which is good enough to enhance the shelf life of fruits and vegetables by 5 to 15 days. In evaporating, cooling, humidity is maintained high and therefore moisture and physiological losses are relatively low. Since there is no energy requirement, the cost of cooling is very low as compared to refrigerated cold storages.

8. Controlled /Modified Storage: It has been observed that if the concentration of carbon dioxide is increased in storage atmosphere, the rate of respiration of fruits and vegetables decrease considerably. This has been used in the controlled atmospheric and modified atmospheric storage of fruits and vegetables. Controlled atmospheric storage along with refrigeration extends the shelf life of fruits and vegetables considerably. But the method requires accurate control of various gases in chamber.

Modified atmospheric storage on the other hand is relatively simpler as simple plastic films of desired permeability characteristics and perforation are used for controlling the concentration of carbon dioxide and oxygen. By use of this method, the shelf life of banana bunches is extended from 5-15 days, carrots from 7-14 days, capsicum from 8-13 days,
green chilies from 4-8 days and tomatoes from 7-15 days. At low temperature, the extension of shelf life is much longer. As agricultural products considered as the raw material in agro-based food processing industry, the preservation and storage of these products need special emphasis. Storage also ascertains the supply of the raw material throughout the year. Poor storage facility of Nadia District has not only damaged the agricultural marketing infrastructure of the district, it has also prevented the development of agro-based food processing industry.

9. Hot Water or Vapour Heat Treatment: In this method, fruits and vegetables are treated at 45-55 centigrade with hot water. This treatment considerably reduces the rate of respiration of fruits along with biochemical and physiological changes. It also eliminates surface bacterial and fungal spores and insects. In case of the papayas and green beans, treatment in higher temperatures has no effect but accelerates the rate of deterioration.

10. Precut Vegetables: There has been considerable interest in precut and trimmed and packaged vegetables. Marketing of whole vegetables leads to considerable wastage and resultant environmental degradation. Removal of inedible parts in the field itself during harvesting of vegetables will eliminate wastages, improve sanitation and hygiene and reduce transportation cost of vegetables. Though at present there are some difficulties in marketing of precut or minimally processed vegetables by proper consumer education these methods can be made successful with many advantages in hygiene and sanitation. The active participation and activities are needed by the District Industrial Centre over the different blocks of Nadia district to spread these scientific knowledge to the cultivators and entrepreneurs.

6.6. The Status and Spatial Distribution of Agro-industrial Crops in Nadia:
According to B.N.Banerjee, (1987) there is a need for better and closer collaboration between industry and agriculture. In fact in a country like India, agriculture is predominantly important in economics without which the agriculture industry cannot grow. It is complementary but weighs are more in favour of agriculture. Therefore it, is primarily in the interest of industry itself to see the agriculture grows.
The single most important problem of the present century is perhaps the increasing remunerative price of the farmers for their production without incurring additional burden of subsidy through minimum supportive prices or some such measures. This problem could be solved largely if the surplus production of cereals, fruits, vegetables, milk, fish, meat and poultry etc. are processed and marketed aggressively both inside and outside the country. Food processing adds value, enhances selling life and crop diversification. It has the large employment generation potential for solving the basic problems of agricultural surplus and wastages and providing rural jobs, ensuring better prices to the growers. A strong and dynamic food processing sector thus play a vital role in diversification and commercialization of agriculture to ensure value addition to the agricultural product, generates employment, enhance income of farmers and creates surplus for the export of agro food.(S.Sharma-2003)

Paddy, Vegetables, Potato, Fruits, Spices and Mustard may be considered as the principal agro industrial crops of Nadia district and as the raw material, agro-based food processing Industrial units are dependent over these products. Jute, Wheat, Linseed, Gram, are also grown in the district. A comprehensive analysis of major agro-industrial crops of Nadia District are given below:

6.6.1. Paddy:

Paddy is the main crop and productivity of aus and boro paddy is maximum in Nadia district (National Agricultural Research Project Status Report 1995). Production of Aus paddy has increased. The target area for aman paddy cultivation is highest in Chakdah block where 17600 hectare land has been targeted for this purpose whereas it is only 3000 hectares in the Nabadwip block. According to Directorate of Agriculture (2007-08) the total production of aman paddy has just fallen into 232.2 thousand tons from the previous year's production of 280.8 thousand tons while productivity of aman and aus rice is 2837 and 2449 kg. per hectare respectively (Annual Plan of Agriculture-2006-07). Boro paddy which is also the principal crop of the district cultivated throughout all the blocks in general and in Chakdaha block in particular, where the total 15325 hectare land has been cultivated under boro paddy. In Nabadwip block the area is lowest, just 2550 hectare. huge amount of block-wise variation has been found so far as the productivity of boro
concerned. On the other hand it is evident, from the fig no.3.14 of Chapter III, productivity is highest in Nakashipara block and lowest in Krishnanagar I block with the amount of productivities of 3993 kg/hectare and 2880 kg/hectare respectively. Total amount of production according to Annual Plan of Agriculture 2006-07, is highest 54246 metric ton at Chakdaha block and lowest 7315 metric ton at Tehatta II block.

Table No. 6.2. Spatial Distribution of Cereals Production as Agro-industrial crops:

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the crop</th>
<th>Production in MT</th>
<th>Major Growing Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rice</td>
<td>619074.7</td>
<td>All Blocks</td>
</tr>
<tr>
<td>2</td>
<td>Wheat</td>
<td>125279.8</td>
<td>Chapra, Karimpur, Nakashipara, Krishnanagar I and II, Hanskhali</td>
</tr>
<tr>
<td>3</td>
<td>Gram</td>
<td>6386.6</td>
<td>All Blocks</td>
</tr>
</tbody>
</table>

Source: District Industrial Centre Report-2010-11, Nadia.

6.6.2. Wheat:

Wheat is another important agro industrial crop of the district and it is the main source of atta and maida as the basic raw materials of food processing industry. In the year 2006-07, a total of 47975 hectare land has been targeted as the production area of wheat throughout the district but the target has not marked the complete success and only 43110 hectare land (89.86 percent) has been achieved for the cultivation of wheat. From block-wise variation, it is clear enough that (Appendix no. VI.a) in the blocks namely Santipur (1340 ha.), Karimpur (800 ha.), Haringhata(600 ha.) are the leading blocks, so far as the difference between targeted area and achieved area of wheat production is concerned (fig no.6.1) Productivity is 2597 ton per hectare in Nadia district according to Annual Plan of Agriculture 2006-07. Through all over the blocks, total production is highest in Nakashipara block (14224 ton ) and is lowest at the block of Krishnaganj where it is only 2835 ton.
6.6.3. Oil seed:
The mustard is the main oil seed of the district which comprises 70,000 hectare of land for cultivation in the district. Total amount of production is 73014 ton and the productivity 1043.6 kg. per hectare. Though it is an important agro industrial crop of the district but the total area under rapeseed and mustard has decreased over the years. In the year 2002-03, a total of 85.4 thousands hectare of land has been cultivated under rapeseed and mustard, it has decreased to 79.6 thousand hectare in 2006-07 (according to Directorate of Agriculture, Government of West Bengal). Total production has also declined from 76.8 thousand hectare of 2002-03 to 69.1 thousand of ton in 2006-07. In Karimpur block the total production is highest (8250 ton) and it is lowest in Krishnanagar I block where total production is only 950 ton.

Table No. 6.3. Spatial Distribution of Oil-seed Production in Nadia:

<table>
<thead>
<tr>
<th>SI No</th>
<th>Name of the crop</th>
<th>Production in MT</th>
<th>Major Growing Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rape and Mustard</td>
<td>87150.3</td>
<td>All Blocks</td>
</tr>
<tr>
<td>2</td>
<td>Linseed</td>
<td>1015.5</td>
<td>Chapra, Karimpur, Hanskhali</td>
</tr>
<tr>
<td>3</td>
<td>Groundnuts</td>
<td>6393.5</td>
<td>All Blocks</td>
</tr>
</tbody>
</table>

Source: District Industrial Centre Report-2010-11, Nadia.
Sunflower which is going to be very important and useful agro industrial crop has not yet received much attention in the district for cultivation. Total 4000 hectare of land has been targeted for the cultivation and only 1275 hectare (31.88 percent) has been achieved. Total production is only 1999 metric ton throughout the district. Sunflower cultivation is highest in Hanskhali block and the total production of the block is 511 metric ton and it is lowest in the block of Nabadwip where only 35 hectare has been cultivated under this crop and the total amount of production of 31 metric ton. From block-wise variation, following diagram has been drawn (fig no. 6.2), from which it is clear enough that in the blocks namely Tehatta-I (835 ha.), Karimpur (475 ha.), Kaliganj (465 ha.) and Nakashipara (360 ha.) are the leading blocks, so far as the difference between targeted area and achieved area of sunflower production is concerned (Appendix no. VI.a).

