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**Occupational health: Methodological issues for consideration
from a study of the leather tanning industry**

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Abstract of Paper

This paper elucidates the methodological issues involved in studying health problems related to occupations. The emphasis on rapid industrialisation particularly for exports and the consequent (deteriorating) impact health-wise this has for workers' involved in these (export) industries is the broad context in which this paper is situated. We discuss the various perceptions from which the issue of occupational health has been studied and argue for a multi-dimensional approach to the problem. Taking the leather tanning industry as a case study, an attempt is made to explicate the linkage between processes of production, labour, conditions of work, and the impact of all these on the health of the tannery workers.

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introduction

The term 'development' is usually associated with economic development and the growth of National Income normally is considered as its potential measure. There is, however, never any one to one correspondence between per capita income, growth and conditions of human existence. This is more especially so in developing countries. In this context, maintaining and improving health of a population as an objective of development is a relatively new phenomenon.

Health is a multi-dimensional term. As per the definition handed down by the World Health Organisation, health denotes, "a state of physical, mental and social-well being and not merely the absence of disease or infirmity".¹ Health can be approached both in terms of negative and positive models; in dynamic and static terms; or described either as stock or flow; some have explained health as a good while quite a few have tried to conceptualise it in terms of production and consumption functions. At times health is also explained in terms of health care, utilisation of health services etc. Since the objective of this paper is confined to the methodological issues of occupational health, we have refrained from the debate surrounding various concepts and determinants of health.

When an individual's health fails, it need not be only due to genetic or biological reasons. His/her environment, that is, living and working conditions, could also account for it. Our emphasis in this paper is on this aspect of health, namely, the direct and indirect impact of a person's occupation on his/her health/well-being. The origin of occupational health as a distinct branch of health care services is recent even in developed countries; in developing countries it has only begun. The joint ILO/WHO Committee on Occupational Health, in the course of its first session, held in 1950, gave the following definition of occupational health: "Occupational health should aim at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention among workers' of departure from health caused by their working conditions; the protection of the workers in their employment from risks resulting from the factors adverse to health; the placing and maintenance of workers in an occupational environment adapted to his physiological and psychological equipment; and, to summarise, the adaptation of work to man and of each man to his job".²

This definition of health places emphasis on the immediate causal linkages between the development of particular industrial processes and specific health hazards. Any attempt to understand fully the causes of health problems consequent upon the processes of industrialisation has of necessity to go beyond the immediate causal linkages. There is need to examine the wider political and economic forces which determine the pattern of industrial development, the consequences of which are borne by workers and their families as well as by people who may not be directly or even indirectly connected to the process of development, but, nonetheless are exposed to health risks.³

The plan of this paper is as follows: in Section I we try and establish how occupational health is directly related to the pace, pattern and intensity of industrial development. Given that the underdeveloped countries (UDC's) are characterised by large informal sectors, ill-conceived and poor-coverage of social legislation, and the near impossibility of monitoring and evaluating the implication and working of policies on different sections of the population, any emphasis on accelerating industrial development ipso facto means a sharp deterioration in the working environment and therefore the health of the workers.

In Section II we bring together various perceptions on occupational health, the different methodologies developed based on these perceptions and, emphasise the need to approach occupational health as a multi-dimensional phenomenon.

In Section III, taking the leather tanning industry in Dindigul as a case study we hope to explicate in a concrete manner the linkage between the organisation of production and the conditions of work, and the consequent impact of this on the health of the tannery workers. This exercise is done against the background of the Government of India's industrial policy emphasising export-intensive production in the name of development.

SECTION I

Over the last few decades, industrial activity in developing nations has greatly increased. These nations have used a variety of policies to stimulate production and achieve economic gains. In order to compete in world market, many countries have restructured production in their industrial sectors, actively promoted investments by foreigners and encouraged the development of small-scale enterprises. However, the expansion of industries and the resultant higher growth has not meant better working conditions for the workers. On the contrary, this growth has increased the health risks confronting workers and communities. In other words, we can say that the pattern of industrial development or industrialisation, the choices of particular products, the technologies that the production of these products require, carry with them the germs of occupational hazards. It is this nature of overall production process that ultimately sharpens or blunts the edge of hazards.

