REVIEW OF LITERATURE

CHAPTER 2

REVIEW OF LITERATURE

As mentioned in the previous chapter, the present study is an attempt to evaluate the nutritional status of tea plantation labourers in Assam and the influence of plantation type on their nutritional and socio-economic variables.

This chapter will be discussed under the following heads :

A. HISTORY OF TEA INDUSTRY IN ASSAM

I. Growth of the tea industry in Assam

II. Recruitment of labour

B. HEALTH AND NUTRITIONAL STATUS OF VARIOUS KINDS OF PLANTATION /CONSTRUCTION/AGRICULTURAL WORKERS

I. Global studies

II. Indian studies

A. HISTORY OF TEA INDUSTRY IN ASSAM

Tea is the major cash crop in Assam and occupies an important place so far as agriculture-based industries are concerned. Das (1931) and Griffiths (1967) have given detailed historical accounts of the Tea Industry in India with special reference to Assam. The history of Tea Industry will be discussed on the basis of their studies.

(I) Growth of the tea industry in Assam

In the early eighteenth century when the East India Company was functioning with its administrative headquaters at Calcutta, Governor General Warren Hastings outlined a plan to promote industrial development in the North Eastern part of the country. As a result of the plan in 1878, Sir Joseph Banks was asked to prepare a series of notes for the Company for evolving new crops for cultivation. He advocated cultivation of tea between the 26th and 30th parallel latitudes. In 1841 C.A. Bruce and Lieutenant Charlton of the Horticultural Society of India highlighted the fact that tea was indigenous to Assam. In 1823, C.A. Bruce visited the tea tracts in Assam and discovered wild tea plants. Later on, as reported in the Asiatic Journal in 1936, a scientific committee was entrusted to follow up this discovery with scientific vigour. This panel assembled at Sadiya in North East Assam during January 1936. They systematically searched all the tea jungles, analysed soils and collected seeds. Tea was found to be far and widely scattered in Assam. Dr. Wallich, one of the team members, then proposed to the Government of India to establish a large number of tea plantations in Assam.

The Government of India decided to try planting China seeds which demonstrated the most satisfactory results in all the areas of Assam. Thus,the first tea nursery was established in Assam towards the end of 1835 at Sadiya plantation and then in the Singpho forest near Sadiya. Some plants from Sadiya were

replanted at Jaipur. In 1937, a new plantation was established at Chabua and this proved successful. Tea was at that time manufactured by crude methods like drying in the sun after clapping the leaves between the hands to soften it and to give it a black colour and bitter flavour.

On 21st November, 1836 the Calcutta Courier reported that a small quantity of tea prepared at Sadiya in Assam was brought by Mr. Gordon to Calcutta. On 12th December, 1837 a large quantity of Muttock tea, cultivated in the Singpho forests, was sent to the Government of India. As per the suggestion of the Government, twelve chests of Assam tea (both from Sadiya and Chabua) were sent to the Honourable Court of Directors in London. On receiving the sample chest, it was extensively distributed for testing. Out of twelve tea chests, eight chests were auctioned at extraordinarily high prices. The Court of Directors in their letter of 23rd January 1839, expressed great satisfaction with the tea produced in Assam. Thus, with this successful manufacture of tea in Assam, the experimental stage was completed.

The high prices that Assam tea fetched in 1838-39, at once attracted the attention of enterprising businessmen both in Calcutta and London. In 1839, the Bengal Tea Association was formed in Calcutta and in the same year the Assam Company was formed in London to promote cultivation of tea in Assam.

In March 1840, practically all the East India Company's plantations except those at Chabua and Dinjoy were handed over to the Assam Company, rent free for ten years. The Company divided the plantations into two divisions - Northern and Southern under the charge of C.A. Bruce and J.W. Masters, respectively. Further, to expand the cultivation, The Assam Company leased jungle land from the Government under The Assam Waste Land Rule of 1838 and created a new Eastern Division.

By 1942, there were 1,645 acres of tea in the Southern Division and 666 acres in the Northern and Eastern Divisions. In the later years many new companies and individuals entered into this highly profitable business. Fifty seven private individuals or private companies and five public companies owned one hundred and sixty gardens in 1862. In the same year, production of Assam tea rose from 220,000 lbs to 1,250,000 lbs. Under these favourable conditions the tea industry flourished and both the area under tea cultivation and the yearly output increased tremendously.

