

Valuing Life in a Regulated Labour Market: A Study on Tea Plantations in Assam, India

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Kalyan Das



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V.V. Giri National Labour Institute, NOIDA

Kalyan Das is Associate Professor at OKD Institute of Social Change and Development, Guwahati. E-Mail: kalyanaugust@yahoo.com. This working paper is the outcome of a research study carried out with the support of North East Research Center (NERC), V. V. Giri National Labour Institute (VVGNI), NOIDA. Author acknowledges valuable feedbacks received from anonymous referees which have helped to give a concrete shape to the paper. The author is grateful to Assam Branch of Indian Tea Association and the Office of the Labour Commissioner, Assam for logistical supports to conduct the field work. Special thanks to Sonali Sarma, Visal Nag, Pabitra Saharia, Dhuli Dharani Medhi and Dadul Chutia for excellent field support, and Abikal Borah for editing of the paper.

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Preface

North East Research Centre (NERC) at V.V.Giri National Labour Institute has been set up with an objective of promoting research on themes specially related to labour and employment issues pertaining to India's North Eastern Region, comprising of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. Identifying and involving concerned institutions and individuals who are working on similar issues was the first task before NERC. It is in this context that a National Workshop was organized during 19-20th November, 2009 at Agartala, Tripura in which invited resource persons presented papers and proposals on their ongoing and proposed research on various dimensions of labour in North Eastern States. As a follow up to this Workshop, a set of research projects were commissioned by the NERC on select and prioritized areas/themes. The present working paper by Dr. Kalyan Das, titled, '*Valuing Life in a Regulated Labour Market: A Study on Tea Plantations in Assam, India*' is an outcome of one of these projects.

This study based on a survey of workers engaged in pesticide applications in tea plantations argues that there is need of compensating for the presence of occupational hazards in the jobs of pesticide applications. Uniformed wage structure in the labour market regulated by PLA, 1951 means that at present there is no compensating wage differences for the workers involved in the risky job. One reason for this is that the risks are not yet well perceived in the job of pesticides applications. The author meticulously captures symptoms of health hazards of overexposure to pesticides and estimates three values – value of statistical injury, value of statistical sickness/physical discomfort and value of perceived risks at work through econometric analysis. The issue of measuring compensations or the value the risks to health in pure economic term is debatable issue. In the context of uniformly waged regulated labour market of tea plantations, it is more difficult as the workers cannot make the trade-off between health risks and economic gains.

I am sure this working paper addressing certain unaddressed dimensions on occupational hazards, will be of immense interest and use to policy planners. I congratulate the author for the excellent and time bound work and thank Mr. Anoop K. Satpathy for skillfully coordinating this project for the NERC/VVGNI.

V.P. Yajurvedi
Director General

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Chapter One

Introduction

1.1 Context of the study

Tea industry is a major livelihood provider in the economy of the state of Assam. The state produces more than half of the tea produced in India. This labour intensive industry employed 619,703 numbers of workers in 2006, which is 49 per cent of the total labour employed in tea plantation sector in India². The labour market in the estate sector of tea plantation is regulated and here wellbeing is ensured by the Plantation Labour Act, 1951. Moreover, security of the workers in the estate sector of plantation is ensured by one of the largest social security network in the world - the Assam Tea Plantation Pension and Provident Fund Trust (ATPPPF).

Despite all the regulatory provisions, studies and reports- such as North Eastern Social Research Centre (2004) and the National Campaigns for Labour Rights (1999) reveal that, this prime livelihood sector lacks labour standard. There are multiple factors leading to poor labour standard³ in tea plantations, discussion on these is not under the scope of this study. The indications on poor labour standard, however, reflect only one part of deprivation in the plantation estates. One important issue that often does not come into light is the work related health hazards, mechanical injuries and deaths in the sector. Information on these is very limited. The issue of work related health hazards in tea plantations of India was, however raised even in the 1970s. In tea gardens of West Bengal the conditions of work of workmen engaged in pesticides application was raised and the state labour department had agreed to appoint a technical committee for enquiry into the existing service conditions and make necessary recommendations (Basu, 1980).

The PLA, 1951 though safeguards the wellbeing of the workers in the estate sector of tea plantations, the Act is silent on indicating the compensations for work related injuries and death. At present, the plantation estates follows the Workmen's Compensation Act, 1923 in estimating the compensations for work related hazards and deaths. The PLA, 1951 was reviewed in 1984 in a conference of labour secretaries of the states and advocated the need for additional safeguard for workers in the plantation industry in view of the increasing use of hazardous

²This information excludes the tea smallholdings in the unorganized sector.

³The argument here is that though the workers in tea plantations enjoy many pecuniary and non-pecuniary benefits such as free housing, highly subsidised rations etc. the present daily wage of Rs. 71.5 is reportedly not enough. Incidences of sickness, poor educational attainment and alcoholism are some of the reflections on labour standard in this sector.

chemicals⁴. The industrial committee on plantation was formed subsequently and it recommended amendment of the PLA, 1951 to ensure welfare facilities as well as to provide adequate safeguards against toxic chemicals that are being increasingly used in tea plantations. The Cabinet though approved the proposal of Ministry of Labour to amend the Act and the Bill was introduced in Parliament of India on 16th December 1988, but following dissolution of the Parliament, the Bill got lapsed. In the meanwhile, certain aspects relating to handling of hazardous chemicals by workers in plantations came up for a fresh scrutiny. It was felt that an enabling provision may be made by the state governments to prohibit and regulate employment of women and adolescents for using or handling any hazardous chemicals. The Bill subsequently got deleted from the list of Business of the Parliament on July 26, 1989 with a view to examine the suggestions of industrial committee on plantations. Efforts and steps, however, continued in the past two decades to amend the PLA 1951 and the Plantation Labour Amendment Bill was finally placed before the Parliament of India on February 13, 2009 proposing to prohibit or restrict employment of women and adolescents workers in handling the hazardous chemicals and certain improvement of existing medical facilities in the estates. The bill got passed in the Parliament of India on April, 2010. This now includes safety precautions to be taken by planters for storage, utilisation and handling of agro-chemicals. It also mentions regulation of employment of women and children, below 14 years of age, from handling hazardous chemicals in plantations. The issue of chemical hazards in tea plantations has now got recognized, but we have little estimation on the magnitude of the harm caused by the use of chemicals.

Primary observation reveals that apart from the chemical hazards, accidents and mechanical injuries are common in both fields and factories of plantation estates. There are reported deaths due to accidents at work in the tea plantations sector. Apprehension is that the workers suffering from the ailments, injury or lost life at work, are not compensated adequately under the prevailed regulatory frame⁵. This context may raise curiosity to have an understanding on occupational safety and health hazards of workers in one of the largest tea plantations cluster in the world. Here we may ponder about safety measure adopted in tea plantations and compensation measures in case of accidents in factories or fields. All could indicate the decency at work and the value of life in this important livelihood sector.