In developing countries Occupational Health and Safety (OHS) problems associated with industrialisation are and will increasingly (unless confronted headlong) become more serious than in developed countries because of the generally poor quality of human and environmental conditions. The developed nations have over a long period devised mechanisms to safeguard and monitor the pollution of air, water and soil. Industries which are more polluting and hazardous are either banned or forced to pay higher taxes in these nations. On the other hand, the 'industrialise or perish' situation in which a country like India finds itself, does not but lend itself to a situation where its air, water, land and people are exposed to pollution of all kinds.

It is important to mention at this juncture that since the prevalence of unemployment in UDCs is of very high order, workers are prepared to accept any job, irrespective of the dangers involved. Labour is cheap and easily replaceable; therefore employers see no need for improving occupational health and safety. Labour unions are mostly controlled by full-time politicians who consider health a political issue, especially when their party controls the country's government. The seriousness of all these facts is heightened by the existing socio-economic order in poor countries, in which national medievalism and multinational modernism play a crucial role.⁴ A related phenomenon affecting UDCs which are dependent on Multinational Corporations/Transnational Corporations for most of their production techniques, is the lack of full information (deliberately or otherwise) particularly that relating to safety measures. By its very definition, the standards of safety, and working conditions for a worker in an UDC are not matters where strict monitoring and evaluation systems apply.

Apart from these, in UDCs the differentiation in labour parallels differentiation in production processes and therefore differentiation in exposure to health. This has been brought out by Qadeer⁵ in her analysis of the organisation of labour around technologies in the new and old industries of India. Her study reveals that (i) the technological option⁶ chosen has made some tasks in the production process more hazardous; (ii) that these tasks are generally given to unskilled contract and casual workers who

have little bargaining power; (iii) that there is a strong tendency to device less safe but quicker methods of production particularly in the small-scale units; (iv) even in the unorganised sector, industries which are mechanised sub-contract to small-scale units and thus depend on contract labour for the completion of many necessary tasks. Thus the vulnerable position of casual workers in the informal sector, (who are labelled 'unskilled' who are significant in size, contribute maximum labour and are likely to take up hazardous jobs) goes unrecognised.

The wastage of human life during the industrial revolution, brought about by child labour, unsafe mines and other exploitative conditions has been documented for various countries.⁷ Improved labour organisations,⁸ protective labour legislation programmes⁹ and increased sophistication¹⁰ have since ameliorated such conditions and many grosser known hazards in industrialised countries. But other measures were slow to be taken up. In the United States, for example, it was not until 1970's that a relatively Comprehensive Occupational Safety and Health Act was adopted specifying one definite standard, with others to be adopted administratively as set forth by law.¹¹ This is true, in the case of other developed/industrialised countries too.

In other words, it can be said that almost all OHS policies were and still are standard setting, piecemeal in nature, directed to particular industries like mines, construction etc., with legislation enacted being specific to an industry and administered bureaucratically. After considerable struggle by labour a 'new style' legislation was enacted which covers all employees and includes them in the strategy for development.¹² Emphasis is now given to problems in a manner very different from the past. Physical exposure to fumes, dusts and toxic substances have been nearly overcome and occurrence of a specific poisoning or dust disease is on the decline in these countries due to environmental research and education controls taken. Consequent upon the strict supervision of the work environment and controls, measures to avoid any existing and potential hazards, occupational health (OH) services are now available within the industry.

On the contrary, in developing countries OH is equated with labour welfare and labour legislations. There is neither any comprehensive understanding nor stringent laws covering health and safety of workers. The laws regarding health and safety of workers are part of various legislations which actually deal with workers' welfare. This we will explain with the case of India. One important and probably the only way the Indian government deals with occupational health is through the legal mechanism. There have been a series of labour laws aimed at ameliorating the conditions of labour, namely: (1) Factories Act, 1948 (this is prescriptive and protective in nature), (2) The Workmen's Compensation Act, 1923 (curative), and, (3) Employers' State Insurance Scheme Act, 1948 (ESIS) (compensatory).