6.6.4. Pulses:

The pulses occupy one of the most crucial role in food processing industry as raw material. But the area as well as the total production is decreasing over the years. In the year of 2003 a total of 6.8 thousands hectare land has been cultivated, it is only 39 thousands hectare in the year 2006-07. Total production has also decreased sharply from 53 thousands ton of 2002-03 to only 28.3 in the year 2006-07. However Tehatta-I, Tehatta-II, Chapra, Kaliganj and Krishnanagar II blocks are leading producer of Musur and Mung dal.
Table No.6.4. **Spatial Distribution of Cereals production in Nadia:**

<table>
<thead>
<tr>
<th>SI No</th>
<th>Name of the crop</th>
<th>Production in MT</th>
<th>Major Growing Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Musur</td>
<td>15736.5</td>
<td>All Blocks</td>
</tr>
<tr>
<td>2</td>
<td>Motor</td>
<td>1738.2</td>
<td>Do</td>
</tr>
<tr>
<td>3</td>
<td>Khesari</td>
<td>1757.5</td>
<td>All Blocks</td>
</tr>
<tr>
<td>4</td>
<td>Winter Kalai</td>
<td>4258.7</td>
<td>All Blocks</td>
</tr>
<tr>
<td>5</td>
<td>Corn</td>
<td>1085</td>
<td>Chapra, Karimpur, Krishnagar I and Hanskhali</td>
</tr>
</tbody>
</table>

Source: District Industrial Centre Report-2010-11, Nadia.

6.6.5. Sugarcane:

The sugarcane is an important cash crop of the district on which not only the economy of the growers depends but also one large scale sugar industry which has been established at Palash, namely the Khaitan Sugar Mill depend on it. But it is observed that like other agro industrial crop sugarcane producing area and the total production is decreasing. Only 77.4 thousand ton sugar cane is produced in the year 2006-07 in comparison to 219.5 thousand ton production in the year of 2002-03. Total sugarcane producing area has, also been decreased from 2.7 thousand hectare of 2002-03 to 1.1 thousand hectare in the year of 2006-07, according to the Directorate of Agriculture Government of West Bengal.

Table No. 6.5. **Block-wise Difference Between Targeted Area and Actual Area of Agricultural Productions in Nadia-2006-07:**

<table>
<thead>
<tr>
<th>SI No.</th>
<th>Blocks</th>
<th>Target (hactare)</th>
<th>Achievement (hactare)</th>
<th>Difference (hactare)</th>
<th>Percentage of Difference</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chakdah</td>
<td>68133</td>
<td>64327</td>
<td>3806</td>
<td>5.59</td>
<td>Low</td>
</tr>
<tr>
<td>2</td>
<td>Chapra</td>
<td>45995</td>
<td>44637.62</td>
<td>1357.38</td>
<td>3.04</td>
<td>V. Low</td>
</tr>
<tr>
<td>3</td>
<td>Hanskhali</td>
<td>44253</td>
<td>42683</td>
<td>1570</td>
<td>3.55</td>
<td>V. Low</td>
</tr>
<tr>
<td>4</td>
<td>Haringhata</td>
<td>37470</td>
<td>33195</td>
<td>4275</td>
<td>11.41</td>
<td>Medium</td>
</tr>
<tr>
<td>5</td>
<td>Kaliganj</td>
<td>46035</td>
<td>42939</td>
<td>3096</td>
<td>6.73</td>
<td>Low</td>
</tr>
<tr>
<td>6</td>
<td>Karimpur</td>
<td>75025</td>
<td>67970</td>
<td>7055</td>
<td>9.4</td>
<td>Medium</td>
</tr>
<tr>
<td>7</td>
<td>Krishnagar</td>
<td>22000</td>
<td>19694</td>
<td>2306</td>
<td>10.48</td>
<td>Medium</td>
</tr>
<tr>
<td>8</td>
<td>Krishnagar-I</td>
<td>47466</td>
<td>44995.5</td>
<td>2470.5</td>
<td>5.2048</td>
<td>Low</td>
</tr>
<tr>
<td>9</td>
<td>Krishnagar-II</td>
<td>25950</td>
<td>22755</td>
<td>3195</td>
<td>14.04</td>
<td>High</td>
</tr>
<tr>
<td>10</td>
<td>Nabadwip</td>
<td>18281</td>
<td>15243</td>
<td>3038</td>
<td>19.93</td>
<td>V. High</td>
</tr>
<tr>
<td>11</td>
<td>Nakashipara</td>
<td>56698</td>
<td>51018</td>
<td>5680</td>
<td>10.02</td>
<td>Medium</td>
</tr>
<tr>
<td>12</td>
<td>Ranaghat-I</td>
<td>26727</td>
<td>24067</td>
<td>2660</td>
<td>9.95</td>
<td>Medium</td>
</tr>
<tr>
<td>13</td>
<td>Ranaghat-II</td>
<td>39436</td>
<td>37027</td>
<td>2409</td>
<td>6.11</td>
<td>Low</td>
</tr>
<tr>
<td>14</td>
<td>Santipur</td>
<td>34247</td>
<td>31132</td>
<td>3115</td>
<td>9.1</td>
<td>Medium</td>
</tr>
<tr>
<td>15</td>
<td>Tehatta-I</td>
<td>39924</td>
<td>38399</td>
<td>1525</td>
<td>3.82</td>
<td>V. Low</td>
</tr>
<tr>
<td>16</td>
<td>Tehatta-II</td>
<td>32193.5</td>
<td>29647.5</td>
<td>2546</td>
<td>7.91</td>
<td>Low</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>659833.5</td>
<td>609729.6</td>
<td>50103.88</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Office of the Principal Agricultural Officer, Krishnagar.
Chapter VI: Status and Prospect of Food Processing Industry

Achievement and Failure of Agro Industrial Crops
(Nadia District: 2007)

Legend

<table>
<thead>
<tr>
<th>Range</th>
<th>Nature Degree</th>
<th>Name of the Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 - 4.0</td>
<td>Low</td>
<td>Tehatta-I, Chapra, Hanskhali</td>
</tr>
<tr>
<td>4.1 - 8.0</td>
<td>Low</td>
<td>Tehatta-II, Kaliganj, Krishnagar-I, Ranaghat-II, Chakdaha,</td>
</tr>
<tr>
<td>8.1 - 12.0</td>
<td>Medium</td>
<td>Karimpur, Nakashipara, Krishnagar, Santipur, Ranaghat-I, Haringhata,</td>
</tr>
<tr>
<td>12.1 - 16.0</td>
<td>High</td>
<td>Krishnagar-II</td>
</tr>
<tr>
<td>16.1 - 20.0</td>
<td>V. High</td>
<td>Nakadwip</td>
</tr>
</tbody>
</table>

Data Source: District Principal Agricultural Office, Nadia.
Note: Map has been drawn on the basis of sixteen agricultural blocks of Nadia.

Fig No. 6.3

Micro Level Planning Based on Agricultural Potentiality: A Case Study of Nadia District, West Bengal
With the help of above tabulation, calculation has been made to divide Nadia district into different agro productivity zones. A map has been prepared to figure out the levels of difference so far as the target area and achieved area of different agricultural productivity is concerned (fig no.6.3). With the help of this map Nadia district has been divided into five different level of agro productivity zones, namely very high, high, moderate, low and very low, where higher the value is representing the greater difference thus, the high level of deficiency. Difference between targeted area and achieved area under different agricultural crops clearly reveals the anomaly between actual and hypothetical agricultural production of the very block. Thus, with the help of zonation method the block-wise variation has been established so far as the level of efficiency or agricultural production are concerned.

With the help of fig no.6.3 it is evident that Nabadwip (19.93) and Krishnagar-II (14.0) followed by Haringhata (11.41) blocks posses the highest position in the difference and representing the highest level of agricultural deficiency followed by the blocks of Nakashipara (10.02), Ranaghat –II (9.95), Karimpur (9.4), Santipur (9.1) and Tehatta-(7.91) where the level of intensity is maximum. On the other hand blocks like Chap (3.04) and Hanskhali (3.55) have experienced the lowest level of difference between targeted area and achieved area which clearly denotes the balanced agricultural productivity and development in these blocks. As Karimpur block –I and II treated as single agricultural blocks, in time of making this map, Karimpur has been treated as a single block.