⁴The chemicals used in tea plantations are to control the pests and the weeds. There are numerous brands and compositions of pesticides to minimize the impacts of attacks of pest and weeds in effort to raise the outturn. There is scope to argue that to maintain the field productivity compromise is made on health of the workers, which in turn affects productivity and wellbeing of the workers. The basic objective in this study is to have the estimate on valuation of statistical life in case of risks, injuries and even death at work. The proposed values may be used by the state for assessing the benefits of risks reduction measures.

⁵The argument here is that all the compensations and premiums calculated based on the prevailing uniformed wage rate does not help to arrive at a decent value.

1.2. Perceiving risks at work:

What would be the value of reducing the risk? In the past one decade there has been a growing interest in valuation of statistical life (VSL) and quality of life (QOL). The VSL can be inferred through wage-fatality risk trade-offs made across different occupations (Shogren and Stamland, 2002). On the other hand QOL can be measured in four broad health contexts - measuring the health of population, assessing the benefit of alternative uses of resources, comparing two or more interventions in a clinical trial and making a decision on treatment for an individual patient (Cox et al, 1992). Occupational hazards and diseases to a large extent influence the measurement of VSL and QOL. This is evident that most of the occupational diseases are not covered by workers' compensation⁶. VSL is basically related to wage-trade risk and QOL is related to occupational disease (Leigh and Robbins, 2004). Objective of this study is to have estimates on these two lines, and address the labour standard issue.

Wages, risks in occupations, work skills all are related to VSL. The workers in a job, however, need not be equally skilled or equally tolerant to risk because of differences in self-protection, self-insurance, job stickiness, switching costs, irreversibility, imperfect mobility across occupations, life cycle in skills, experience, education and safety (Shapiro and Stiglitz, 1984). In a regulated labour market, where all workers get equal benefits irrespective of skill,⁷ it is difficult to include wages and skills as the determinants of VSL as in such context there is no variation in wages. This is however not that, workers cannot perceive the variations in risks across the types of jobs in the sector. Wage though is intimately related with selection of a job or occupation; sometimes this is seen that workers are compelled to select a risky occupation for a non-differentiated wage even in a regulated labour market. This is not likely that relative to workers in less risky occupations a worker chooses a risky occupation at own will when there are no differences in wages and thus revealing to be more tolerant to risk or more skilled in personal risk reduction or both. Such situation could easily arise in an unregulated job sector surrounded by a huge reserve army of labour. In a regulated labour market the situation could emerge because of the fact that the risk factor in the sector is not well perceived, estimated and presented before the stakeholders and the policy makers. Here two situations could emerge- that

⁶The argument to cover the workers by health insurances emerges in this context. Initiative from the state as well from the tea estates management is not known to cover the workers under insurance scheme, except that of the ATPPPF. The private insurance companies now have started to penetrate labour lines of the tea estates and reportedly have done survey on the possible market. This is found that even the agents of Life Insurance Compancy of India have taken initiatives to cover the workers under various micro insurance schemes.

⁷In lower end job of an economic sector skill acquisition is not the issue as jobs at best requires semi-skilled labour. The issue is that labour supply is abundant in developing country context like India and allocation of workers to relatively risk prone jobs is not a problem at the same wage unless specific regulations are made.

workers cannot perceive the risks and even though they perceive unable to do anything because of their poor bargaining power. On the whole, the wage differential needs to be set so that it is sufficient to compensate the worker in the dangerous job. In such situation a contingent valuation survey could capture workers willingness to pay (WTP) to obtain a specified reduction in job related risks (Alberini et al 2005). This is also possible by capturing a wage (hedonic wage) perceived by the workers in the risk prone jobs. Mrozek and Taylor (2002) find majority of the studies indicating a significant relationship between the risks of death on the job and workers' wages, though there are reports revealing no significant relationships.

This may lead us to assume that the higher waged workers are more prone to injuries and death; and this reflects their life value in case of accidents! The argument overall is that the measurement of VSL is a sub set of QOL and three factors may become instrumental in keeping the life value of workers high- i) a decent wage⁸ ii) provision of adequate insurance and social security covers and iii) investments in safety measures by the employers.

There is growing complexity in industries of India, with the increasing use of machinery and chemicals, leading to consequent danger to the workmen. This along with the comparative poverty of the workmen, it is advisable that they should be protected, as far as possible from hardship arising from accidents. In India the workmen's compensation law takes into such consideration and the law is based upon the doctrine of 'trade risk'. According to that doctrine, the trade risks are the risks of personal injury inherent in an occupation, independent of the faults of the employee and his employer, and ought to be borne by the employer and treated as an element in his general cost of production or service (Sherman, 1917).

The basic purpose of valuation of life, injury or perceived risks of the workers involved in risk-prone job is to have the indication of the value of reducing the risks and that value overall would indicate whether an initiative is socially desirable or not (Madeshwaran, 2004). Are there need to spend on improving the labour standard? Since the resources are scarce in our country, the spending on safety and preventive measures are need to be justified. Researchers are adopting various methods to have the estimate on implicit prices of reduced risks to life and injuries at work. These are the cost of illness approach, human capital approach, WTP approach (considered as the most relevant method, the price paid for preventing health and death risks), insurance approach and court awards

⁸How much wage would be decent in lower end jobs of tea plantations? How the workers perceive the wage set by the bilateral agreements of trade unions and the representatives of the management? The issue is to what extent the trade unions and managements capture workers perceptions and execute it under a regulatory frame.

and compensations and portfolio approach (Linnerooth, 1979; Madeshwaran, 2004).

Now this has emerged that there are two approaches for measuring WTP for risks reductions. The contingent valuation approach is based on the information acquired on how much one would be willing to pay to reduce the risks of their life at work⁹. The revealed preference approach (infers the hedonic value) relies on the wage data¹⁰. The mechanisms for wage determination in hazardous jobs would lead to an efficient level of job safety and optimal match ups of jobs and workers. The revealed expected wage and the premium for insurance cover would help to arrive at the value of life in our study context.

1.3 Objectives

This study basically tries to address three issues-

Have an estimate of occurrence and presence of work related health hazards-injuries as well as deaths in the tea plantations sector of Assam. This could help us to understand the rate of incidences and the nature of injuries and risks involved in the tea plantations sector; perceived otherwise as a secured job sector.

Attempt to capture the nature of compensation received in the case of injuries and deaths at work. Objective is also to look at the space of law in ensuring compensation.

Capture WTP of the workers for risk reductions at work as well as their preferred/ expected wage in the job of pesticides application; all reflect an indication of their life value.

1.4 Study Area

The study is confined to 21 tea plantation estates in five districts of Assam¹¹ in four distinct tea producing zones in the north and south bank of Brahmaputra River. The study includes only large plantation estates those come under the domain of PLA, 1951.

⁹This is the insurance premium a worker willing to pay in a month or in a year.

¹⁰There is a methodological issue of using wage data in our study context as there are no variations of wages in different jobs in tea estate sector. The wage risk trade off however can be perceived by asking the workers to indicate the wage they expect in the risk prone jobs. A related additional issue here is to what extent the workers perceive that the jobs they involved are risky and they know the fallout of the risks.

¹¹The study however, could get information from 19 tea estates and conduct labour survey in 19 tea estates. Two estates thus left out are not the same for the two sets of questionnaires.