The Factories Act, 1948 has laid down provisions for the general health of workers by PRESCRIBING details about cleanliness, disposal of wastes and effluents, ventilation and temperature, dust and fume, artificial humidification, over-crowding, lighting, drinking water, latrines, urinals, and spitters. It also provides for safety of employees by laying down specifications for fencing of machinery, work on or near machinery in motion, employment of young persons on dangerous machines, striking gear and devices for cutting off power. Further, it contains provisions which prohibit employment of women and children in hazardous operations besides specifying safety appliances for various parts of bodies against heat, fire, noise, chemicals etc. Standard safety specifications are also mentioned in the Act.

The Act empowers state governments to declare a manufacturing process as dangerous operation. It also makes it mandatory for the employer/owner to employ safety officers to periodically assess the hazards and to review the conditions of dangerous operations. The Chief Inspectorate of Factories is the highest authority to recommend and specify safety and health measures.

The ESIS Act provides for benefit in case of sickness, maternity and employment injury to workers whose monthly income is less than Rs.3000/-. The ESIS Act is applicable to all units where 20 or more workers are employed. In case of employment injury, the Act guarantees sick leave without loss of wages. Schedule III¹³ of Workmen's Compensation Act is applicable to ESIS Act for claiming compensation. The sickness benefits apply not only to related occupational diseases, but also to all types of sickness problems of insured workers and their families.

The Workmen's Compensation Act guarantees compensation in the case of occupational injuries and diseases. Diseases listed in Schedule III of the Act are compensable. The compensation paid under this Act is mainly for injuries caused by accidents. The act covers a wide range of workers who are not covered by ESIS Act. Under this Act, workers whose employment is temporary, including agricultural labourers, can claim compensation.

These Acts have several kinds of problems: Firstly, even the little that has been enacted in the name of safeguarding workers does not cover all category of workers - casual and contract as well as workers in the unorganised sector. It is precisely these categories of workers who are working in unhealthy environments and are engaged in dangerous processes involving contact with hazardous chemicals/dangerous operations. Thus those who are in greatest need of protection are the ones who are least touched by regulations.

Secondly, even those who are covered by various Acts, have not really benefited for the following reasons:

- i) A worker cannot directly take a factory owner to court even if the latter violates all provisions of the Factories Act. The Factory Inspectorate is the only authority which can seek legal action against employers.
- ii) All factories are not inspected by the Factory Inspector for the target given to him/her is beyond his/her capacity (both in terms of time and money).
- iii) The Acts only provide/lay clear remedies that are available to workers subsequent to disease or infirmity, but do not lay down any principle regarding prevention of unsafe working conditions.
- iv) The benefit at the time of injury under ESIS is not available if the injured worker has not contributed to the common fund for at least 13 months.
- v) As far as ESIS is considered it has become a scheme for general health of worker. The ESIS hospitals do not have trained doctors to diagnose occupational diseases.
- vi) Under Workmen's Compensation Act, a worker is entitled to compensation only if he/she is bedridden for a minimum of 3 days. If the injury does not hamper the production of a commodity, then, it is not considered injury.

There are many more lacunae; it is evident that these laws are far from adequate. Still one can say, strict enforcement of these is as important as the struggle for better laws.

In UDCs the health hazards have resulted not only from the 'export or perish' policy of the government and the extreme immiserization of workers, but also from shortcomings, such as financial resources, operational experience, training capacity, information system and pollution control technology. These shortcomings have restricted the assessment of adverse health consequences of industrial development and the establishment of policies for their prevention and control.

SECTION II

In this section, we bring together various perceptions of occupational health, and the different methodologies that are used to study occupational health based on these perceptions. Our analysis consequently emphasises the need for a multi-dimensional/interdisciplinary approach to the problem of occupational health.