Progress of the tea industry in respect to area under cultivation and production is outlined in the following tables. The data have been collated from various sources.

TABLE (1.a)

The progress of tea gardens from 1950 to 1980

Year	No.of tea Gardens	Area under tea (in Thousand acres)	Production (in million lbs)
1850	1	2.0	0.22
1859	48	58.0	1.21
1871	388	58.0	11.46
1890	867	231.0	82.12
1900	804	337.0	141.12
1910	730	350.0	173.72
1920	876	420.0	234.31
1930	996	433.0	226.34
1950	999	386.0	336.11
1970	751	445.0	473.33
1980	770	492.82	675.43

Sources : Griffiths (1967) and Tea Statistics (1971-71, 1980-81).

TABLE (1.b)

Number of tea gardens from 1975 to 1980

Year	No.of Tea gardens	No.of factories	Daily Avr. of labour employed (in '000)	Total Production (kg)	Area under cultivation	Average yield (kg/ hectare)
1975	756	589	402	263055	188794	1393
1976	753	579	404	276308	189338	1459
1977	756	579	410	293837	190621	1541
1978	763	576	421	297033	192427	1544
1979	769	576	446	306455	195459	1413
1980	770	575	446	306455	199441	1537

Source : Tea Statistics (1980-81)

TABLE (1.c)

Number, area and yield of tea gardens in Assam during the last decade

Years	No.of tea gardens	Area in (hectare)	Average yield in (tonnes)
1980	770	200,599	300,700
1986	844	224,718	-
1987	844	226,883	368,629
1988	844	-	371,745
1989	844	-	378,726

Source : J. Thomas Co., Pvt. Ltd. cited from Sutradhar, Tea Industry and Development of Assam by Bora (1990)

The conditions of soil and climate in Assam were favourable for the growth of Tea Industry, as abandoned and suitable land was easily available for growing tea. Phukan (1976) reported two grades of land, viz. high and low; however, only the high land, was suitable for growing tea. As there was not much demand for the land by the local people it could be easily acquired for tea cultivation.

Harler (1964) also reported that the Brahmaputra valley was perhaps the best tea growing area of the world, since the soil, climate and the topography were suitable for tea cultivation. Inspite of all these favourable conditions however, the greatest problem faced by the planters was with regard to recruitment of labour.

(II) Recruitment of Labour

For establishment and expansion of tea gardens a large number of labourers were required. In the early stages of experimentation, work was done with local labour. Bruce in 1839 complained bitterly of the shortage and unsatisfactory character of local labour resulting in high costs of production. He was very concerned about recruiting opium smoking Assamese labourers and suggested recruitment of labour from outside the state. With the establishment of more tea gardens,the supply of local labour became inadequate to meet this increased demand. Planters naturally preferred not to recruit the local inhabitants as they were indolent and largely addicted to the use of opium. Moreover,

they were not interested in working on tea gardens. Therefore, it became imperative to recruit labourers from other parts of India to meet the demand.

Another survey by the Labour Bureau (1968) reported that till the early fifties of the last century, local labourers were sufficient for Assam gardens. However, gradually with the increase in the number of plantations, availability of labour became a problem. There were mainly two reasons, firstly, the socio-economic set up of the region and secondly, the nature of the industry. Explaining the first reason, the Bureau mentioned that there were very few landless labourers in Assam and people who had land naturally preferred independence and ease of their position as cultivators as compared to the disciplined and regular hours of work of the tea gardens.

Referring to the second reason, the report indicated that the speculators had got interested in the industry quite early and as a result the industry was expanding too quickly. The land policy of the Government was a system which came into effect only in 1926.

Phukan (1976) in his study of ex-tea garden labourers suggested that only potential migrants could fulfil the large demand for labour in the tea industry in Assam. Patel (1965) reported that in the mid nineteenth century a vast landless agricultural labour section had emerged in densely populated provinces of India. However, lack of knowledge of Assam acted as

an obstacle for these potential labourers to migrate into these tea gardens. Since free flow of migrants was not expected and the need for labour was great, the colonial planters adopted a semi-forced method of recruitment of labour. Under this method, landless agricultural labourers from densely populated provinces of India were identified and forced to come to Assam.