Table 1.1: Study areas and the sample

Assam Districts/zone	Region	Approx number of tea estates in the district/zone	Sample estates selected
Dibrugarh/ Tinsukia	South bank of Brahmaputra River	280	8
Golaghat	South bank	75	5
Darrang	North bank	90	5
Lakhimpur	North bank	15	3

1.5 Research methods

This study indicates that there is no variation in wages for different tasks and jobs in the tea plantations sector. This will, however, be wrong to assume that workers engaged in certain tasks do not perceive the risks at work. In absence of any support mechanisms under legal framework or in absence of any insurance coverage, there is need to understand how the workers could get compensated in hazardous lower ends jobs of tea plantations. On the other hand the compensation received by the affected workers or by the workers' family in case of injuries and/or death could indicate workers' value of life and limbs. The value of life of a worker could increase substantially under the domain of certain legal provisions, insurance coverage made by self or employer or by the state and with social security measures such as provident funds and pensions (inference from Leigh, 1989; Shogren and Stamland, 2002).

In addition to legally entitled compensatory provisions, affected workers utility maximizing behaviours would also help to have an estimate on cost arising out of work related health hazards. Exposure to chemical hazards results in morbidity, affecting workers welfare. This results in discomfort and pain, loss in productive time and expenditure in medical expenditure and avertive actions. In chemical exposure studies, researchers often model individual behaviour as utility maximizing; assumed to choose optimal amount of avertive and mitigating actions to reduce health impacts (Freeman, 1993). This may be that the workers need a wage premium for this.

1.6 Data for the study

The study adopts approaches in *three stages* to collect the required information. The *stage one* involves approach to 21 estates in the study areas¹² and stratification

¹²We had approached more than 30 tea estates, randomly. Consent was given by 21 tea estates to share information on the estates. Labour survey was possible in 19 among these 21 estates. There was no prior information to estimate the size of the tea estates and the number of labour employed in the estates; stratification of the estates was possible only after information on the estates was collected.

of the estates to the size classes (to the numbers of workers employed and acreages of tea in bearing¹³). Information was sought on injuries related to work in the plantations as well as in the processing factories from the records of the estates. Information on work related injuries and death is acquired for the past 10 years.

From the tea estates information was acquired on number of accidents, causes of accidents, date of accidents, date of return to work after the incidences, number of workers in the estates-permanent as well as casual, workers absent from work, absent from work due to sickness, nature of diseases frequently reported in the estates and number of workers send for cholinesterase test¹⁴. The data thus acquired from the tea estates has helped to have an estimate on rate on accidents, labour use in the tea plantations and the extent of casualisation of workers¹⁵. This may be noted that estate wise data on the number of workers employed is not readily available from published sources. It is estimated that the average size of workers in large plantation estates of Assam is about nine hundred¹⁶. The size classes of sampled tea plantations derived are presented in Table 1.2.

Table 1.2: Tea Estates Covered in the sample and their size class (Labour use criterion)

Permanent workers in number	Tea estates	Total workers (permanent & casual workers) in number	Tea estates
< 500	3	< 500	1
500 to 750	4	500 to 750	2
750 to 1000	3	750 to 1000	1
1000-1500	1	1000-1500	5
> 1500	7	> 1500	8

¹³The tea estates on request provided information on the workers employed- both permanent and casual. The information on land area under possession and tea in bearing was not provided by the estates. This information was collected from the Tea Board of India.

¹⁴People using organic phosphorus compounds such as Parathion, Sarin or Tetraethyl Pyrophosphate in the farming or chemical industries need to be routinely monitored to assess any adverse exposure. Cholinesterase levels can also be used to assess any acute exposure to these compounds which can cause neuromuscular damage. Toxicity can follow a rapid absorption of the compound through the lungs, skin or gastrointestinal tract. The symptoms of toxicity are varied, ranging from vomiting to paralysis or coma, and depend on the compound, quantity and the site of exposure. Since the cholinesterase level, varies from person to person and fluctuates over time, it is essential to have own baseline of cholinesterase level and blood test need to be taken at beginning of every season.

¹⁵This is assumed that casual workers in general used in hazardous jobs and they enjoy minimal work benefits.

¹⁶There are about 620,000 workers on roll in tea estates of Assam. This is estimated that there are around 750 large sized tea estates in the state. To this average deployment of workers in tea estates come to 885 per estate.

In the *second stage* the offices of the Assistant Labour Commissioners in the zones where the sample tea estates are located were approached to extract and supplement records on work related injuries and deaths and compensation amounts settled. This *second stage of survey* has helped to derive information on the rate of incidences of injuries and death in the tea plantation estates in a year, the type and nature of injuries, compensations calculated under the domain of law and compensations received by the affected workers' families.

We may agree that all these data provide only one side of hazards in the tea plantation estates. The *third stage* of the study involves interaction with the workers engaged in application of pesticides in tea plantations. This is reported that about 15 percent of the workdays in tea estates are required for soil conservation measures, control of pests and diseases and sundry activities (Daily News, January 19, 2010, Sri Lanka). In the tea estates visited for this study it was reported that about 5 percent workers are engaged in pest control. We found a group of workers, average 30 to 40 in size, from a minimum of 12 to maximum around 50, in the plantation estates engaged in pesticides spraying. Information was acquired from about 20-25 workers from each estate on their age, educational attainment level, nature of their jobs, nature of reported physical discomforts, injuries, perceived risks at the job, expected wage, insurance cover and their willingness to have an insurance cover and the premium they willing to pay, training on integrated pest management, precautionary measures taken by the management as well as by the workers, absenteeism rate from work and the reasons of absenteeism. We covered 426 workers engaged in pesticides application in 19 tea plantation estates. Assuming that tea estates engages about 5 percent of the workforce in pesticides application, and there are 620,000 workers on roll in the tea estates of Assam, the number of workers engaged in pesticides spraying would come to 31,000. The sample of 426 is considered representative at 95 percent confidence level.

Chapter Two

Injury, Sickness and Workdays Lost in Tea Plantations

2.1 Estimation on work related injuries and deaths in the tea estates

One of the objectives of the study is to have an understanding on the rate of accidents and nature of injuries and risks involved in the tea plantations sector. Occupational health, which is well researched in developed countries, remains neglected in developing countries (Nuwayhid, 2004)¹⁷.

The tea estate managements were approached and requested to furnish data on cases of work related injuries and deaths in their estates for the past 10 years. Of the 19 estates furnished data (we had approached more than 30 estates) on accidents occurred in their estates, eight estates furnished data for past 10 years, one furnished data for nine years, two each provided information for eight, four and three years, three estates provided data for five years and one provided data for two years. The reason for some estates' inability to share information for the entire ten year period was that these estates had closed their files/registers after completion of certain period and it was difficult for them to reopen. Compilations of data reveals that incidences of work related injuries (the registers of the sampled estates record no death cases) in the estates are minimal (Table 2.1).