6.7. Status of Agro-based Food Processing Industries in Nadia District:
The nature and the development of the food processing industry in Nadia District, gathered from the industrial establishment data (EMP I and II, 2006 to 2011), has been analysed along with the unequal growth and establishment of different types of processing industry within this period throughout the blocks of Nadia District.

6.7.1. Paddy Processing:
Paddy processing occupies the prime position amongst all agro based processing in Nadia. The industry has built up sufficient design and manufacturing capabilities for various...
machinery and equipment required for paddy processing and milling. Several types of paddy driers, parboiling plants, shelling, fast separation, polishing and grading equipment along with a variety of mechanical and automatic handling systems are available. Three blocks have gone into modernized rice mill along with technical collaboration like well known rice mill machinery users in Barddhaman and Birbhum District.

However, rice husk is being used only as source of fuel in rice mills, in making particle boards, in poultry houses as bedding material and in landfills. Similarly, paddy straw has found limited applications as cushioning material in packaging of fruits and for preparation of soft boards. It is extensively used as cattle feed in many parts of Nadia district. The upcoming areas in rice processing research and development include high capacity dehuskers and more efficient polishers, improved technology for storage of paddy and rice, on farm or community level drying of paddy, mechanical handling systems for grain markets and millers, cold storage of rice and downstream products, products diversification in the form of flakes, puffed rice, snacks, bakery items, quick cooking and ready-to-eat rice etc. The need is therefore, to promote modern rice mills and develop milling technology for fine rice.

Future of Rice Mill and Associated Industry:
Because of the liberal government and other developmental measures being taken the future of the industry looks very bright. The discussion over agricultural development in
the district of Nadia (Chapter no. III), it has emerged clearly that the production base being enlarged, modern methods of cultivation are being adopted, thus various attempts have been made to improve the productivity which will help in retaining quality and freshness and reduce post harvest losses so far as the development of processing industries by rice products in Nadia District is concerned. With the new hybrid varieties being added, the production season is also being extended.

These developments shall result in the greater availability of quality raw materials to the industry. Thus resulting in better capacity utilisation and producing a wider range of products and international quality. The quality is now the watchword for success. With the rise in the per capita income particularly of the middle class a drastic change in the food habits has been noticed. This will lead to an increased domestic consumption of the processed foodstuffs.

The multinationals now entering the food industry have an international marketing network and have their brand loyalties all over the world. This has enabled the local agriculture products reaching all over the world in the form and packing required. On the other hand these international marketing networks has experienced a monopolistic market with the the number of Kishan Credit Card holder and disbursement of loaner huge capital at brand loyalty where the local entrepreneurs are seems far behind.

6.7.2. Wheat Processing:
Nadia district is still lagging behind in respect to wheat as a base for agro-based industri development. It still depends on imported wheat as a raw material, which generally brought from outside district. Moreover privately owned large bakeries import the machineries from Delhi and Maharashtra. Again small bakeries still use firewood or charcoal instead of oven. These are some of the major drawbacks of the agro-based industry in the district.

A number of commercial organizations have been offering processing units for handling cleaning, grading, drying, storage, treatment and bagging of wheat for seed and food applications. Wheat is now increasingly being used in the form of bread, biscuits, suji or atta. Wheat flakes and puffed wheat as breakfast cereals has been gradually picking up. Traditionally used smaller size atta chakkis may face problems of declining clientel Better mechanized chakkis (with lower pollution level and better energy efficiency) a
likely to increase in number. The number of roller flour mills is also likely to increase steadily, however, majority of the mills may continue facing the problems of low capacity utilization and working capital constraints. These units would need to function through vertical integration of operations for sustaining profitability and cost reduction.

Trends in consumer preferences suggest increasing demand for baked products. Demand for bread is likely to grow faster than the demand for biscuits. Presently bread is consumed mostly in large cities. Its consumption is expected to grow in smaller towns also. States with higher per capita income would continue to lead in the consumption of baked products. Among diversified products, full brand wheat bread has also been gaining popularity.

![Block-wise Distribution of Major Agro-based Processed Industries](image)

**Fig No 6.5**

Data Source: District Industrial Centre. Nadia.2011

Blockwise profile of rice mill and wheat grinding centers exhibit a poor scenario in totality. Out of 23 rice mills, only Chakdaha possesses five and rest of the blocks have either one or two rice mills, while out of total 15 wheat grinding centers Chapra and Ranaghat II has 3 each while others are insignificant in this respect.

**6.7.3. Oil Seeds Processing**

Mustard oil and oil cake processing occupies one of the prime position amongst agro-based industrial centres in Nadia. A wide range of plants and machinery for refining at small
scale is found in the different blocks of Nadia. These plants also find export markets outside the district as well as in the states.

In the area of packaging of edible oils, significantly rapid growth has been recorded in Nadia district specifically in urban centre attached with industrial units. Polypacks and plastic containers have gained popularity over traditionally used metal containers about 30-35 years ago. Refinement of oil meal/cake for food products development could be of high importance. Oil expeller with lighter weight, high energy efficiency and capable of extraction up to 90 percent oil and above needs to be developed for decentralized oil milling. Hydraulic press, batch solvent extraction, extrusion-expelling and physical refining, also need to be considered and tried.

6.7.4. Soyabean Processing:

Besides other oilseeds, soyabean has gradually become an important crop of India. Soyabean is a special legume. Average recovery is 17.7 percent for oil and 82.4 percent for meal. Soyameal contains about 48 percent protein. Its export has been worth Rs.15,000 million/year. Soya foods are nutritious and economical and must be promoted. A strategic plan for expansion and diversified use of soyabean for food in India for the next 25 years should be made and implemented. This crop has a great potential to enhance nutrition and health status of the people and to alleviate poverty. To uphold the banner of agro-based food processing industry in Nadia district, the cultivation and production of soyabean therefore, is of utmost need. But the cultivation of this commercially and industrially sound agricultural production is been neglected throughout every blocks of Nadia district.

Fig No.6.6 Block-wise Location of Oil Processing Units, Nadia

Data Source: District Industrial Centre. Nadia. 2011

Micro Level Planning Based on Agricultural Potentiality: A Case Study of Nadia District, West Bengal
The future areas of research include application of bio-technology for enhancing yield of edible oil from different oilseeds, application of de-oiled cake for food purposes through protein isolation and health applications of edible oil for treating various physiological disorders.

6.7.5. Fruit and Vegetable Processing:
With a wide range of vegetable and horticultural productions, Nadia district deserves a distinct place for fruit and vegetable processing in the state. Preparatory operations in processing is important for tropical fruits like mango, banana, jack fruit etc. are carried out in labour intensive manner due to lack of suitable machineries. However for betterment of the industry, modern and up to date technology is required.

6.7.6. Processing of Jute:
Jute, started with West Bengal state, has the distinction of having ushered India into industrialization era. Both jute production and manufacture of jute-based products are highly labour intensive. For each tones of jute, 2-3 tones of jute sticks are produced. Chemically these resemble hardwood. Sticks are traditionally used as fuel wood and low cost structural material. Jute sticks yield excellent particle boards and the technologies are now fully commercial. Jute sticks are a good feedstock for paper pulp. The sticks can also be used as fuel for steam and power generation.
Box No. 6.4 New Application of Processed Jute: Invented by IIT, Kharagpur:

Jute is the latest fad. It is used in everything from delicate jewellery to hardly bags. Researchers have now found one more use of the omnipresent golden fiber: as an additive in cement to strengthen it delaying its setting. “During construction, roofs are flooded with water for as long as 28 days to strengthen the structure. Water is also sprinkled on the walls for the same purpose. Addition of jute strengthens the structure further”, says Subhasish B Majumder of IIT, Kharagpur. Majumder and his team investigated the impact of adding jute to cement and found it significantly delays hardening. According to their study, published in Industrial and Engineering Chemistry Research on 23 January 2013, this delay in hardening can allow for transport of the mixed mortar and concrete over long distances. The study shows that depending on the amount of jute in the mix, delay in setting could be as long as eight hours. This would allow for a transport at around 200km. says Majumder.

The group had earlier shown that jute is sustainable reinforcement material and has a potential to replace steel or synthetic fibers in cement, the most widely used building material. The fiber makes cement compositions resistant to cracks. By reinforcing cement matrix with jute fibre, the compressive and flexural strengths of the resultant mortar was increased to 9 percent and 165 percent respectively, as compared to the mortar specimen without jute reinforcement. This comes as an advantage in quake-prone areas, says Majumder.

The study was done to investigate how adding jute to cement mix could change its properties. This is imperative before the material can be used widely in construction. While the researchers are yet to figure out the increase in cost due to this addition would cost Rs. 40 per cubic metre of concrete. “This natural fiber is a fantastic reinforcement material for concrete,” says one of the researchers, Basudam Adhikari. “We used the material in sewer pipes, lamp posts and railway sleepers and found that the addition of jutes leads to substantial improvement in properties”.