In 1841, The Assam Company recruited the first batch of labourers from Chota-Nagpur in Bihar. An outbreak of cholera proved disastrous and none of the recruits reached the garden. In most cases recruitment was done through contractors in Calcutta. Planters fixed Rs.5.00 per month as wages for an imported labourer during 1858-59. However, mortality on the journey to Assam was high and on one occasion it was as high as fifty percent.

After such sporadic incidences of recruitment, in 1859, on the advice of the Bengal Government, the planters adopted a somewhat uniform recruitment procedure. The Tea Planters Association was entrusted to look after the recruitment and forwarding of labourers to Assam. They adopted the "Free Contractors" system under which contractors were employed by recruiting agents. These agents termed "Arkatties" or "Arkatiyas" were paid on the basis of the number of labourers recruited and placed at the disposal of the contractors for despatch to Assam. This system of recruitment was so horrific that it met with protests from various quarters. The mortality rate of labourers in their journey to Assam was appalling.

Griffiths (1967) reported that some 84,915 labourers landed in Assam between 1863 and 1866 of which over 30,000 died by January 1866.

The Bengal Government appointed a committee in 1861 to enquire into the emigration of labour to Assam and Cachar. The committee felt the need to control emigration of labourers to the plantations and suggested passing of an act. Thus, the first legislation for the control of emigration was formulated and the Transport of Native Labourers Act of 1863 was passed. This act became necessary for the recruitment of labourers for the Assam Tea Gardens and was the earliest plantation labour legislation in India (Phukan 1976).

Under this act, all recruits should be licensed, produced before the magistrate of their own districts and should be medically examined for fitness to work in Assam. But the act did not protect the labourers after their arrival in the garden. Therefore, it did not improve upon the conditions that prevailed during the "Free Contractors" system. The act was amended in 1865 but the new act also did not remove any of the abuses in the recruitment system. It prescribed minimum wages, limited to nine hours of work per day and six days per week, and laid down that contracts with immigrant labourers must not extend beyond three years. The act also provided imprisonment for refusal to work by an immigrant labourer or for absence exceeding seven days. Even this act did not work satisfactorily as reported by a Commission of Enquiry in 1868. The commission reported that the mortality

in transit was very high, many labourers who were totally unfit to work were sent back,and in many gardens labourers were over worked and ill fed and not properly attended to at the time of sickness. Death rates in many gardens as a result of bad housing, over crowding, impure water and insufficient or unsuitable food were appalling.

The Commission made a most important and constructive proposal. They considered that recruiting contractors had proved unsatisfactory and suggested recruitment by gardens themselves through the garden "Sardars". The act of 1865 was amended again in 1870 to legalise recruitment by garden "Sardars". The Government then passed an Act known as the Tea District Emigration Act of 1873. Recruiting through garden "Sardars" gained popularity. Labourers were engaged on a contract for one year and wages were Rs. 5.00 for a man and Rs.4.00 for a woman per month.

A few years later, a new Commission of Enquiry reviewed the working of the Labour District Emigration Act of 1873. In its report in 1881 it favoured free recruitment by the employers to accelerate importation of labour. Then the Government passed the Inland Emigration Act of 1882 which recognised the local agents in the recruiting districts and execution of contracts in the tea districts.

In the mean time Assam was separated from Bengal and brought under the administration of a Chief Commissioner. The Inland Emigration Act of 1882 was thus amended and the title of the Act

was changed to Assam Labour Emigration Act of 1893. A commission of enquiry appointed in 1895 strongly criticised the system of recruitment and pointed out the abuses. Subsequently, the government passed the Assam Labour Emigration Act of 1901. The Assam Labour Enquiry Committee in 1906 recommended few changes of the act which was again amended in 1915. The new act abolished the indentured system of labour recruitment for the Assam gardens.

Griffiths (1967) reported that Assam Labour Enquiry Committee in 1921-22 found that in many gardens the amendments had been ignored and local contracts for specific number of years were still being effected. A bill was passed in 1924 which repealed the act of 1859 and abolished the remaining traces of the indentured system of labour recruitment. Naturally, it became progressively difficult for the industry to get cheap labour locally.

The Royal Commission of London was appointed in 1926. According to this commission the system of recruiting families rather than individuals and the practice of granting land for spare time cultivation meant that the life of a tea garden labourer resembled that of the villager and avoided the worst features of town life.