Table 2.1: Recorded cases of accidents in tea estates register

Sampled Estates	Total accidents recorded in the 19 estates	Average accident cases in a year #	Maximum accident cases in a year #	Minimum accident cases per year #	Estate with zero accident cases during their reference period	Injury incidences per 1000 workers (average for all estates, reference period count)
19	93	1.0	2.5	0.0	7	0.76 (max 3.7, min 0.0)

* Source: Field work, 2010; # reference periods of respective estates count

2.2 Nature of injuries recorded in the registers of the tea estates

A deeper look at the registers of the estates reveals that the injuries are very common in nature, reflect carelessness and could have been avoided. Electrocutation of the workers in the estate factories, trapping of limbs in factory machines and conveyor belts are found to be common incidences. Apart from

¹⁷This can be argued easily that huge population size, poor level of human development, unlimited labour supply in the lower end jobs are the cumulative factors that occupation health remains a neglected subject in developing countries.

these, fall in the tea fields, fall from tree, cut and amputation of limbs while clearing and maintaining plantations field, snack and insect bites are recorded in many estates (Table 2.2).

Table 2.2: Nature of physical injuries in tea plantation estates (sampled tea estates)

Nature of injuries	Frequency
Fingers/limbs trapped in factory machines	15 (16.1 percent)
Fingers/Limb trapped in conveyor belt	13 (14.0 percent)
Electrical short-circuit- Electrocutted	10 (10.8 percent)
Fall in factory	5
Trolley/belt broken, Spray machine fall	7
Cuts/amputation –garden maintenance	34 (36.6 percent)
Insect bite	7
Burn	2
Total	93

* Source: Field work, 2010

2.3 Casualisation of workforce and perceived impact on labour welfare measures

In the organized estate sector of tea plantations about 16 percent workers are casual workers (Statistical handbook of Assam, 2008 quoted Tea Board of India data of 2005). We perceive that at this present competitive and liberalized regime, the tea plantations estates are pushed to extreme to cut down their operational costs. This may be noted that in tea sector labour costs accounts for about two third of the total costs of production. As wages and other benefits in tea estates are ensured by PLA, 1951, efforts of the managements are always there to cut down the labour costs. Approach of the estate managements at present lies on use of casual labour as and when required to clear the tasks in the plantations.

The data provided/ collected¹⁸, reflect that the tea estates on an average engage 2.6 permanent workers per hectare of tea in bearing¹⁹. Inclusion of casual workers, however leads to deployment of labour in higher numbers in the tea

¹⁸The sampled tea estate provided the numbers of labour-permanent and casual, engaged in their plantations. The area of the estates and tea in bearing were collected from tea board of India. Some estates however, put their area in public domain that is in their websites.

¹⁹Labour requirement in tea plantations is primarily determined by the productivity of the estate, more yield means more workers are required to clear the flush. Other influencing factors are health of the workers and time devoted by the workers during the day etc. Average engagement varies from country to country and even at the district level. Average engagement of labour in per acre of tea in bearing in Sri Lanka at present is 2.7. This figure is 2.5 in India and 2 in Bangladesh. On the other hand, tea smallholdings use less labour compared to estate sector. Certain regulatory factors on labour front are the reasons for this.

estates (3.9 workers per hectare). The stated figures on number of workers, both permanent and casual, engaged in sample tea estates reveal massive casualisation (31 percent workers are casual). Field interactions with the workers reveal that the male casual workers are mostly engaged in field maintenance and spraying of pesticides and fertilizers and women are used to clear the seasonal flush in the plantations.

Table 2.3 shows some reflection on the presence of casual labour in tea plantations in Assam. The rise in casualisation of workforce in this largely regulated labour market has some repercussions. The casual workers are not entitled to many pecuniary and non-pecuniary benefits under provision of PLA, 1951. Moreover, it is likely that these workers are pushed to the jobs which are more risk prone.

Table 2.3: Nature of labour use in the tea estates

	Average	Average per hectare	Maximum	Average per hectare	Minimum	Average per hectare
Permanent	1198	2.6	2458	5.5	149	1.0
Casual	543	1.3	1823	4.1	23	0.04

* Source of data field work; estimate based on 19 sampled tea estates

2.4 Propensity to attend work: leave and sick leaves

The 19 sampled tea estates have on an average 1741 workers (1198 permanent and 543 casual workers). It is found that on an average 90 workers are on leave every day in the sampled tea estates. The figures are estimated from the data extracted from the leave register of the tea estates. Two to three dates of every month were picked up randomly and the figures of 24 to 36 dates for the past one year helped to arrive at the figure of nonattendance rate of the workers. On the other hand, estate hospital registers helped to get the figure of workers on sick leave. It is estimated that on an average 29 workers are on sick leave every day. This shows that every day 5.4 percent workers in the estates are on leave for different reasons and 2.5 percent workers are on sick leave; altogether 8 percent of the total workers remain absent from work in a day in the tea plantations of Assam.

There is ground to argue that nonattendance at work is largely because of prevailed labour standard factor in the tea estates. More and more workers fall sick means that there are not enough provisions and care to address the health and safety needs of the workers or incentives are poor to attend the work. Exploration of the reasons for nonattendance would reveal the causes reflecting the issue of labour standard.

2.5 Estimate of workdays lost due to injuries

This is estimated from the estate register that the total workdays lost due to injuries of 89 workers²⁰ was 1355 days, averaging 15 days per worker. From the limited data it is estimated that about 40 percent of the accidents take place inside the factory. The reasons reflect, apart from carelessness of the workers, faulty electrical connections as well as presence old machineries. Interactions with the management reveal their efforts to reduce the incidences by overhauling and modernization of their factories. This could be the reason that physical injuries in tea plantations are now confined to a minimum level. This study did not go deeper into the issue of physical injuries in the plantations. Effort was made to concentrate on the initiatives of the estate managements on safety and preventive measures for work related hazards in the job of pesticides application. Some of the estates' initiatives to conduct the cholinesterase test on the workers to be engaged in pesticides application reveal their effort towards this end.

Among the 19 tea estates only 8 reported that during 2010 they have had sent some of their workers for cholinesterase test conducted at the state civil hospital. Average number of workers sent for the test in the eight estates was 24, 40 being the maximum and 10 being the minimum. The number of estates who had sent their workers for the cholinesterase test was just five during 2008. In that year on an average 19 workers were sent, 26 being the maximum and 10 being the minimum in the estates. In 2009, five estates on average had sent 31 workers for the cholinesterase test, 57 being the maximum and 18 being the minimum.

²⁰Information on workdays lost for four workers was not available.

Chapter Three

Injuries, Death and Compensations: What Labour Office Data Indicates

3.1 Information on injuries and death and compensations

This study put effort to extract information from Assistant Labour Commissioner's (ALC) offices on the compensation paid after settlement of work related injury and death cases. Information was collected from five ALC offices in the study zones. Labour offices located in two study areas- Mangaldai and Lakhimpur were contacted, but there were no records on such cases. Tables 3.1 and 3.2 present the average amount of money settled for deaths and injuries in different zones of the ALC offices. The average amount of money settled in death cases is estimated at Rs. 193,250/-. The average amount paid in case of injuries is Rs. 66,317/-.