6.8. Industrial Intensity of Nadia district: A Block Level Variation

Through the spatial distribution of agro-based food processing industry, the very nature of growth and the pattern can be identified. Calculation of industrial intensity in this regard reveals the levels of variation so far as the distribution and development of agro-based food processing industry is concerned. Therefore, calculation of industrial intensity is also necessary for strategy making and planning purpose. According to Mondal and Peters (1982) ‘ An answer to what of the planning strategy seeks adherence to favour to deliberate industrialization. An answer to how of the planning strategy settles with the notion of rational dispersal. Rational because the strategy goes for concentrated decentralization or decentralized polarization to in fuse sectoral specialisation through selective development. Spatial distribution of things or phenomena at all levels of regional subdivisions tends to follow the norms of inequities.

With the help of the data provided by the District Industrial Centre, Krishnanagar, Nadia, an attempts has been made to analyse the spatial distribution and to identify the block-wise variation of agro-based food processing industry. From the records of Entrepreneur
Memorandum Part-I and Part-II, preserved in the District Industrial Centre, Krishnanagar, an account has been made of those industries, who have registered themselves in D.I.C. office in between 12.12.2006 to 20.04.2010. After processing the data (Appendix no. VI.b), to figure out the industrial intensity of Nadia district, block-wise data has been tabulated with the help of the following formula:

\[ I_i = \sqrt{\frac{X + Y}{2}} \]

Where,

\[ X = \text{No of industries in respective block} \times 100 \] / \[ \text{No. of industries in the entire district}, \]

\[ Y = \text{No of block-wise employment in agro-based food processing industry} \times 100 \] / \[ \text{No of employment in agro-based food processing industry in the entire district}. \]

### Table No. 6.6. Industrial Intensity of Nadia district, 2010-11

<table>
<thead>
<tr>
<th>Sl no.</th>
<th>Blocks</th>
<th>No. of Industry</th>
<th>Industrial percentage</th>
<th>No. of Labour</th>
<th>Labour Percentage</th>
<th>Industrial Intensity</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chakdah</td>
<td>10</td>
<td>4.52</td>
<td>57</td>
<td>4.05</td>
<td>4.29</td>
<td>Low</td>
</tr>
<tr>
<td>2</td>
<td>Chapra</td>
<td>17</td>
<td>7.69</td>
<td>102</td>
<td>9.74</td>
<td>8.72</td>
<td>Medium</td>
</tr>
<tr>
<td>3</td>
<td>Hanskhali</td>
<td>17</td>
<td>7.69</td>
<td>51</td>
<td>4.87</td>
<td>6.28</td>
<td>Medium</td>
</tr>
<tr>
<td>4</td>
<td>Haringhata</td>
<td>4</td>
<td>1.81</td>
<td>67</td>
<td>6.39</td>
<td>4.1</td>
<td>Low</td>
</tr>
<tr>
<td>5</td>
<td>Kalimpong</td>
<td>23</td>
<td>10.4</td>
<td>91</td>
<td>8.69</td>
<td>9.55</td>
<td>High</td>
</tr>
<tr>
<td>6</td>
<td>Karimpur-I</td>
<td>8</td>
<td>3.62</td>
<td>46</td>
<td>4.39</td>
<td>4.0</td>
<td>Low</td>
</tr>
<tr>
<td>7</td>
<td>Karimpur-II</td>
<td>6</td>
<td>2.72</td>
<td>37</td>
<td>3.53</td>
<td>3.13</td>
<td>Low</td>
</tr>
<tr>
<td>8</td>
<td>Krishnaganj</td>
<td>11</td>
<td>4.98</td>
<td>57</td>
<td>5.44</td>
<td>5.21</td>
<td>Low</td>
</tr>
<tr>
<td>9</td>
<td>Krishnagar-I</td>
<td>19</td>
<td>8.6</td>
<td>66</td>
<td>6.3</td>
<td>7.45</td>
<td>Medium</td>
</tr>
<tr>
<td>10</td>
<td>Krishnagar-II</td>
<td>5</td>
<td>2.26</td>
<td>40</td>
<td>3.82</td>
<td>3.04</td>
<td>V. Low</td>
</tr>
<tr>
<td>11</td>
<td>Nabab镍ip</td>
<td>15</td>
<td>6.79</td>
<td>34</td>
<td>2.42</td>
<td>4.6</td>
<td>Low</td>
</tr>
<tr>
<td>12</td>
<td>Nakashipara</td>
<td>13</td>
<td>5.88</td>
<td>55</td>
<td>5.25</td>
<td>5.57</td>
<td>Low</td>
</tr>
<tr>
<td>13</td>
<td>Ranaghat-I</td>
<td>20</td>
<td>9.05</td>
<td>88</td>
<td>8.4</td>
<td>8.73</td>
<td>Medium</td>
</tr>
<tr>
<td>14</td>
<td>Ranaghat-II</td>
<td>9</td>
<td>4.07</td>
<td>82</td>
<td>7.83</td>
<td>5.95</td>
<td>Low</td>
</tr>
<tr>
<td>15</td>
<td>Santipur</td>
<td>4</td>
<td>1.81</td>
<td>37</td>
<td>3.53</td>
<td>2.67</td>
<td>V. Low</td>
</tr>
<tr>
<td>16</td>
<td>Tehatta-I</td>
<td>14</td>
<td>6.34</td>
<td>62</td>
<td>5.92</td>
<td>6.13</td>
<td>Medium</td>
</tr>
<tr>
<td>17</td>
<td>Tehatta-II</td>
<td>26</td>
<td>11.77</td>
<td>75</td>
<td>7.16</td>
<td>9.47</td>
<td>High</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>221</td>
<td>100</td>
<td>1047</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Computed by the Author
Fig. No. 6.8

Intensity of Agro based Industry
Nadia District (2006-07 to 2010-11)

Data Source: District Industrial Office, Krishnanagar, Nadia.

Micro Level Planning Based on Agricultural Potentiality: A Case Study of Nadia District, West Bengal
With the help of above mentioned formula, calculation has been made to divide Nadia district into different agro-based food processing industrial intensity zones. A map has been prepared to figure out the levels of development so far as the location and intensity of industry is concerned. (fig no.6.8) where Nadia district has been divided into four different level of industrial intensity, namely very high, high, moderate or medium and low.

With the help of Map no. 6.8 it is evident that Kaliganj (9.55) and Tehatta-II (9.47) block posses the highest position in industrial intensity, followed by the blocks of Ranaghat (8.73) and Chapra (8.72) where the level of intensity is maximum. On the other hand block Santipur (2.67), Karimpur-II and Krishnanagar-II have experienced the lowest level of intensity.

It has been expected that block Haringhata and Chakdaha will rank a high level of industrial intensity, as the Kalyani industrial region is there and it is also a part of Kolkata Metropolitan Area with full of industrial demand. But the high degree of intensity in agriculturally developed blocks of Nadia instead of industrial region proves that, these blocks are waiting for the future industrial development with huge potentiality so far as the agro-based food processing industry is concerned.

Identification of Different Sectors of Agro-based Food Processing Industries for Future Prospect in Nadia district:

Cereals and Jute Processing:
- Modern Rice Mill, Rice Flakes, Puffed Rice, Hard Board from Rice Straw.
- Modern Flower Mill
- Processing units for decorticating of different pulses and Groundnut Dal Milling.
- Cornflakes.
- Edible oil extraction plant from mustard seed, linseed, sunflower, groundnut.
- Manufacturing of jute-diversified item like jute twine, jute twisting, jute partic board, jute stick powder.

Vegetables Processing:-
- Processing units for Dehydration & Canning of cabbage, cauliflower and peas.
- Processing units for juice, sauce, ketch up of tomato and canning of tomato.
- Potato Processing (Chips, Powder, Granules).
- Servicing units for grading, sorting and packing of fresh vegetables for domest and export market.
- Short duration storage/ Multi-purpose cold storage.
Fruits Processing:

- Processing units for producing mango leather, mango bar.
- Processing units for extraction of mango pulp for producing different food items.
- Processing units for juice pickles of mango using modern technology.
- Juice extraction from litchi and canning of litchi.
- Processing units for banana powder, banana wafer.
- Canning of jackfruits.
- Processing units of Date Palm molasses candy, canning of Date Palm molasses after being produced by modern process.
- Service providers like ripening chambers, grading, sorting and packing house.