As a result of the report of the Royal Commission on Labour (1931) the Tea District Emigrant Labour Act of 1932 was passed. The rules under the Act were published in July 1933 and though there have been minor changes in them from time to time, the Act

itself has required no amendment. Referring to this Act, Griffiths (1967) remarked that this immigration act worked well as it encouraged the recruitment of an entire family rather than an individual and provided land for spare time cultivation.

Subsequently, the Tea District Labour Association was formed for the purpose of recruitment of labour. After this, considerable improvements were noticed in recruitment of labourers which continued upto 1960. In the same year, when the Industrial Committee on Plantations decided that the recruitment from out side should be discontinued.

Literature pertaining to the recruitment of labour is very limited. The problem of recruitment of labour was clearly stated by the Royal Commission on Labour (1937), namely, that from the point of view of the employer, the outstanding problem during the whole history of tea planting in Assam has been the scarcity of labour. The bulk of the present tea gardens were, seventy years ago, uncultivated and nearly uninhabited jungles. For the expansion of the industry it was necessary to continuously import fresh labour. The Surma valley was able to secure a certain amount of labour either locally or from adjoining districts in Bengal. But in the Assam valley the supply of local labour was negligible and it was found impossible to obtain supplies from areas nearer than Chota Nagpur and Bihar.

Das (1937) stated that inspite of immense potentiality, the supply of labour in India is quite inadequate to meet the demand

of the organised industries. According to him the most difficult question of labour supply arose in connection with plantations, especially the tea gardens in Assam. Owing to ignorance and illiteracy, very few people in recruiting districts knew the actual conditions of work in Assam.

As mentioned earlier, tea industries in Assam have been dependent upon immigration for their labour supply. The Assam Company was importing labourers from Bengal. Later on, Chota Nagpur became the most important recruitment centre. The tribals of that area were considered to be most suitable as labourers. In the subsequent periods, Uttar Pradesh, Madhya Pradesh and some other areas gained importance as the recruiting areas for tea plantation labourers, although Chota Nagpur still continued to be a very important area of recruitment.

The distribution of tea plantation labourers from 1877-78 to 1880-81 with reference to their areas of origin is shown in Table (2). This period of four years has been highlighted because major labour recruitment was done during this period only. After that recruitment was very minimal (Griffiths, 1967) and also available data on recruitment is very scarce.

TABLE 2

Distribution of labourers during 1877-81 with reference to their area of origin

Labourers recruited from	Percentage of total labour force			
	1877-78	1876-79	1879-80	1880-81
Chota Nagpur	48.56	65.35	44.47	29.62
Santhal Paraganas	3.87	3.18	2.94	1.78
Bengal proper	23.08	14.66	19.75	43.81
Bihar	24.86	15.56	14.41	22.98
Orissa	0.15	0.02	0.08	1.78
North West provinces	0.86	0.39	0.06	-

Source: Annual Report on Inland Emigration 1880-81 (Bose & Kumar)

From the above data, it can be seen that there was a sharp fluctuation in the recruitment of labourers from different areas, within a short span of 4 years.

Das (1931) reported that nothing is definitely known of the exact number of immigrants who came to Assam in the early years. In 1877, their number amounted to 31,897 and rose to as high as 3,22,753 in 1918-19; but dropped to 68,900 in 1928-29 as shown in the Table 3 below:

TABLE 3

Labour immigration into Assam during the period from 1877 to 1929

Year	Men	Women	Children	Total
1877	15,205	10,558	6,134	31,897
1897	34,842	31,486	29,603	95,931
1918-19	74,980	60,630	87,143	3,22,753
1928-29	37,161	16,548	15,191	68,900

The proportion of women and children in comparison with men also varied from year to year. Further, due to the sudden expansion in the number of gardens in the year 1918-19, there was a nearly four fold increase in the number of labourers recruited in that year. The need for these labourers then stabilised and there was a decline in the recruitment in the subsequent years.

The origin of the plantation worker can also be recognised by their surname or caste (Phukan, 1976). Among the common names are those listed below :

	Name of Caste	Place of origin
i.	Tanti	Orissa
	Naik Guala Pantanti	
ii.	Teluga, Rao	Andhra Pradesh
iii.	Kurmi	Bihar
	Kuli Munda Rabidas Orang Bhumis	
iv.	Kurmi	Uttar Pradesh
	Rabidas	
v.	Karmakar..	West Bengal
	Munda Kuli Nag	
vi.	Chowra	Madhya Pradesh
vii.	Naidu	Tamilnadu

Women labour in tea plantation

In India, the demand for women labour outside their traditional economic occupations (agriculture and handicraft) was extremely limited. However, plantation industry made a greater demand for women workers particularly when they were available as a part of a family unit.