Few issues are important to what extent these figures can be used to indicate average value of life in case of deaths and injuries. The reference period of the cases varies in the study zones from 1989 to 2009. There are revisions of wages during the period²¹ influencing the estimation of the compensated amount. Moreover, there is influence of the age factor of the workers in the estimation of the compensated amount. We however expect less variation in the compensated amount in the death cases, compared to the injury cases. The injuries could be temporary in nature to cent percent disability and accordingly this has influence on the compensation amount calculated.

Averaging the compensation figures for shorter span of time periods could help to have an estimate on the trend; how over the time the compensation figures have moved. For the Dibrugarh zone the estimated average figure of compensation in the five death cases settled during the period 1997-2000 was Rs. 116,481/-. This average went up to Rs. 178,477/- in the four death cases settled during the period 2001-2005. The period 2006-2009 shows further rise in the amount at Rs. 202,501/- for the 11 death cases settled. In Tinsukia district during the period 1989-2009 altogether 41 cases were recorded of which 11 were death cases. No claim was settled in four cases and litigation is going on for one case. In remaining six cases of deaths a total amount of Rs. 1,063,241/- was disbursed,

²¹In the estate sector of tea plantations wages and provisions at work of the plantation workers are determined by the bilateral agreements between by the apex trade union body (Assam Chah Majdoor Sangha) and by the employers' associations. The wages now get revised in every three years. For more on wage determinations and revisions in Assam tea estate sector see Das (2002).

averaging Rs.177,207/ per case. Among the six death cases five were settled during 2002-2005 and the estimated compensation averaged at Rs. 186,109/. The case which was settled in 1997, an amount of Rs. 132,695/ was paid to the kin of the deceased as compensation.

As expected we find higher variations in the compensated amounts in injury related cases (coefficient of variation calculated at 77 percent) than the death cases (coefficient of variation is 44 percent). Considering the average figure for all reference periods, value of life in case of death comes to Rs. 193,250/ 22 and injuries to Rs. 66,317/. There could be argument that we take the average of the figures of recent times to estimate the value of life of the workers. Another problem in estimation is that compensation figures are also determined by the age of the workers and it is difficult to have an estimate at what age group, workers are more prone to accidents²³. One possibility is that the average age of the workers included in the sample of the study is 33 and to this we can have an estimate to get the figures of compensations.

The figures overall provide a fair indication on the compensations received by the workers or their families.

Table 3.1: Compensations on death cases recorded

Zone	Reference period	Death cases	Settled case	Average	Maximum	Minimum
Dibrugarh	1997-2009	22	22	176,693	275,587 (2004)	16,393 (199)
Tinsukia	1989-2009	11	6	177,206	215,262 (2005)	132,695 (1997)
Jorhat	2002-09	3	3	230,591	363,730 (2009)	45,235 (2005)
Golaghat	2003-10	6	6	263,354	415,960 (2007)	120,746 (2004)
Tezpur	2007-09	7	7	163,494	218,478 (2009)	47,225 (2008)
Total	1997-2009	49	44	193,250	415,960	16,393

* Source: Offices of Assistant Labour Commissioners

Table 3.2: Compensations on injury cases recorded

Zone	Reference period	Injury cases	Settled case	Average	Maximum	Minimum
Dibrugarh	1997-2009	9	9	35,496	66,405 (2001)	11,723 (2001)
Tinsukia	1989-2009	30	15	74,093	207,385(1992)	5,279 (2005)
Jorhat	2002-09	3	3	145,996	283,810 (2002)	53,061 (2004)
Golaghat	2003-10	15	5	52,105	81,331 (2004)	16,783 (2006)
Tezpur	2007-09	17	17	65,889	155,879 (2008)	19,744 (2009)
Total	1997-2009	74	49	66,313	283,810	16,393

* Source: Offices of Assistant Labour Commissioners

²²We here however need to add the money received from the pension and provident fund account.

²³From the death cases 44 death cases we could extract information on age for 15 death cases. The average age of the deceased was 35 years.

It has emerged that the death incidences are high from the records of ALC office compared to the ratio in the estate records. There could be two reasons for this. One, the sample estates are not representative to report the death cases. Two, death cases are not registered in the estates; referred to police and courts and subsequently settled at ALC for compensations.

Chapter Four

Workers Perceptions on Risk at Work

4.1 Demographic profile of the workers

For this study personal interviews were conducted with 426 workers engaged in pesticides application in 19 tea estates.

Average age of the 426 workers is estimated at 33 years. This means that the workers are young and have ample time left before getting retired at the age of 58. It is found that 69 percent workers engaged in these activities are less than 35 years in age (Table 4.1). About 19 percent workers found to be in the age group of 36-45 years and about 11 percent is in the age group of 46-59 years. The average years spent in pesticides application by the workers is estimated at 9 years. This means that most of the workers in such jobs started their work at the young age around 24 years. It is estimated that about 58 percent workers are engaged for less than 9 years in of pesticides application and about 18 percent workers are engaged for more than 15 years (Table 4.2).

Table 4.1: Age group distribution of workers engaged in 19 sampled tea estates

< 19 years	19-25	26-35	36-45	46-59	60 & above	Average age	Max age	Min age	Total
6 (1.4)	106 (24.9)	182 (42.7)	80 (18.7)	46 (10.8)	6 (1.4)	32.8	70	16	426

Table 4.2: Average years the workers spent in the job of pesticides application

Upto 3 years	4-8	9-15	16-20	21-30	Above 30	Average	Max	Min	Total
69 (16.2)	139 (32.6)	90 (21.1)	37	24	3	9.4	35	1	426

* Source: field work, 2010; figures in brackets are in percentage

The data indicate few serious issues. It is apparent that a large section of workers cannot continue the job of pesticides spraying and withdraws after a certain time period. It may be also true that the management prefers young workers in such jobs and mostly the casual workers are engaged. It is found that about 55 percent workers in the sample are casual workers.

Educational status of the workers is found to be minimal. Altogether 38 percent workers were illiterate, 30 percent went up to class IV and among the rest none

of them have completed the high school (Table 4.3). Poor level of educational attainment reflect poor labour standard.

Table 4.3: Average years spent on school by the workers engaged in 19 sampled tea estates

Illiterate	Primary (1-4)	Middle (class 5-7)	Secondary (up to class X)	Average years in school	Total
118	92	67	30	3	307

* Source: field work, 2010

4.2 Reflections on hazards in the job of pesticides applications

The observations, arguments and debates since 1980s continuing are that the job of pesticides application in tea plantations is hazardous and need arises for adoption of safety measures and certain specific regulations. In contemporary times the cholinesterase test to a great extent determines whether a worker is physically fit to apply pesticides. The action of cholinesterase inhibitors is insidious. By the time symptoms appear, it may be that irreparable damages already have been done. Therefore, it is now necessary to take advantage of the medical research, that to have laboratory analysis of body fluids, to determine the level of cholinesterase activity in the body. By detecting a drop in cholinesterase activity, one can spot danger signs in a person who has been exposed before symptoms appear. Symptoms of overexposure to cholinesterase inhibitors include headaches, dizziness, blurred vision, nausea and vomiting, stomach cramps, diarrhoea, excessive salivation and sweating, tightness of the chest, muscle twitching, and pinpoint pupils. The test helps to take positive steps to prevent further exposure.