Before going into the methodologies, it is essential to bring out the difference between occupational injury/accident and occupational illness/ill-health. From an OHS policy perspective the former has received more attention than the latter, since the cause of an accident can be more readily known than the cause of illness. Illness may not show up until, say, 20 to 40 years; therefore establishing causality becomes difficult. Moreover, work-related injuries may also be undistinguishable from chronic illnesses due to other causes. However, from the methodological and/or research point of view, more emphasis has been given to illness than injury.

Over the years, the scope and approach to occupational health has widened considerably and now broadly covers the following personnel: pure-scientist, toxicologist, ergonomist, epidemiologist etc., each of whom have imparted a particular perception to occupational health. Until recently the concept of occupational disease denoted a specific clinical and pathological syndrome caused by a hazard specific to a particular type of work or work atmosphere. This was largely considered to be a physician's domain and/or it was largely associated with 'clinical/laboratory' research. This is mostly curative in nature. This often does not consider the other social, economic and environmental factors which contribute to workers' health. Moreover all physicians do not possess adequate knowledge of work processes and its effect on health.

Ergonomics is now a well recognised discipline and constitutes an integral part of any advanced OH service. It simply means fitting job to the worker which involves designing of machines, tools, equipment and manufacturing processes, lay-out of the places of work, methods of work and environment in order to achieve greater efficiency of both man and machine. This application of ergonomics makes significant contribution in reducing industrial accident and hence in improving the overall health and efficiency of the workers. It involves protection from physical hazards/injuries but chemical and biological hazards involved in industrial processes are beyond its scope. It is 'technical' in approach and the human component is neglected.¹⁴

In order to reduce the time of production and to increase the pace, many chemicals are used in industries. Herein comes the role of the toxicologist, who studies the harmful effects of chemicals on biological systems. There are currently sixty to seventy thousand chemicals in production and the list is expanding at a rate of 700 per year. But, only 20 chemicals per year on an average have been recognised by most OHS agencies as human carcinogens (which means, it could cause cancer). The International Agency for Cancer Research, a body which works with WHO, lists 221 chemicals as carcinogenic. National Institute of Occupational Safety and Health (NIOSH), USA, lists over 2000 chemicals as suspected carcinogens.¹⁵ Unless all chemicals used are tested and Threshold Limit Value (TLV) is recommended based on climate and working atmosphere, it is difficult to ban chemicals even if the latter turn out to be fatally toxic. Moreover, in the work place, since local names and brand names are used, it becomes difficult to identify the actual chemical and its effect. Hence the role of toxicologist cannot be ignored in OHS policy.

Epidemiology - which studies the distribution of disease, its causes and its risk factor on human population - contributes to knowledge on the impact of occupation on health by (i) identifying hazards and estimating their significance, (ii) relating hazards to disease and impairment, (iii) quantifying such relationships to generate and test hypothesis on cause-effect relations. This provides a sound basis for recommending safe working conditions. These recommendations, with or without further policy modifica-

tions, are frequently used as the scientific basis for legal standards.¹⁶ The data needed for descriptive epidemiology can be obtained from health surveillance of workers and by monitoring of workers' health and their environment. Epidemiology studies can be either cross sectional or longitudinal ones.¹⁷ The former measures the prevalence rate and the latter measures the incidence rate. However epidemiological research tends to focus too narrowly on the direct cause of ill-health without seeing the wider relationship which exists between a disease and the socio-political-economic environment.¹⁸

in the world of work, work processes and work pace keep changing. The changes are mostly dictated by technological and/or economic considerations. Whatever be the motive for change, the implications of such change on the environment or for the health of the workers involved seldom form part of the programme either at the stage of conception of the change or in its implementation. There has always been some scientific uncertainty about whether a specific exposure causes a specific health effect. People with different interests and perspectives often disagree on the credibility and strength of the evidence.