The history of the recruitment of labour revealed that this labour intensive industry is always dependent on a settled labour

force. Recruitment was on a family basis as the men were not expected to leave behind their families to migrate to this distant place for occupation.

Sengupta (1960) quoted Atkins (1957) regarding employment of women in tea estates as "In due course woman found a niche in the tea estates on account of her more skilful fingers in relation to plucking and the attractive garden pluckers became famous throughout the tea drinking countries of the world. It is in fact difficult to think of any other industry in which women have played so important a part. We find her, therefore, an essential factor in this industry because she can do certain types of work better than the male and not because she is being exploited".

According to Das (1931) there are several reasons for a proportionately larger number of women workers on plantations which are as follows :

i. Being akin to agriculture, plantations are more congenial to women than other organised industries such as factories and mines.

ii. The very fact that the labourers not only work but also generally live on plantations or in the vicinity gives women a chance to work on them.

iii. The system of labour contracts based on the principle of utilising every able bodied person in the family for labour and of fixing the wage rates accordingly compelled women to seek employment in order to balance the family budget.

Sengupta (1960) listed the reasons for greater employment of women workers as follows :

i. The nature of work in plantations being agricultural in character requires little skills.

ii. Recruitment of plantation labour was on a family basis.

iii. The low wages prevailing in plantations necessitate that all members of the family including women and children should work.

The tea garden labourers form an important population group in Assam. Forgetting their origin they have become a part of the Assamese population and consider this state as their homeland. Yet, the disturbing factor is that there still remains a wide gap of social contact between the tea garden labourers and the local people of Assam.

B. THE HEALTH AND NUTRITIONAL STATUS OF VARIOUS KINDS OF PLANTATION/CONSTRUCTION/AGRICULTURAL WORKERS

Though research on the nutritional status of vulnerable groups has gained momentum in the last decade, yet studies on the general nutritional status assessment of adults are very limited. Data is more scanty for the agricultural or industrial labour community. The studies available are reviewed here.

I. Global studies

Gardner et al (1977) studied the interrelationship of physical work capacity and selected physiological parameters related to work performance in female (26-62 years of age) tea estate workers in Sri Lanka. They reported a wide variation in the haemoglobin levels with a range from 6.1 to 15.9 g/dl.

Another study on Sri Lankan female tea plantation workers by Edgerton et al (1979) reported that poor nutritional status (assesed by haemoglobin concentrations between 6.0 to 9.0 g/dl) of the tea plantation workers was directly related to poor plucking performance. An improvement in the nutritional status and plucking performance was observed after iron supplementation.

Anaemia and productivity were studied among the Indonesian workers by Basta and Churchill (1973). The haemoglobin levels of these workers were between 11.0 to 11.9 g/dl. Davies et al (1973) studied the African industrial workers and reported the mean haemoglobin level to be below 10 gm (8-12 g/dl).

In another study, agricultural labourers engaged in primitive agricultural tasks, aged 16-41 yrs, and residing in Guatemala were investigated by Cifuentes and Viteri (1972). Sixty nine of the farmers were anaemic with the haemoglobin values ranging from 3.5 to 16.5 g/dl, using the WHO cut -off point of 13.0 g/dl.

There are few studies available which compare the haemologin levels of male and female workers. One such study in the Philippines, on industrial workers reported that the per cent prevalence of anaemia, based on the WHO cut off point of 13 g/dl for men and 12 g/dl for women, was higher among female workers. The study also indicated that younger women were more prone to anaemia. In contrast older men were more likely to be affected. Further the prevalence was more among women of the low income

group and those from large families. The reported haemoglobin level in males ranged from 7.9 to 14.6 g/dl and in females from 6.8 to 13.8 g/dl (Ona et al, 1978).

Japanese farmers from 49 regions of the country were studied by Watanabe et al (1986). The prevalence of anaemia judged by haemoglobin concentration was 3.7% in men and 10.3% in women using the WHO cut off point of 13 g/dl for men and 12 g/dl for women respectively. Futatsuka (1985) also reported similar values of Hb in Japanese agricultural workers. Scant data are available on the anthropometric status of different categories of labourers. The studies reviewed below indicate a far from satisfactory situation.