During the interactions with the 426 workers (pesticides sprayers) a question was asked whether they have been experiencing any form of physical discomforts. Muscle and body ache was reported in the case of 242 workers (57 percent in the sample), and altogether 209 workers (49 percent) reported constant feeling of weakness. Apart from these two symptoms, headache (138 workers or 32 percent), chest pain (97 workers or 23 percent), respiratory problem (68 workers), eye irritation (62 workers), skin irritation (56 workers), chapped hand (14 workers), throat infection (9 workers), excessive sweating (8 workers) were some of the discomfort reported by the workers (Table 4.4). The responses on discomfort are however not mutually exclusive and there are workers having multiple physical discomforts. On the other hand reported injuries among the workers were minimum, only 40 workers reportedly had injuries of temporary nature at work from minor cuts to sprain in legs.

The payments the pesticides sprayers receive is on time rate as well as on work rate basis. This is similar to what permanent workers in the tea estates receive. To get entitled for a day's wage, the workers need to apply a mix of 12 liters pesticides for 12 times (144 liters overall). This is the case in general for the permanent workers. The contract or temporary workers are required to spray up to 16 times (192 liters) to get the daily wage. However, there is incentive to spray more. The pesticides filled in a container are carried on workers' back to spray in the fields and this work demand physical strength. The workers to get double the wages often volunteer to spray pesticides double the quantum. This results in severe muscle pain and subsequently compelled them to remain absent from work in next few days. This way too the workers get more exposed to the pesticides, and at the same time they also compromise on the quality of the application not covering all the tea acreages uniformly.

Table 4.4: Pesticides sprayers indicating presence of physical discomforts

Headache	Muscle pain	Chapped hand	Excessive sweating	Eye irritation	Skin irritation	Weakness	Respiratory	Chest pain	Throat
138 (32.4)	242 (56.8)	14 (3.3)	8 (1.9)	62 (14.5)	56 (13.1)	209 (49.1)	68 (16.0)	97 (22.8)	9

* Source: field work, 2010; figures in brackets are in percentage

Altogether 255 workers in the sample found visiting health centers for the reported illness. All the tea estates of Assam have basic provisions of free medical care and for these workers have easy access. This could indicate that the workers are aware of their physical discomforts and sensible to take the medical advice. This however, is unlikely that the serious symptoms arising out of exposure to pesticides are get addressed and treated.

4.3 Perceiving the health hazard and risks

On perceived health hazard in the job of pesticides spraying workers revealed mixed reactions. Workers perceptions was captured on 5 point likert scale, mean of which was 2.9, 5 being maximum and 1 being minimum or no risks with a standard deviation of 1.1. For 184 workers (43 percent) this job is free from health hazards. Altogether 59 (14 percent) workers believed that this job has some form of insecurity in form of health hazards. Altogether 183 (43 percent) workers perceive that this sector is full of hazard (Table 4.5). It is found that about 31 percent workers have gone through IPM training or received some instructions how to handle the pesticides. Very few workers found attending formal training sessions organised by the tea estates and institutions like Assam Agriculture University and Tea Research Center. Altogether 59 workers in 7 tea estates in upper Assam reported that they were send for the cholinesterase test at Assam Medical College.

Table 4.5: Perceived danger in the jobs of pesticides spraying (Likert scale)

Very low	Low	Medium	High	Very High	Total
42 (9.9)	142 (33.3)	59 (13.8)	170 (39.9)	13 (3.1)	426

* Source: field work, 2010; figures in brackets are in percentage

Long sleeved shirt, full pant, cap, shoes, gloves and face mask could prevent exposure of the chemicals to the body of the workers. This is desired that the workers use these preventive measures. The study however finds that just 224 workers (53 percent) reported to wear long sleeved shirt, 234 workers (55 percent) wear full pant, 59 workers (14 percent) put cap, 88 workers (21 percent) put shoes, 139 workers (33 percent) use hand gloves and 155 workers (36 percent) wear the mask. Being asked the reason for not using the protective gears, the citation of majority was that these are not provided by the estate management (reported 225 workers or about 53 percent). Some however reported that they are not aware of the consequences (75 workers or 18 percent), some are just ignoring the consequences (69 workers or 16 percent) and for some cloths and gears are inconvenient to use (19 workers). It is observed that in general workers wear half pant and a half shirt with slippers in their feet while spraying pesticides.

4.4 Hazards and fallout: Absenteeism at work

About 57 percent workers (240 in total) in the sample abstained from work due to illness in the past one month prior to the date of the survey²⁴. Workday lost for 161 workers was minimal at 1-3 days during the month. Some workers, however, were absent from work for about a week and some for a fortnight (Table 4.6). Illness (131 workers), hangover from alcohol (8 workers), injury (one worker), availability of other lucrative work²⁵ (26 workers), and to get engaged in cultivation²⁶ (31 workers) were the reasons for non-attendance (Table 4.7).

²⁴The rule 74 of Assam Plantation Labour Rule, 1956 states that a worker is entitled for sickness allowance for certified illness for 14 days in a year. For temporary workers this is at the rate of one day for every 21 days of work attended.

²⁵The wage workers in tea estates at present is just Rs. 71.5 a day. On the other hand in petty casual jobs outside the estates the workers could get upto Rs. 200/ a day. Moreover, there are some reported part time income avenues such as firewood and timber collection and sell, NREGA jobs where workers could easily get engaged availing the entitled as well as leaves without pay.

²⁶The bilateral agreements between the trade union and employers ensure that the plantation workers are entitled for two days paid leave for utilization of the paddy fields they possess. This may be noted that many worker families in Assam tea plantations possess paddy plots.

Table 4.6: Numbers of day workers abstain from work in past one month

No absence	1-3 days	4-7 days	8-15 days	More than 15 days	Total
181 (42.5)	161 (37.8)	50 (11.7)	24 (5.6)	5	421

Table 4.7: Cited reasons for worker abstain from work

Illness	Alcohol hangover	Injury	Other lucrative jobs	Cultivation	Total
131 (30.8)	8	1	26	31	421

* Source: field work, 2010; figures in brackets are in percentage

The rate of absenteeism from work, and workers engagement in other relatively lucrative temporary jobs reveal that the jobs at tea plantation estates are not remunerative enough. This is more so with the perceived danger in the job of pesticides spraying.

It emerges that overall low rate of work related injuries compare unfavourably with a fairly high rate of sickness and absenteeism at work. The focus in the tea estates, at present primarily on to record the mechanical and physical injuries and there is no space to record the long term occupational diseases. Discomforts such as headache, muscle pain, excessive sweating and chest pain often considered as common ailments. Moreover, as we have found there is massive casualisation of workforce in the tea estates and workers in pesticides application are primarily casual workers. It is possible that injury rates among them go undocumented.