**Table No. 6.7. Address and Machinery Code for the Entrepreneurs interested in Agro-based Food Processing Industry of Nadia District:**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name and Address of Manufacturer</th>
<th>Machine code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>East End Engineering Co., 173/Gopal Lai Thakur Road, Kol-35</td>
<td>B,D,F</td>
</tr>
<tr>
<td>2</td>
<td>Pasteur Engineering Co., (P)Ltd., 15/8/A The Mall, Dumdum, Kol-80</td>
<td>B,C,D,E,F</td>
</tr>
<tr>
<td>3</td>
<td>Elmech Engg. Co., 4 Commercial Buildings (2nd floor), 23 N.S. Bose Road, Kol-1</td>
<td>C</td>
</tr>
<tr>
<td>4</td>
<td>B.S. Industries, 14/B Manmathanath Ganguly Road, Kol-2</td>
<td>F</td>
</tr>
<tr>
<td>5</td>
<td>Oriental Machinery (P) Ltd., 25 R.N. Mukherjee Rd., Kol-1</td>
<td>B,D</td>
</tr>
<tr>
<td>7</td>
<td>5-Cargo, 28 A Narayan Chandra Dutta Street, Kol-6</td>
<td>D</td>
</tr>
<tr>
<td>8</td>
<td>Model Mark, Howrah-Amta Road, Dasnagar, Howrah-711015</td>
<td>C</td>
</tr>
<tr>
<td>9</td>
<td>Basic Technology (P) Ltd., 2/2B Nundy Street, Kol-29</td>
<td>A,B</td>
</tr>
<tr>
<td>10</td>
<td>McNeil and Magor Limited, 4 Mango Lane, Kol-1</td>
<td>E</td>
</tr>
<tr>
<td>11</td>
<td>Vulcan Level Limited (Alfa-Level), 104 Ho-Chi-Minh Sarani, Kol-71</td>
<td>E</td>
</tr>
<tr>
<td>12</td>
<td>Laxmi Boiler Pvt. Ltd., 11/A Chowrongee Terrace, Kol-20</td>
<td>A</td>
</tr>
<tr>
<td>13</td>
<td>Hamilton Engg. Works Pvt. Ltd., Mall Road, Kol-80</td>
<td>A</td>
</tr>
<tr>
<td>14</td>
<td>Shiva Glass Works Co. Ltd., 27 Braboun Road, Kol-1</td>
<td>B,D</td>
</tr>
<tr>
<td>15</td>
<td>Prercision Engg. Co., 72 Hindustan Park, Kol-29</td>
<td>A</td>
</tr>
</tbody>
</table>

Source: District Industrial Centre Report-2010-11, Nadia.

A- Boiler/ Burner/ Pipeline, B-Pulper/ Juicer/ Mixer/ Press Bottling Plant, C-Rice, Wheat Crusher/ Grinder/ Seive, D- Peeler/ Slicer/ Coring Machine, E- Sterilising Drier/ Evaporator Concentrator, F- Steam Jacket Pan/ Storage Tank
6.9. Food Processing Industry in Nadia: Nature and Evolution:

The growth potential of agro-based food processing industries in the district like Nadia is enormous due to its natural advantage of raw materials as also mammoth size of domestic markets. Nadia is one of the low cost producers of wide range of fruits and vegetables. The district has a market more than 8 million people in Kolkata alone. It has easy access to Bangladesh for export and booming market in West Bengal of 80 million people.

The horticulture has been recognized as an important area for product diversification in today’s agri-business system. The state government has given top priority for development of food processing industries in the state. It has been to create a suitable and congenial situation to attract entrepreneurs for setting up food processing industries in the State. A number of small, medium and large scales of food processing industries in fruits, and vegetables and mushroom, potato and biscuit have come up. In the light of above scenario a thorough analysis of agro-based food processing industries of Nadia district has been carried out. As mentioned earlier in chapter-I, a detailed account have been obtained about block wise variations of agro-based food processing industrial location from Nadia district Industrial centre, Krishnanagar. Along with spatial data, establishments and evolution of the industry has also been analysed. Different elements of agro-based food processing industry namely amount of investment, turnover, employment of labourers and related input-output documents has been analysed to figure out the actual status and conditions of agro-based food processing industry within the regional variations of Nadia district (Appendix VI.b. and VI.c). To serve this purpose a set of ten year data (2000-2009) regarding various elements of agro-based food processing industries of Nadia district like total investment, total turnover and status of employments have been analysed.

6.9.1 Nature of Investment:

Agro-based industries are these, which are involved in supplying the farm with agricultural inputs besides handling the products of the farm. Agro-based industries are those industries which have either direct or indirect links with agriculture. Agro-based industries must foster the spirit of interdependence between agriculture and industry. Such industries must
use the raw materials provided by agriculture and their output must have a market among the rural population. Surplus rural manpower must be absorbed by these industries.

The economic prosperity depends largely on the development of agro-based food processing industries which in turn leads to the creation of forward and backward linkages of the development process on large scale by making mutual complementary of agriculture and industries. A set of ten year data (2000-2009) regarding total investment of agro-based food processing industries of Nadia district has been analysed. According to the reports maintained by DIC, Nadia, total investment has been categorized under following two sections:

- **Investment in Plant and Machinery/ Equipments:**— This includes machinery, factories, equipment, new technology, buildings, computers, and other goods that are designed to increase the productive potential of the economy for future years. Nowadays, many consider computer software to be a form of fixed capital or equipment. This type of capital in the form of investment does not change due to the production of the good.

- **Investment in Other Fixed Assets:**— This has many meanings, including the financial capital or other fixed assets raised to operate and expand a business. In much of economics, however, "capital" means goods that can help produce other goods in the future, the result of investment. It refers to machines, roads, schools, infrastructure, and office buildings which humans have produced in order to produce goods and services.

![Graph showing nature of investment in different sectors of processing industry, Nadia](image)

Fig No.6.9 Source: District Industrial Centre, Krishnanagar, Nadia
As reflected from the fig no. 6.9 above that total investment has shown a radical increase in the year 2008-09 and a total of 289 lakh Rs. has been invested. In Nadia district, upto the financial year 2009-10 total 915 lakh Rs. has been invested in different sectors of agro-based food processing industry (Appendix VI.b). Rice processing and allied sectors have achieved the highest percentage of investment of 256 lakh Rs.(27.97 percent) followed by mustard oil processing (22.19 percent), wheat processing (20.87 percent) and baker sectors (13.66 percent). Otherwise making of jam, jelly and pickle reveals insignificant in the district's industrial profile and posses only 5.36 percent of total investment. Dehydrated and puffed rice Sectors of Nadia also account a very negligible amount of 6 lakh Rs.(7.21 percent), which can not be considered as a improved sign so far as the development of area under agro-based food processing industry is concerned.

6.9.2. Nature of Employment Generation:
The establishment of agro-based industries may be expected to result in the creation of indirect employment opportunities. Th indirect employment creates in the farm sector would mainly be in the form of additions employment generated followed by the changes in the cropping pattern. It has been observed that the tertiary sector developed in the parts of Nadia district and that the growth of this sector can be attributed only to the location of the agro-based industries. The development of agro-based industries in rural areas substantially increased the wage rates for different agricultural operations. The increases was more pronounced in the case of women and child labourers than in that of men. Obviously the wage differentiations were reduced among casual labourers men, women and children to a large extent. But wage differentials cropped up in a new direction in rural areas i.e. agricultural workers and workers employed in agro-based food processing industries. In brief, the wage rates of agricultural workers increased irrespective of the nature of the agro-based industries in rural area.

It is evident from the below diagram (fig no. 6.10) that in Nadia district, upto the financial year 2009-10 total 838 labourer has been appointed directly in different sectors of agro based food processing industry (Appendix VI.c) where number of employment generation has experienced a sharp increase in the year 2008-09. Rice processing and allied sector...
have achieved the highest percentage of employment generation of 163 (19.45 percent) followed by dehydrated and puffed rice Sectors where 159 labourer has been assigned (18.97 percent), oil processing (18.38), wheat processing (16.59 percent) and bakery sectors (15.99 percent). Though making of jam, jelly and pickle posses a bit in the district’s industrial profile and achieve only 10.62 percent of total employment, it is interesting to note that in this sector scope of employment generation has been enhanced in recent years.

![Status of Employment in Different Sectors of Processing Industry, Nadia](image)

**Fig No.6.10** Source: District Industrial Centre, Krishnanagar, Nadia

**6.9.3. Nature of Turnover:**

The rural agro-based food processing industry can enhance farm incomes by offering a ready market for farm products, generate off-farm employment, and reduce rural–urban migration.