Thirty one adult (34-39 yrs of age) tea plantation workers in Sri Lanka were studied by Edgerton et al (1981). They reported that the height of the workers ranged from 146 $\pm$ 4 to 147 $\pm$ 2 cms; weight from 38 $\pm$ 3 to 39 $\pm$ 2 kg; and haemoglobin levels from 6.3 $\pm$ 0.1 to 13.8 $\pm$ 03 g/dl. Similarly, Spurr (1977) studied the productivity of sugarcane cutters in Columbia. The workers were within the age group of 18 to 34 yrs and had haemoglobin values between 12.0-16.5 g/dl; and the weight/height ratio ranged from 29.9 to 41.2 kg/m.

In another study (Torun et al, 1989) compared the nutritional status of 2 communities of sugarcane cutters of coastal Guatemala. Their ages were 34 $\pm$10 and 36 $\pm$12 years. Not much differences were observed in their weights and heights. The

values reported were 57.6 ±5.4 and 53.5 ±6 kg for weight and 160 ± 6 and 159 ± 6 cms for height respectively. Zuniga et al (1986) reported on men and women between 18 to 77 years of age from four areas in Northern Brazil. The sample comprised small land owners (upto 10 hectares), medium land owner (10 to 50 hectares) and large land owners (more than 50 hectares). These were anthropometrically and clinically evaluated. The mean height, weight, skin fold thickness and biochemical status as assesed by haemoglobin values, were better in the large land owners.

Dietary patterns and nutritional status were surveyed by Shirley et al (1978) in Southern Illinois on a population of coalminers and ex-coalminers aged 42 to 86 yrs. All the subjects were suffering from some degree of respiratory insufficiency. The population showed a low dietary intake of calcium, vitamin A and vitamin C. The mean blood volume, indicative of iron status, was within normal (above 13 g/dl). The mean body weight of the miners was 76 kg (range 46 to 105 kg). The mean height was 175 cm (160 to 190 cms) and mean haemoglobin was 14.7 ± 1.6 g/dl. The anthropometry and haemoglobin values showed adequate nutritional status of the workers.

The pattern of dietary intake for 366 urban families of poor migrant workers in the city of Fortaleza in North-East Brazil was reported by Ward and Amoni (1980). They found that grains and cereals constituted 40% of the diet. Intakes were dependent on age and sex. Reference daily requirement of energy was 3000 kcal, but 68% families got less than that, 80% families could not

meet their requirement for niacin and vitamin C, and 90% or more families did not get their required calcium, riboflavin and vitamin A. The reasons cited for inadequacy of nutrients were poor purchasing power and lack of nutrition knowledge.

In another study on migrant agricultural workers in Southern Brazil, it was reported that the traditional diets of Boia Frias (cold meal eaters) were nutritionally inadequate both in quality and quantity. Blood analysis did not indicate major subclinical deficiencies except low hematological values and low plasma vitamin A concentrations. However, anthropometric data indicated clear signs of malnutrition/or undernutrition which adversely affected their overall health (Sesai, 1980).

Two groups of Guatemalan labour population were studied by Torun et al (1989). The first group (S1) worked in a farm that had dairy cattle and the other group (SAP) did not have dairy cattle but worked on other agricultural activities around the village. The men in S1 had an intake of 3,555 $\pm$ 712 kcal and 107 $\pm$ 21 g protein/d (26% protein with high biological value). The diet at SAP provided 2,693 $\pm$ 441 kcal and 82 $\pm$ 13 g protein/d (8% with high biological value). The poorer dietary intake of the SAP group resulted in their being lighter than the SI group, namely, 50.8$\pm$4.2kg vs 60$\pm$5.4kg.

The clinical and anthropometric findings of Indonesian contract workers revealed that the health of the majority of the workers was poor to fair. The average caloric intake was

deficient. The protein consumption was on an average 0.76 g/Kg body weight /day, which was low. Iron deficiency (Haemoglobin less than 13 g/dl) was found in 83% and hook worm infection in 85% of the sample studied. The workers also showed severe deficiencies of calcium, vitamin A, C and the B groups (Karyadi and Basta, 1973). In another study, Basta et al (1974) reported that the incidence of both anaemia and hookworm infection (85%) was very high among rubber plantation workers in West Java. Forty one per cent of the subjects were anaemic on the basis of the WHO norms of haemoglobin > 13 g/dl. The results also revealed that there was a highly significant correlation between infection (other than hookworm) and haemoglobin levels of both tappers and weeders.