Epidemiology, however seems to be more comprehensive, compared to others, but it is not holistic. Epidemiologists are still struggling to free themselves from the older model of a single etiological agent producing a specific disease to one that encompasses the dynamic influence of social and environmental influences on the distribution of disease in a population. Epidemiologists, most of whom are physicians, have become habituated to think in uniform ways that stifle creativity. One unfortunate consequence of medical culture's influence on epidemiology is the commitment to a system of disease classification that was generated and utilised mainly by practitioners of clinical medicine, which fails to take into account the social and environment causes of disease distribution. Some epidemiologists have given thought to the development of other schemes of classification which are not derived from clinical medicine or from pathology, in which diverse types of diseases may be grouped according to other properties they may have in common.¹⁹ In order to make their methodology powerful epidemiologists are mindful about the (bio) statistical interpretation of their data. Unless epidemiologists go beyond these epistemological and technological constraints of the discipline in search of explanations with political and social foundations it cannot be holistic. Since all these methodologies need sophisticated data systems and techniques, they cannot be applied in all work places, more so in developing countries.

Analogous to the 'new style' legislations and techniques in the developed countries based on an integrated approach to occupational health and safety, we have in India, albeit in not so integrated a manner, quite a few research laboratories, institutions and organisations (voluntary and government) etc., increasingly looking into the phenomenon of OHS. These include the Indian Toxicology Research Centre (ITRC), Lucknow; National Institute of Occupational Health (NIOH), Ahmedabad; All India Hygiene and Public Health, Calcutta; Central Labour Institute, Bombay; National Environmental Engineering Institute, Nagpur. Apart from these there are some university departments, medical colleges and industries which do research on occupational health, but their interest generally relates to special OH problems. Most of these are project-based research institutes, where developing a methodology to study OH and/or act as a body to influence legislations relating to the same is not of primary concern.

If one goes through the review of OH research in India published periodically by the Indian Council of Medical Research (ICMR), it would be clear that the same industry would have been the subject for quite a few independent studies, adopting different approaches, but without any attempt being made to integrate them. Each of these studies, however is limited in scope, most of it being purely clinical, which excludes the culture of factory - its organisational structure, technology, process, work climate etc. Besides very little emphasis is accorded to OHS in medical syllabus and in the training of medical personnel, which in turn also limits the number of persons involving themselves in the clinical research of occupational health. Worse, even these limited findings are not incorporated and/or made the basis for appropriate workable policies.

SECTION III

Before we go on to outline the approach we have adopted in our attempt to study the effect of tanning on the health of the workers at Dindigul, we discuss below few studies that exist on the subject of leather industry, their methodologies and findings. This will help us in delineating how we differ and/or go beyond what these studies have attempted. We start first with epidemiological studies done abroad, then in India and in Tamilnadu; next we dwell on studies of a descriptive nature; finally we take up those studies which give guidelines for research and policy based on their own survey of research and actions.

Decoufle's²⁰ study in 1976 has brought out the cancer risks associated with employment in leather and leather product industry. Following case control analysis, persons with suspected cancer from a cancer institute (resident in the institute between 1956 and 1965) were interviewed.²¹ Then retrospective examination of occupational differences between persons with specific forms of cancer and persons without cancer were done. Two groups, (i) persons engaged in manufacture of leather and leather products and (ii) persons engaged in shoe making were taken as 'case' and 'control'. It was found that men and women with the history of employment in leather and leather product showed significantly high risk of bladder cancer.

Another retrospective study, was carried out in Leicestershire between 1976 and 1982, eliciting the causes of perinatal death.²² The women interviewed were from 27 occupations. The analysis of maternal occupation showed that leather workers were at an increased risk of having perinatal death when compared with other manual workers of the same social class.

These studies draw our attention to an occupational hazard by the occurrence of disease because of high concentration of the causative agents used in the work spot. Further these studies, with some statistical tools, have also tried to trace/forecast relative risks of occurrence of the same disease for controls, who are exposed to less concentration of causative agents, in the long run. In these studies, health is quantified by using statistical tools. The clinical picture of health dominates these studies. The fact that a worker is not sick now but could fall sick in the long run due to exposure of causative agent is not of primary concern in these studies.