Total 3319 lakh Rs. turnover has been gathered in different sectors of agro-based food processing industry of Nadia district at the end of 2009-10 financial year (Appendix VI.c). As reflected from the above (fig no. 6.11) that total turnover has shown a radical increase in the year 2008-09 and a total of 1287 lakh Rs. has been invested. wheat processing and allied sectors have achieved the highest percentage of turnover (38.78 percent). It is interesting to note that in 2008-09 Nakashipara block has experienced a annual turnover of 1200 lakh Rs. through wheat processing. Rice processing and allied sectors have accounted a turnover of 652 lakh Rs.(19.64 percent), followed by dehydrated and puffed rice Sectors (486 lakh Rs.,14.64 percent), and mustard oil processing (13.35 percent).
Stages and Processes of Small Scale Food Processing Industry and Role of Labourer

Photo No. 6.1 and 6.2. Preparation of different food items from agricultural raw materials

Photo No.6.3. and 6.4. Process of grading and standardization of different food products

Photo No. 6.5. and 6.6. Process of grading and packaging of different food products and participation of female labourer
On the other hand, making of jam, jelly, and pickle reveals insignificant in the district’s industrial profile and possesses only 2.59 percent of total turnover. Rural-based food processing industries are mostly small- and medium-sized enterprises and face such constraints as poor infrastructure, shortage of entrepreneurial talent and skilled manpower, limited access to appropriate technologies, volatile demand, and small profit margins along with low turnover. It can be concluded that all the types of processing system have a distinct place in a district like Nadia to complement crop production to meet the food demand with proper industrial establishment and employment generation. Historically, however, small and intermediate scale processing proved to be more successful than large scale processing.

Box No. 6.5. A Tentative Plan of Introducing Industries into Agricultural Areas:

1. To designate rural areas as target areas to improve the storage capacity of raw materials and also to provide employment through District Industrial sector.
2. Concerted efforts to develop rural areas into industrially cultured and clustered areas.
3. To involve Panchayet as the nodal points for developing their own schemes, plans, monitoring system and infrastructural development agencies.
4. The local area has to develop its own potential industry; it must plan and act to provide incentives in rural areas, basically in terms of infrastructural support.
5. Administration at the level of the block level authority state government as well as the must enable rural industrialization to become an economically attractive proposition.
6. The central government has to take concerted policy, steps to encourage, plan, fund and monitor the implementation of schemes through Zilla Parishads. For this, positive incentives which should be at par or better than those available to urban industries must be mooted.
7. Linkages with educational institutions keeping in mind the problem of funds and cultural development of institutions. One should realize that it is only under pressure that better results are obtained. The coordination required between educational institutions, farm and industry, planners and funding institution can be achieved only through coordinated efforts.

8. The Centre can act like a non-profit-making body consisting of major departments of government which are interested in rural industrialization.

9. While organizing this centre the following points will have to be kept in mind:
   (i) Area planning, (ii) SWOT analysis of the areas, (iii) Infrastructure and linkages with educational, developmental, and marketing institutions, (iv) Study of marketing potentials, both local and outside the rural area, (v) Institution and local finance, (vi) Identifying entrepreneurial capacities and institutionalizing them, (vii) Linkages with on-going programmes, (viii) Learning lessons from past mistakes.

The above steps, if taken in right earnest, will go a long way in involving agriculture, rural development department, voluntary organization and industrial houses, etc. for sustainable industrialization.

6.9.4. Disadvantages of Large Scale Industries:

Industrialization in any country is to be viewed with reference to the local context, the economic, demographic and social conditions. Ideas, programmes and technology are to be adopted suited to the indigenous conditions. While the large industries have a place and play a vital role in the national economy, they suffer from certain disadvantages in the context of developing countries. These disadvantages are relative in nature. They are in a way associated with the political and economic systems, nature of the population, and the resources with which the country is endowed. Briefly some of the disadvantages of large-scale industrialization are:

- Developing and agro-based economic areas like the district of Nadia, generally lack know-how and technical skilled workers, whereas small-scale and cottage industries, normally, do not require a high level of technology. Small-scale and cottage industries are labour-intensive therefore do not require large amounts of capital. Along with the overall agricultural potentiality, district of Nadia much developed in handloom industry also. Small-scale industrial projects can be undertaken in a short-span of time and hence can increase production with direct implications both in the short and long run. Most of the developing regions are rich in certain agricultural, forest, extractive, mineral and marine resources, hence small-scale and cottage industries can be based on the processing of locally available and produced raw materials.
Chapter VI: Status and Prospect of Food Processing Industry

• Large scale industries requires large capital resources beyond the capacity of developing countries to rise on their own, which involves substantial foreign exchange which is not available in adequate amounts from the export earnings of the regions like Nadia district.
• The large-scale units take longer gestation period resulting in immediate inflationary trends in the economy. Because of the sophisticated nature of technology and techniques adopted, it has to depend for quite some time on technical know-how from abroad.
• Employment potential per unit of capital investment in large-scale industries is too small to afford much relief to the growing unemployment problem. Most often, large-scale industrialization has resulted in concentration of economic power in fewer hands, it failed to provide solutions to regional economic imbalances and generated monopolistic tendencies.

Box No. 6.6. Market Fragmentation of Agro-based Food Processing Industry

( Case study of Coca-Cola )

The evolution of the food industry in the past 15 years may be considered as a case-study of a fragmented market that is becoming increasingly global under the effect of two powerful forces: the evolving patterns of consumption and technological progress. In the 1970s the food industry was characterized by: i) a large number of local producers, generally specialized in the production of a single good or in a set of closely related products; ii) a small number of national or international producers also specializing in a single core business; iii) an even smaller number of multinational firms, which were either extremely diversified (Unilever, Nestlé) or strictly specialized (Coca Cola).

Starting in the mid-1980s, however, the larger producers in Europe and the United States gradually took over local markets by developing a high-growth strategy based on three tenets: i) covering the market to achieve dominance of a few standard products; ii) increasing the degree of differentiation by acquiring or by directly challenging the local leaders; and iii) introducing new products that could embody some of the characteristics of local products without trying to replicate them. This strategy not only required rapid growth, but also an expansionary policy of horizontal acquisitions and aggressive control of marketing activities, such as advertising, retailing and investment in research and development for product innovation. The present trends, which constitute a continuation of the expansion at the national level, are mostly characterized by national producers’ attempts to upgrade their traditional leadership to an international level.

In the current environment of increasing competition in international markets the main strategies adopted by the agrifood enterprises have been those of obtaining, through acquisitions of other enterprises operating on foreign markets, a level of competitiveness which would otherwise have been more costly or risky to achieve. Indeed, the food industry has been affected since the early 1980s by major acquisitions, mergers and agreements, the main product of which has been a strong market concentration in numerous sectors. According to data from UNCTAD, over the period 1990-95, cross-border mergers and acquisitions in the food, beverages and tobacco manufacturing subsectors amounted to an annual average of $12.2 billion, representing 7.7 percent of total cross-border mergers and acquisitions over the period.
Under the foregoing disadvantages of large-scale industrialization, the prudent policy and approach could be dispersal and decentralization of industries which has, the following advantages:

- It is possible to save and earn foreign exchange by producing and exporting goods processed from local resources employing local unutilized and under-utilized labourer.
- Small-scale industrial enterprises, whether traditional or modern, provide a training ground for local entrepreneurs for upward movement. The knowledge and managerial skills gained through small-scale industrial enterprises can be transferred to other sophisticated enterprises.
- By creating opportunities for the small businessmen, small industrial enterprises can bring about a more equitable distribution of income.
- The growth of small-scale and cottage industries in the district like Nadia will help to create economic stability in society by diffusing prosperity and by checking the expansion of monopolies and concentration of wealth in a few hands.
- The development of small-scale and cottage industries will create employment opportunities in the rural areas where unemployment and underemployment are relatively high. These are the most important characteristics in agriculture dominated regions like district of Nadia. This will tend to reduce the exodus of workers from the rural to the urban areas in search of jobs.
- The development of small-scale and cottage industries will make possible a transfer of manufacturing activities from the congested urban centers to rural areas. This dispersal and deconcentration of manufacturing away from the urban areas is a policy pursued by most of the developing countries.
- Apart from the linkages between agricultural or rural development and small-scale industrial enterprises, there is an essential linkage between large and medium-scale industries and small-scale industries in the sense that the former create opportunities or facilities for the growth of the latter.
- The development of small-scale and cottage industries in rural areas will contribute to balanced regional development and a relative local self-sufficiency and social justice. It also contributes to rehabilitation of displaced persons.
And so, industry alone with a wider spread embracing all rural communities can draw the hidden unemployed off the land into production and so long as they are left on the land, agriculture cannot increase its efficiency. Industrialization must jolt the agrarian sector out of its deep sleep. This transformation is to be brought about in a phased manner with systematic and realistic planning of schemes carried on by rightly orientated and trained administrative and developmental personnel.