The nutritional status and general health of male road construction workers living in the highlands, coastal lowlands and the semi arid North West Kenya were studied by Latham et al (1982). The results of their study revealed that undernutrition was common in all areas but was most pronounced among men in semi-arid areas. Anaemia was most prevalent in the coastal lowlands where 41% men had haemoglobin values less than 13.0 g/dl. Hookworm infection was highly prevalent in all the workers with the highest percentage (69%) among workers from the coastal lowlands. There was a significant association between hookworm infections and low haemoglobin levels among the workers from various areas.

The influence of water and sanitation on health, morbidity and mortality status of agricultural communities in Thailand was studied by Sai (1983). Water management was a very important consideration for agriculture as well as for general health and nutrition. Due to the poor source of water, infectious and communicable diseases and helminthic infections were very common.

The impact of seasonal variations on the nutritional status of various categories of workers in Nigeria has been reported by Loutan and Lamotle (1984). Men lost a mean weight of 3.1 kg and women lost a mean wt of 452 gm between February and May, which was the peak of the dry season. The weight loss caused an increase in the proportion of acute malnutrition (less than 80% of the reference weight for height) from 7% in November to 17% in May. After May normal weight gain was resumed. Similarly, Rosetta (1986) studied the Sengalese sedentary farming population to assess the seasonal variations in anthropometric and dietary status of adults. Data were collected once in the middle of the dry season and at the end of the rainy season and before the first harvest (at the end of the food shortage). The average weight loss of the men during the shortage period was 5 kg. whereas it was 3 kg in the women. During the shortage period, the energy requirements of the men were maintained by mobilization of body protein, indicating a negative nutrition balance. Although energy reserves of the women were lower than the normal values, they resisted seasonal shocks markedly better than men, regardless of age and physiological status. The

possibility of seasonal variation in anthropometry among coffee plantation workers of Guatemala was explored. The year was divided into three major seasons, namely dry season with little farm activity (post harvest), monsoon (pre-harvest) with high farm activity and winter (harvest) with moderate farm activity. A slight drop of one to two percentage points occured for all anthropometric indices in the monsoon season, however these differences were not statistically significant (Valvende, 1986). The health and nutritional status of different occupational groups, viz. farm labourers, mine workers and peri-urban workers in Zimbabwe were compared by Loewenson (1986). The survey included nutritional anthropometry, data on demographic patterns, income, diet, education and environmental conditions to assess their health status. Health status (low anthropometry) was poorest in the commercial farm areas, and was associated with over crowding, poor housing, poor access to water supply and poor sanitary conditions.

II. Indian studies

Limited studies are available on the nutritional status per se of agricultural, industrial or other labour communities in India. Most of the studies have assessed nutritional status only as part of either/both of food and iron supplementation .

The nutritional status of the organised agricultural women workers of a tea plantation in South India was studied by Rahamathullah (1983). The results indicated that women aged 25

to 44 yrs were anaemic with an average haemoglobin level of 6.1 g/dl. The mean body weight was 48.1 kg. Further, hookworm infection was found to directly affect their nutritional status.

Another study (Satyanarayana et al, 1977) reported the relationship between work output and anthropometric, bio-chemical and socio-economic variables in male industrial workers engaged in production of detonator fuses. The clinical and bio-chemical parameters showed adequate nutritional status. However, daily work output was significantly higher in those with high body weight. Supplementation with 500 calories and 11 g protein for 6 months improved the nutritional status of coalminers, the average increase in body weight being 740 g (Satyanarayana et al, 1977).

The nutritional status and physical work capacity of road construction workers on different rations (3131 ± 29 calories and 3744 ±35 calories) was studied by Sridharan et al (1987). The results revealed that the high calorie ration diet was positively related with haemoglobin levels of the workers. The initial haemoglobin level of the workers was 11.2 g/dl and was further improved to 15 g/dl after supplementation. There was not much difference in the anthropometry, the initial body weight was 55.20 ± 1.80 kg while after one month it was 56.00 ±1.90 kg. The initial height was 170 ±5 cms and remained the same even after supplementation.

Nag et al (1987) conducted an anthropometric study of women aged 16-58 years working in small scale industries. The mean body weight was 45 ±8.6 kg and mean height was 149.8 ±6.2 cms.