In a study done at Kanpur,²³ India, with a representative sample of 20 tanneries stratified on the basis of tanning process and processing capacity, 497 workers in tanning operations (case) and 108 workers in non-tanning operations but employed in tanneries (control), were studied. A social and medical questionnaire was administered.²⁴ This study has found occupational morbidity²⁵ among tannery workers to be high when compared to non-tanning operations. This is a cross-sectional study, where the relationship between disease and other factors to which working population is exposed in an occupational environment is brought out.

While the above study was conceived in a more comprehensive manner by including a medical and social questionnaire, its analysis of the data has however tended to remain clinical with social components being left out of the analysis.

A study conducted by the Indian Toxicology Research Centre²⁶ using case-control method studied 266 tannery workers: 167 tannery workers formed the case while 99 workers of the same factory but in different departments formed the control group. This study revealed that the incidence of skin disease among workers in the tan yard was very high as compared to those not working in the tan yard. The study is a disease-oriented study, other diseases and hazards associated with tanneries are not taken into account in this study. Socio-economic conditions of workers are once again omitted.

The study²⁷ by Nandakumar and Backiyavathy is epidemiological in approach, where 500 male employees of 11 large tanneries were subjects. It is also a case-control study (purely clinical); the case component

was formed by those who were exposed to occupational environment while the control component were family members of case not exposed to occupational environment. The data were collected from the health cards obtained from the Scudda Memorial Hospital, Ranipet. Eight diseases were identified as being more prevalent among those forming the case; using further statistical tools relative risks were calculated. However, this study is based purely on physicians' records.

There are few more studies, dealing with occupational health in tanneries, but they are descriptive in nature. The study done by NIOH,²⁸ Ahmedabad, gives a description of the industry and brings out the occupational health hazards in tanneries. No mention has been made about methodologies, findings etc. The studies done by the Government of India - Labour Investigation Committee²⁹ and Labour Bureau³⁰ describe the social conditions and give personal profiles of workers besides elucidating the working condition in tanneries. These studies however have nothing to do with clinical/pathological diagnosis of diseases due to work in tanneries as also stay in and around tanneries.

The monograph of the IARC³¹ based on secondary information and clinical tests has identified the carcinogenic chemicals used in leather tanning units. Similarly NIOSH,³² USA has identified health hazards at various processes and gives safety guidelines, particularly for the tanners and for better work environment in tanning units.

These independent studies, though useful, have not provided an overall picture of OH in tanneries. They also seem to take an 'either/or' approach: occupational illness studies do not touch upon injuries the workers may have suffered; while occupational injury studies are not concerned with the illness that may occur in the course of work.

A recent article on leather tanning in Tamilnadu³³ discusses the issue of health from a gender perspective. The concentration of women in the most polluting process of the industry is the prime motivation of this study. The paper confines its analysis to the impact of different processes on the workers (particularly women) involved in each; the environment outside the units but within the leather industry belt is not taken into account.

Apart from these, there are some published data available, but cannot be used for the following reasons :

The Annual Survey of Industries as well as studies undertaken by the Labour Bureau provide information on workers employed in registered units. However, these do not have information on occupational diseases. Though the Annual Reports of the Factories Act provide information on fatal and non-fatal accidents the usefulness of the data are questionable. The absence of state level and/or industry-wise response, mechanism for surveillance findings, the lateness of reports, the failure to analyse data by operational processes and geographic location - all this limits the usefulness of their data.

Workmen's Compensation data present the most readily available information on work related injuries. However, these data exclude workers who do not claim compensation. Moreover there is underreporting of accidents to avoid payments of compensation as well as to avoid prosecution for negligence under various Acts. (Because of procedural delays and inability to satisfy bureaucracy - this number is quite large). It also excludes cases of chronic illness and is also limited by adjudication procedures and diagnostic criteria.