4.5 Risks and perception on the wage

Most of the workers engaged in the job of pesticides application feel that the wage they receive is not enough. This is considering the effort they put and risks involved (though this is not perceived by many). The workers were asked what should be the ideal wage at present time. Earlier we had mentioned that in the regulated labour market of tea plantations there is no wage differentiation across its various jobs. To the indication of the workers the average wage they desire is estimated at Rs. 105/ . This is much higher than the prevailing wage of Rs. 66.5/²⁷. The modal wage reported is Rs. 100/ and a maximum of Rs. 200/ a day is reported by few workers as ideal wage in the job of pesticides spraying.

The study hypothesized that insurance coverage would raise the life value of the workers. It is found that 132 workers in the sample have some form of insurance

²⁷During the time of field work (2010) the wage rate was Rs. 66.5/; revised to Rs. 71.5 in April, 2011.

coverage²⁸. Those workers having insurance cover (in 13 estates) are paying on an average annual premium of Rs. 248/. The average maturity value of the premiums of each worker is calculated at Rs. 121,788/²⁹.

Among the workers, not having an insurance cover (294 workers), altogether 163 workers showed interest to have an insurance cover. A question was asked how much they are willing to spare monthly to pay the premium. The average premium these workers are willing to pay annually is estimated at Rs. 304/, which is higher than what the workers with insurance cover are paying at present. The average maturity value of the premiums of these workers is calculated at Rs. 230,184/.

Table 4.8: Premium paid by the workers annually in Rs.-range

Range Rs.	Upto 100	101-120	121-150	151-200	201-250	251-300	301-350	Average Rs.	Max Rs.	Mode Rs.	Total workers
Workers	15	3	19	40	37	10	7	248	1800	200	131

* Source: field work, 2010

Table 4.9: Calculated maturity of the premium paid by the workers

Range in Rs.	Upto 25000	25001-50000	50001-100000	100001-200000	200001-300000	300001-400000	400001 & more	Average Rs.	Max Rs.	Min Rs.
Workers	7	9	33	31	21	7	2	121,788	676,000	20,000

Table 4.10: Premium the workers without insurance cover are willing to pay

Range in Rs.	Upto 100	101-120	121-150	151-200	201-250	251-300	301-350	400 +	Average Rs.	Max Rs.	Min Rs.	Mode Rs.	Total
Workers	35	8	4	41	5	17	1	52	304	1600	40	200	163

Table 4.11: Calculated maturity of the premium WTP by the workers

Range in Rs.	Upto 25000	25001-50000	50001-100000	100001-200000	200001-300000	300001-400000	400001 & more	Avg. Rs.	Max Rs.	Min Rs.	Total
Workers	5	3	41	40	31	19	23	230,184	1018,368	14,220	162

²⁸Apart from the universal social security schemes of Assam Plantations Provident and Pensions Fund Trust, which came into force in 1955, other security scheme such as insurance was unheard about in tea estates of Assam till recent past. Micro insurances availed by the plantations workers are largely result of the endeavour of insurance agents, both from public and private sectors.

²⁹We have the figure of the premium the workers paying monthly/annually. Some workers have reported the sum assured value. Taking into consideration of the years of premium paid, service years remaining and the annual premium, an insurance person was consultant to arrive at the maturity value of their premiums at their retirement age.

In the next chapter we shall try to have an estimate on the quantum of wage premium required to compensate the risks of injuries and illness arising out of the risk prone job of pesticides application. This study avoids the valuation of life in case of death as secondary data of the sampled tea estates do not show death cases.

Chapter Five

Econometric Analysis to Determine Risks and Life Value

As we know, the labour market of tea in the estate sector plantations of Assam has uniform regulated wage. This has promoted us to acquire a hedonic wage (an expected wage for the type of job workers perform) indicated by the workers perceiving risk in the job of pesticides application. It is possible to construct that the wage expected by the workers gets influenced by their age, educational level (years spent in school), years of involvement in the job, the nature of the job- permanent or temporary (permanent 1 or otherwise 0), incidence of injury at work (injury 1 or otherwise 0), insurance cover of the workers (coverage 1 or otherwise 0), participation in pest management training (yes 1 or otherwise 0) and symptoms of presence of physical discomforts (yes 1 or otherwise 0). The survey though has acquired information on presence of 10 types of physical discomforts (Table 4.4), to assess the impacts of pesticides four discomforts, namely headache, muscle pain, excessive sweating and chest pain are taken into account. This may be noted that these four physical discomforts clearly indicate the changes in cholinesterase level in the body, resultant of exposure to certain chemicals (Brown, 2006). We expect positive coefficients of all the indicators in the regression analysis. In the analysis, however the indicator age of the workers is dropped, because it shows high colinearity with the years spent in the job by the workers. The estimates also include two indicators in a separate equation to capture perceived risks in the job (measured on likert scale of 1 to 5), and workers WTP to have an insurance cover (those reported not having insurance cover, yes 1 or otherwise 0).

We have measured the dependent variable as the perceived daily wage rate. Many studies (Madeshwaran, 2004; Rafiq, 2010) however use the dependent variable as hourly wage rate. The prime issue however, here is the use of the wage variable in linear or log-linear form. The functional form of the dependent variable (linear or log linear) in the compensating differential model is an unresolved problem (Madeshwaran, 2004). This study runs Box-Cox transformation in STATA to ascertain which transformation of wage variable has the highest explanatory power, and finds the explanatory power of semi-logarithmic model is marginally better. Moreover, the semi-logarithmic specification has advantage of not predicting negative earning for absence of any risks, injuries and discomforts (Dougherty, 2007).

Table 5.1: Summary statistics of variables used in regression (N-426)

Variables	Mean	Std. Dev.	Min	Max
Age	32.77	10.110	16	70
Education	2.7	2.840	0	10
Years in job	9.9	7.576	1	40
Nature of job	0.356	0.479	0	1
Hedonic wage	105.31	22.885	66	200
Perceived risk	2.929	1.116	1	5
Injury	0.962	0.303	0	1
Insurance	0.309	0.462	0	1
Would insure	0.652	0.476	0	1
IPM training	0.307	0.462	0	1
Symptom reflecting changes in cholinesterase level	0.741	0.448	0	1

Table 5.2: Regression results of hedonic wage equations

Variables	Equation 1	Equation 2
Education	0.026* (0.002)	0.003** (0.002)
Years spent in the job	-0.001 (0.001)	-0.001 (0.001)
Nature of job	0.014 (0.011)	0.013 (0.011)
Injury	0.015 (0.015)	0.011 (0.015)
Insurance	0.011 (0.001)	
Would insure		0.010 (0.010)
IPM training	-0.033*** (0.010)	-0.039*** (0.011)
Symptom	0.034*** (0.001)	0.033*** (0.010)
Perceived risk		0.008* (0.004)
Constant	1.98*** (0.013)	1.96*** (0.017)
R ²	0.10	0.10
F	6.3	6.0
Valuation of Statistical Injury (VSI) per worker, per annum in Rs.	34,011/	-
Valuation of Statistical Sickness/physical discomfort (VSS) per worker, per annum in Rs.	35,532/	-
Valuation of Perceived Risk (VPR) per worker, per annum in Rs.	-	33,468/

Note: significant ***at 1 percent, ** at 5 percent and * at 10 percent level; standard errors are in brackets.