Comparison of the nutrient intake of 30 anaemic and non anaemic farm women revealed that the mean nutrient intake of the anaemic women was inadequate with respect to all the nutrients, except thiamine. The non anaemic women had inadequate intakes of protein, energy, iron, retinol and riboflavin. There was no significant difference in the height of the two groups. The haemoglobin and weight were only slightly better in the non anaemic group. Mean haemoglobin of the non anaemic women was 13 g/dl and of anaemic women was 9.4 g/dl. The mean body weight of the anaemic women was 41.6 kg and for the non-anaemic was 42.6 kg. (Vijayalakshmi et al, 1987).

A extensive study was undertaken by the Labour Bureau, Ministry of Labour, Government of India in 1980 to assess the socio-economic conditions of women workers in plantations. The survey included various aspects of socio-economic conditions of women workers of various plantations including tea plantations of India. Results revealed that women plantation workers had a low socio economic status.

Studies in Assam relating to the working population are very limited. Available studies are reviewed below.

Macdonald (1939) conducted a study on the effect of anaemia and dietary intakes of the labourers of Assam tea estates. He observed that anaemia was prevalent among them. The diets of all tea garden populations were similar and very simple in composition, rice being the main constituent. He suggested that

a possible reason for variation between different gardens with respect to prevalence of anaemia was the type of rice used.

In another study, Foy and Kondi (1957) summarized their data on more than 7,000 Hb determinations on adults from rural working population in Africa and India. In India, the subjects were labourers working on tea gardens and peasant farmers from outlying villages. They reported that in hot damp river valley of India (Assam, with an altitude 300-600 ft) the mean haemoglobin level for all groups was 10.9 g/dl with 16.5% of the population below 8 g/dl.

A recent study by Bora (1985) reported that the tea garden labour families had very low dietary intake of all the nutrients when compared with those recommended by the Indian Council of Medical Research. They had a mean haemoglobin level of 6.9 g/dl. Mean height and weight were also lower in comparison to the clerical and managerial classes. The prevalence of deficiency symptoms of vitamin A, iron and B complex vitamins was quite high among the tea garden families.

In another study, Baroova (1988) reported that tea garden labourers showed poor nutritional status. The dietary intake of all the nutrients were lower than the Indian Council of Medical Research's (1981) recommended dietary allowances. The haemoglobin levels were between 6.2 g/dl to 8.2 g/dl; clinical symptoms of iron, vitamin A and B complex deficiencies were found to be very common among the people. However, both these studies were conducted on very small groups of population.

Harlalka (1975) reviewed the various aspects of working conditions of tea garden labourers in Assam. According to him, the working conditions of workers either in factories or in the fields where they perform their tasks had a great bearing on their health and efficiency which in due course affected production. He concluded that the working conditions in the tea gardens in Assam as a whole cannot be said to be conducive to health and need to be improved. Bora (1990) reported that tea garden workers were the most neglected masses and were under the strict control of capitalists. They were no more better than slaves.

Socio-economic status of tea garden female workers was studied by Phukan (1986) who commented on the very low socio-economic status of the population.

The tea industry in Assam is beset with many problems. The tea garden labourers may be considered as the spinal cord of the tea garden. They pay much more attention to the tea seedling than to their children. But it is unfortunate that they are not able to feed and clothe their families at a minimum acceptable level (Poyuvora, 1981).

Paul (1984) conducted a situational analysis of the labour communities in coal mines, textile industry and tea plantations. He reported that the tea plantation labourers were suffering from skin diseases, tuberculosis, malaria, gastro-intestinal disorders, liver and kidney ailments, bronchitis, pulmonary

disorders, dermatitis and alcoholism. He observed that there was not much data available on the nutritional or health profile of tea plantation workers and specially recommended that studies on food habits, nutritional intake, health profile and labour productivity of both men and women workers including supervisers and managers of this industry be conducted. According to him the open air working environment and the large number of women, adolescent and child workers in the gardens justified the need to study their energy and other nutrient requirements. He also recommended steps to prevent adulteration of foods consumed by them and to improve the supply of drinking water. According to him the present efforts in this area need to be intensified.

The review of literature on the health and nutritional status of workers in agro-based industries and especially that of tea plantation workers in Assam reveals a paucity of information, thereby highlighting the need for the present study.