6.10. The Importance of D.I.C in Promoting Rural Industries:
The District Industries Centers (DICs) Programme was launched on 1st May, 1978 to provide the focal point for promotion of Small, Tiny, Village and Cottage Industries and to provide all the services and support to the decentralized industries sector under a single roof as far as practicable at pre-investment, investment and post-investment stages. The main thrust of this programme is on the development of such Industrial Units in rural area and small towns of the country which would create larger employment opportunities in these areas. In pursuance of the statement of the Industrial policy announced in Parliament in July, 1980, the organizational pattern of the DIC has been restructured in order to increase their implementation capability in the development of Industries.

The restructured D.I.C. would consist of the one General Manager and four Functional Managers. Out of whom three Functional Managers will be in Use field of Economic Investigation, Credit and Village Industries respectively. In respect of the 4th Functional Manager, State Governments would be free to choose from any of the areas such its Raw Materials, Marketing, Training, Information, Infrastructure, depending on specific requirements of each districts. The District Industrial Centre of Nadia district, situated in Krishnagar, provides various assistances and supportive schemes in favour of entrepreneurs interested in agro-based food processing industry. To analyse the role and activities of DIC, Nadia, following points can be worked out:

Assistance programme and Activities of the District Industries Centre for Setting up of Enterprises in Micro and Small Sector:

1. D.I.C, Nadia provides technical support for preparation of Project Report by which the project may achieve approval, assistance of different schemes, loans etc.

2. Information of sources of machinery and equipments are also provided by D.I.C, Nadia.
3. Approval of Project Report.
5. Priority in Power supply.
6. Facilitating service for pollution clearance certificate.
7. Receiving of Entrepreneur Memorandum Part-I and Part-II. D.I.C, Nadia preser all the detailing about these memorandum. With the help of this EMP report tl status and block-wise location of agro-based food processing industry, with the different elements can be checked and analysed.
9. D.I.C, Nadia provides financial Assistance through Prime Minister Employment Guarantee Project Scheme also.
10. Marketing Assistance through West Bengal State Industrial Development Corporation.
11. Marketing Assistance through Participation in Exhibitions, Trade Fair / Buyer Sellers Meet, etc.
15. Assistance under West Bengal Incentive Scheme-2007.
16. Attending problems related to Land Conversion / Power Connection/ Pollution Clearance/ Financial Assistance etc.
17. Training through Entrepreneurship Development Programme: District Industri Centre provides training through Entrepreneurship Development Program throughout the year overall the different blocks of Nadia district. D.I.C, Nad provides 4 to 5 Training programme in a month on an average. To analyse tl activity of D.I.C the training schedule has been examined thoroughly. A example of training schedule for two months from December 2009 to January 2010 is given below:
Table No.6.8. Training Schedule by DIC, Nadia

<table>
<thead>
<tr>
<th>Blocks</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chakdaha</td>
<td>22.12.09</td>
</tr>
<tr>
<td>Kaligunj</td>
<td>23.12.09</td>
</tr>
<tr>
<td>Ranaghat-II</td>
<td>24.12.09</td>
</tr>
<tr>
<td>Haringhata</td>
<td>23.12.09</td>
</tr>
<tr>
<td>Haringhata</td>
<td>24.12.09</td>
</tr>
<tr>
<td>Haringhata</td>
<td>22.01.10</td>
</tr>
<tr>
<td>Nakashipara</td>
<td>27.01.10</td>
</tr>
<tr>
<td>Ranaghat-I</td>
<td>28.01.10</td>
</tr>
</tbody>
</table>

Source: DIC, Nadia, 2011

From the above data, it is evident that Block Haringhata and Kalyani Industrial Region is getting more attention in comparison to other blocks of the district so far as the training programme and assistance are concerned. To gain a overall development and balanced industrial growth, DIC. Nadia might attain every block of the district along with its various schemes and facilities. There are provisions that in addition to the staff mentioned above (in structure of DIC), each District Industries Centre could have maximum of three Project Managers in disciplines considered relevant to the needs of the districts. The role of the Functional Manager of Village Industries would be supplementary to that of existing Boards or organization to take care of the different Village Industries like Handloom, Handicrafts etc. District Industrial Office financed projects are improvisation of local designs and fabrication of equipments and handling systems, specially for traditional food machinery.

In a view of modernization of the Agro-based food processing industries in Nadia District, state government in its last industrial policy has stressed for the infrastructural development vis a vis training programmes to be provided by the district industrial centre. Equipment which can be imported under the special scheme of food processing industry development of Government of India include fruits and vegetable processing equipment for preparatory operation, paste goods machinery, processing machinery and a wide range of packaging machineries including aseptic packaging and processing machineries, feeling and ceiling for a variety of containers like reportable pouch system, flexible packaging.
materials, laminated collapsible tubes, thermo formed containers etc, Automatic labeling, coating, check weighing machineries and several other machineries which are not manufactured in West Bengal. It is expected that the use of computer based reservation and marketing system and micro-processors in agro-based food processing units will also be introduced in the near future in West Bengal in general and in Nadia in particular.

6.11. Overall Strategy for Rural Industrialization in Nadia District:
In Nadia, there are medium and small-scale industries besides cottage and cotton textile industries and the new type that has been recently conceptualized and added to the categories, the tiny sector. The medium and small industries have their own place depending on the nature of the product, raw materials, location advantages, regional requirements, priorities, transportation and the interests of the general public. But these industries are only a partial answer to the socio-economic needs and problems of the developing region like Nadia. The promotion of small industries and supporting and sustaining the traditional cottage and agro-based food processing industry in agriculturally sound rural areas plays a much-needed complementary role in balanced development. A multi-pronged integrated strategy on the following lines has to be adopted to ensure proper development of village industries:

1. The heavy and sophisticated industries should not be allowed to establish in rural areas for which neither the required inputs are available in villages nor is there any scope or arrangement for sale of the produced material. Agro-based food processing industry is therefore, the best option for the process of rural industrialisation so far as the development and diversification of agricultural products is concerned.

2. Priority should be given to the establishment of village industries in remote rural areas, and village industries should be recognized as an independent sector for purposes of industrial development. District Industrial Office (DIC), Krishnanagar along with different Gram Panchayets, should make a machinery to promote rural industrialisation according to regional variation.
Entrepreneurs with a genuine motivation to run village industries should be identified, and those having technical skills should be preferred. Gram Panchayets should have more administrative and economic power in this regard.

Procedure of providing financial help should be simplified and made economical. Preference should be given to the people belonging to non-asset owning groups in rural areas.

Capital has a great role in promoting the process of rural industrialisation in general and agro-based food processing industry in particular. For the upgraded tools and machinery, raw materials and export works capital can play a crucial role. Therefore, assistance and effectiveness, through loans and subsidies should be increased by different commercial and cooperatives banks in the blocks of Nadia district. Refinancing of sick units should be done only after careful assessment of their viability.

Financial help in the form of working capital should never be released in one installment; instead, it should be released in more than one installment keeping in view the nature of the industry, after ascertaining the proper utilization of already released installment(s).

In no case should permission be granted for establishment in urban areas of such industries as have been traditionally in existence in villages from ancient times.

District Industrial Office (DIC), Krishnanagar along with different Gram Panchayets, should prepare a training and workshop program. A workshop should be established in every block to cater to the need for repairing of machines, tools etc. used in running village industries in the district.

The limit of financial assistance to village industries should be suitably enhanced from time to time. The entire responsibility for financing and refinancing should be entrusted to
the DIO and it should be given the responsibility to look after all other aspects of
development of village industries too.

10. Appropriate technology should be developed and made available for running the
village industries, including traditional industries.

11. The village industries should be operated collectively on a group basis, and suitable
work sheds should be constructed to provide the site for performance of work in a cluster.
Its reports should be published and the persons assigned to the responsibility should be
held accountable.

12. Appropriate arrangements for proper storage and sale of agricultural-produced material
at optimum rates, yielding maximum economic gains to the entrepreneurs should be made.
Adequate arrangement for regular and timely supply of good quality of raw material at
proper prices, as also for proper storage should be made. Nadia district, as mentioned
earlier in chapter-IV, lack of storage facilities and developed marketing system which are
the principal matter of concern. In order to promote sales, it will be necessary to produce
quality goods, undertake publicity campaigns, using among other means, the mass media,
particularly television; care should also be taken to maintain regular supply of the products
in demand.

13. Export of products of village industries should be encouraged by conducting survey of
foreign markets, organizing international trade fairs and exhibitions, granting concessions
in freight and permitting confessional air fare for short-term business visits to rural
entrepreneurs of repute.