As expected we have positive coefficients of education, nature of jobs, injuries, insurance coverage, presence of symptom related to cholinesterase level and perceived risks in the job. The coefficients are however significant in case of education, perceived risks in the job and symptom related to cholinesterase level. Contrary to the expectation, years spent on jobs and training of workers on pest management show negative (significant) coefficients.

As seen and perceived from the field visits, the indicators are showing differentiated impacts because of certain reasons. This may not be that, the elderly workers, who have spent more years in job, are aware of the situation (hazards) and expect better wages. On the other hand, the permanent workers may expect better wages and the temporary workers being placed in an insecure position, instead of demanding a better wage would insist to attain a permanent stature in the job sector. We find that majority (55 percent) of the workers in the job of pesticides application are temporary workers. We also find that most of the workers in the sample are unable to perceive risks involved in the jobs. The insurance cover, workers already possess not just because that they have able to perceive the risks. Training in pest management would have helped the workers to perceive the risks at work. The trainings are however mere instructions how to mix the pesticides and spray the mix in the plantations; and this does not mean that they are aware of the risks at work. Overall, the workers feel that the wage they are receiving not enough for the reason that the job is tough compared to other jobs in the tea plantations.

The indicator, presence of symptoms of physical discomforts is however different from other indicators in the analysis. This is not merely stated, but revealed by the workers, unaware of the impacts of changes in cholinesterase level in the body.

This study estimates three values – value of statistical injury (VSI), value of statistical sickness/physical discomfort (VSS) and value of perceived risks at work (VPR) using the following equations:

$$VSI = \beta^i * W * 12 * 26 *$$

$$VSS = \beta^s * W * 12 * 26$$

$$VPR = \beta^r * W * 12 * 26$$

Where

- 1) β^i is the coefficient of injuries, β^s presence of symptoms of physical discomforts and β^r perceived risk at work in the three equations.
- 2) W is the hedonic wage, expected wage indicated by the workers

3) 12 in the days workers work in a fortnight³⁰ and 26 is the fortnights in a year.

The estimate comes to Rs. 34,011/ (\$ US 724) annually per worker in case of injuries at work; Rs. 35,532/ annually in case of symptoms of physical discomfort and Rs. 33,488/ in case of perceived danger at the job of pesticides spraying.

Madeshwaran (2004) had estimated valuation of life in case of injury at Rs. 6,400/ and Rs. 9000/ per worker respectively for Chennai and Mumbai during that period. Average annual wage of blue coloured workers in the two cities was Rs. 15,781/ (Chennai) and Rs. 16,667/ (Mumbai). This means that there is an additional premium (40.5 percent in Chennai and 54 percent in Mumbai) of wages for the injury risks at work. It reflects that Indian labour market compensate for the disadvantages of higher occupational risks. Rafiq's (2010) study in the context of industries of Pakistan the value of statistical injury based on actual risks comes in between \$ 417/ (Rs. 19,600/) to \$ 1654/ (Rs. 77,700), much closure to our estimates.

Annual wage for workers in Assam tea plantations at present is Rs. 20,748/, (@ daily rate of Rs. 66.5. Our estimates are based on a hedonic wage of Rs. 105.31 (the expected daily wage average); and this reveals that even at this perceived wage (Rs. 32,766 annually) there is need of additional annual wage premium of Rs. 34,000/ in case of injury, Rs. 35,500/ in case of physical discomfort arising out of pesticides exposure and Rs. 33,500/ for the perceived risk and danger in the hazardous job of pesticides application.

³⁰ In tea estates of Assam workers are paid every fortnight and all the calculations relating to PF and Pensions etc. are estimated based on fortnights.

Chapter Six

Conclusion and Policy Implications

The study overall finds high casualisation of workforce in the tea plantation sector, preponderance of casual workforce in the hazardous and risks prone jobs, inadequate wage compensations for inherent and perceived risks at work, and absence of adequate safety covers and risk reduction measures. Responsibility to make the workers aware of the inherent situation lies on the state, management of the plantations estates as well as on the workers' unions. In this sector at present the risk factor is not well perceived well, and estimated and presented before the policy makers.

The argument of the study is that there is need of compensating for the presence of occupational hazards in the job of pesticides application in the tea plantations. The issue of measuring the value of risks to life and health (for compensation purpose) in pure economic term is a debatable issue (Madheswaran, 2004). In the context of regulated labour market of tea industry, this is more difficult as the workers cannot make the trade-off between health risks and the economic gains.

An argument on second line is that how the management of the tea estates, the labour department in the state and the policy makers take decisions on the arrived economic values in the analysis. The law though permits cases to compensate the workers from visible impacts of injuries and death at work, this however, likely that impact of occupational hazards arising out of exposure to chemicals might not get captured. In this context it is important to have cholinesterase test of all the workers engaged in pesticides application every year. The proposed values arrived through the econometric analysis may be used by the state for assessing the benefits of risks reduction measures. The state might take up cost benefit analysis that adoption of measures to minimize the health risks at work would reduce the perceived value of statistical risks, injuries and deaths. Thus such economic values could be the pertinent factor in deciding whether to accept individual risks (a wage premium) or ensure collective wellbeing by ensuring risk aversion measures. Considering that health risk in the jobs of pesticides application is high, which is reflected in higher valuations of injuries, symptom of diseases and perceived risks (estimated valuations are more than 160 percent higher than the workers' wage rate); it would be wise for the state to go for enabling provisions at work and regulate work in the hazardous jobs.

This may be noted that the calculations in the study are just indicative to support the need of industrial safety programmes and could be biased as it does not include the impacts of discount rates for long term health related risks on wage

premium (Madheswaran, 2004). The study, however, indicates a support line of safety by bringing in the issue of the insurance cover of the workers.

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Appendix Table

Table 1: Recorded injury cases in sampled tea estates

Tea Estates	Years captured	Case of injury	Permanent workers	Casual workers	Total workers	Workers on leave a day-average	Workers on sick leave a day-average	Workers sent for cholinesterase test during 2010
Chubwa	8	11	1573	1200	2773	171	18	10
Delakhat	10	0	599	688	1287	63	38	40
Panitola	3	4	1719	1823	3542	508	15	40
Ethelbari	10	0	149	63	212	15	7	21
Limbuguri	10	0	805	900	1705	97	31	10
Nudwa	10	0	641	411	1052	69	10	25
Dinjoe	10	0	435	580	1015	136	22	24
Srikrishna	10	0	333	226	559	23	7	26
Morongi	9	11	1180	359	1539	73	63	0
Dholaguri	5	9	790	244	1034	56	53	0
Atahabari	8	15	816	237	1053	68	60	0
Sokeeting	2	5	560	115	675	103	27	0
Jamuguri	3	7	630	192	822	80	27	0
Gingia	4	6	2385	632	3017	37	37	0
Majuligarh	5	7	2746	709	3455	40	53	0
Pratapgarh	4	6	2079	963	3042	30	30	0
Baghmari	5	10	2458	556	3014	41	38	0
Ananda	10	0	1897	387	2284	111	10	0
Dolohat	10	2	958	23	981	NA	33	0

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