14. Proper packaging of the produced material making is safe for consumption as well as
attractive so all possible help in the form of supply of packing material, guidance, etc.
should be made available. As packaging is very important in agro-based food processing
industry, attention must be given in this matter.
15. Suitable training in various rural industries should be organized before providing loans for opening local training centers and organizing workshops at the block level. The existing training institutions should be re-structured to make them self-supporting and further strengthened to provide innovative training, in new suitable areas in which rural industries can be viably established. The activities of District Industrial Centre of Nadia should be emphasized more.

16. Required number of technical know-how, guidance and supervision should be made available from time to time by establishing special advisory committees at the respective Panchayets, different blocks of Nadia district.

17. The overall responsibility for policy formulation and implementation of programmes relating to promotion of village industries in rural areas at the central level should be handed over to a separate autonomous body like a Village Industries Commission and a separate post of Development Commissioner for Village Industries should be created in the Ministry of Industries, Government of West Bengal.

18. Intensive survey of village industries requirements of each block should be undertaken by an independent agency in corporation with the respective Panchayet Samity; and based on that, district village industries plan should be prepared separately for Nadia district; to begin with, complete rural industrialization of at least one block should be undertaken.

6.12. SWOT Analysis of Agro-based Food Processing Industry in Nadia:
- Strengths:
  1. Round the year availability of raw materials is assured in Nadia where Irrigation Potentiality is 75 percent of Gross Cropped Area and Cropping Intensity is above 260 percent. With suitable Agro-climatic condition for Horticulture and Floriculture, coupled with large percent of water bodies suitable for irrigation. 2. Social acceptability of agro-processing as important area and support from both the central and state government. 3. Vast domestic market in highly populated Nadia district. 2. Connectivity: NH - 34, State...
highways and Eastern Railways connecting Kolkata and adjoining districts. 3. Kalyani: Upcoming Township and Industrial Estate.

- Weaknesses
1. High requirement of working capital. 2. Low availability of new reliable and better accuracy instruments and equipments. 3. Inadequate automation and information management. 4. Remuneration less attractive for talent in comparison to contemporary disciplines. 5. Inadequately developed linkages between Research and Development, laboratories and industry. 6. Topographically Nadia district is flood prone and western bank of the district is subject to continuous erosion and 7. No major industry / lack of entrepreneurs and Investment.

- Opportunities
1. Large crop and material base in Nadia district due to agro-ecological variability which offers vast potentiality for agro based food processing activities. 2. Integration of developments in contemporary technologies such as electronics, material science, computer, bio-technology etc. offer vast scope for rapid improvement and progress. 3. Opening of global markets may lead to export of country’s developed technologies and facilitate generation of additional income and employment opportunities. 4. Moreover, Nadia has been identified under AEZ - Agro and Food processing industry with the Industrialization potentials like Kalyani, Krishnanagar, Ranaghat, Bethuadahari and Chakdaha coupled with the scope of horticulture based industries.

- Threats
1. Competition from global players 2. Loss of trained manpower to other industries and other professions due to better working conditions prevailing there may lead to further shortage of manpower. 3. Rapid developments in contemporary and requirements of the industry may lead to fast obsolescence. 4. There are lack of marketing support for rural produce in Nadia. 5. No support from big hatcheries and nurseries for horticultural activities. 6. Migration of labourer to different states specially in time of Boro paddy and Mustard cultivation.
6.13. FDI in Agro-based Food Processing Sector: Costs and Benefits

In the annual report, 1996, WTO has discussed several aspects of FDI. The report contains a review and discussion of some of the benefits and costs of FDI to the host country, a question which has been the object of strong debate between supporters and critics of this type of investment. Although the discussion relates to all forms of FDI, it is of obvious relevance to the debates on the role of FDI in the agro-industrial sector and on the agri-food multinationals. Following are some of the main points that emerge from the WTO report.

According to the proponents of FDI, in general terms the benefits accruing to the host country are represented by an increase in national output and income exceeding the gain to the investor. These benefits can accrue either to domestic labourer (in the form of expanded real wages), domestic consumers (through lower prices and/or improved product quality) or government (as increased revenues).

Much criticism has, however, been voiced against FDI and the role of multinational corporations. Critics point to potential negative balance-of-payments effects in the medium term, as the multinational corporations increase imports of intermediate goods and start repatriation of profits. Other points of criticism or concern are the potential market power of multinational corporations on the domestic market of the host country, which would allow them to engage in various restrictive practices that reduce competition, and the possible vulnerability of the host country governments to political pressures. In general, WTO does not believe that these concerns can constitute a sufficient case against FDI as such. As for the potential negative balance-of-payments effect, it is pointed out that FDI in countries with high levels of import protection tends to be less export-oriented than in countries with low protection levels and also that any balance-of-payments effect will depend on the exchange rate regime of the country. In any case, it does not appear that the potential costs associated with FDI outweigh the benefits deriving from it. Also, it is the belief of WTO that some of the problems and concerns associated with FDI could be adequately dealt with in the framework of a multilateral agreement on FDI.
On the positive side, FDI has considerable importance as a vehicle for technology transfer. This transfer can of course take place directly to the farms affected, but there may also be important effects of indirect diffusion of technology in the host country. Such diffusion may be deliberate, for example through the upgrading of technologies in other domestic firms doing business with the foreign affiliate, or in the form of spillover effects, such as when technology is copied by other firms. Other important positive effects in the host country could be the pressure on domestic producers to upgrade and improve efficiency. According to WTO, the empirical evidence tends to support the view that FDI is the most potent vehicle for technology transfer and that FDI leads to higher productivity in locally owned firms.

FDI also has important effects on employment. The view that multinational corporations may have little impact on the development of local skills is rejected by the empirical evidence; rather, evidence tends to support the view that multinational corporations can fill critical management gaps, facilitate employment of local labourer and transfer skills to local managers and entrepreneurs.

6.14. Conclusion:
Agricultural growth gives ample opportunity for setting up various food processing industries to utilize available agricultural raw material. Food processing industry is vital linkage between two main pillar of economy that is industry and agriculture. This industry is going to occupy a driver seat in the economic activities in future. (NABARD PLP report 2011-12).

The growth and development of industries usually depends on certain factors which must exist for creating a favourable condition for industrialization. The population of Nadia district has increased considerably in recent years and the land available for agriculture can hardly support the people. Moreover, being situated very near to the industrial belt of Kolkata, the higher cost of living as well as rapid urbanization cannot perhaps be prevented. This necessitates the setting up and development of industries, mostly of consumer goods.

Though this district has no mining products and other industrial raw materials of importance, the availability of a large quantity of jute, sugarcane, raw hides, skins, etc.
justly the setting up of certain types of industries based on such raw materials. Facilities of communication have also increased considerably in recent times. Apart from the large network of railways, the construction of good roads has made most of the interior places of the district easily accessible. Pradhan Mantri Gram Sadak Yojona has played a very crucial role, which has been analysed previously in Chapter-IV, in this context. The PMGSY Scheme has enabled the cultivators of Nadia district to market their agricultural products. The highway linking Kolkata and Siliguri passes through Nadia district providing a ready link with both Kolkata and North Bengal. The opening of D.V.C.’s navigation canal has linked this district with the mining belt of the country. There is a great demand for power in the district for development of the rural industries. In the recent past, there is a good demand of power from the industrial consumers of certain places, namely, Kalyani, Ranaghat, Santipur, Chakdaha, Nabadwip, Krishnanagar, Fulia etc. It is expected that new types of modern industries will develop with further extension of power supply in the district.

Institutions which are engaged in research and development efforts on food processing equipment and technology in Nadia district are the District Agricultural Marketing Office, District Industrial centre, Bidhan Chandra Krishi Vishyavidyalaya (BCKV), Mohanpur and Jadavpur University.

As a measure to boost employment in rural and backward areas of Nadia district it is necessary to initiate immediate steps such as identification of certain traditional industries like fruit preservation and processing, which should be rendered marketing assistance. This calls for a package programme. Low cost practical consultants can be entrusted with the job of setting up of industries and arranging marketing facilities. Besides, they must function as a coordinating agency between the societies established in these inaccessible regions and the sales outlets in the plains. In respect of electronic industries, it is highly essential that a linkage is established with the organized sector producing electronic goods in the vicinity of urban areas. The female workers, particularly in the age group of 15-35, can be motivated to take up the activities by imparting adequate training to them in the nearby training centers. If need be, a nodal agency may be established around a cluster of such training units, where training in different industries can be imparted besides running pilot projects to inspire the local people to join more such activities.
Chapter VI: Status and Prospect of Food Processing Industry

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