In sum, a reading of the various studies and approaches on OHS brings out the following: disease in medical terminology is reduced to a set of technical tools, the social environment of human beings who suffer is thought to have very little relation to disease and disability. The medico-technical definition of OH makes one believe that a workers' health is merely his capacity to be functional in performing work.

where health is defined as an absence of disease or disability rather than a positive state of well-being. Such an approach inevitably leads to obscuring the large range of damaging conditions to which workers are exposed but to which they have, by sheer necessity, adopted in a very perverse manner in the sense of somehow managing to live with them. But more than this, a definition of OH of this sort serves a profoundly political purpose. It serves to absolve capital and management of their responsibility in the creation of so much misery at the work place, which according to some medically 'established' notions, can be declared non-medical and hence not related to health at all. Apart from visible ill-health (which requires immediate medical intervention) the long range health disorders, problems of work-related stress and anxiety, the not-so-immediately apparent every-day discomfort and alienation of the work place, monotony and competitiveness, lack of creativity, excessive and the intensity of the work are definitely problems of occupational health. It is clear then, that, OH is not just a matter of technical definitions nor is its resolution a matter of relevant control technology. It is primarily a question of social relation of production which finally determines the social condition of work.³⁴

Our study of the tanning industry departs from the above studies in the following manner. We strongly feel that it is important to link the patterns of development in general to the production-structure and the labour process characterising the industry; this in turn means that besides detailing work process we need to identify workers with each process and the consequent impact on their health.³⁵ Hence we :

- (a) begin with the components that make up the tanning industry, the processes involved in each of these components, and the environment in which workers in each of these components have to function :
- b) we have independently collected information on the raw materials and chemicals used (with their toxic contents) in each of these processes, the likely hazards of these chemicals on workers health and other physical hazards :
- c) Our field work which is in progress is a cross sectional study covering workers in tannery - female, male; physicians and health workers; labour and health departments of the government, tanners,³⁶ persons associated with labour unions and voluntary organisations :
- d) As already mentioned women workers are concentrated in the most polluting processes of the industry. However neither their work nor the resulting hazards stemming from this work has been an issue for systematic investigation and action. We in our field work, lay specific emphasis on this aspect by identifying them along with their work process and interviewing as many as we could regarding their health - both due to occupational environment and environment outside the unit.

In short what we are attempting is a combination of several approaches to get a holistic picture of OH in tanning.

Organisation of Tanneries in Dindigul: A Profile and a Preliminary Summary of Findings.

The structural organisation of the tanning industry and the operations involved in processing leather are highly complicated. The industry is by and large 'unorganised' in nature in the sense it is largely outside the purview of the Factories Act.³⁷

The leather industry has three different stages namely, tanning, finishing and manufacture of leather products. Tanning is basically converting animal hide/skin into leather. The main processes involved in converting the raw hides/skins into leather are: flaying, curing, soaking, pickling, tanning, colouring, setting, fatliquoring, stacking and finishing. The heterogeneity of raw materials (namely skins) and the different techniques of tanning (like vegetable (EI) tanning, chrome tanning, alum tanning, mineral tanning etc.) makes the whole

process complicated. The processes mentioned above can be combined, repeated, or omitted to suit quality requirements of final products. (For more details and better understanding about processes, a look at the Flow Chart -I on "process involved in leather tanning" will be useful).³⁸

Our attempt is to explain the components that constitute the production process and the environment in which workers have to function. Our study area is Dindigul.³⁹ Here, by and large, only the processes up to tanning is done. Operations done in beam house are labour-intensive and it is here that workers come in direct contact with raw hides and lime. It is a wet process, which is prone to frequent accidents because of slippery floors. The processes done in beam yard are common to all varieties of raw materials and techniques of tanning.

After pickling, the technique of processing is decided. The hide/skin has to be tanned either by the EI or the chrome method. The process is done in the tan yard in paddles and drums and with chemicals. It is a wet process. Most tanneries in Dindigul stop with this operation. There are very few tanneries which go up to finishing. Tanneries engaged in finishing, use only chrome tanning technique, where all processes are mechanised and use of toxic chemicals is very high. Depending on what is being tanned, there is a variation in processes and consequently a variation in the use of machines and chemicals.

What we would like to highlight is, EI tanning is more labour intensive and labourers come in direct contact with chemicals use hand tools, and are prone to health hazards and accidents. On the other hand chrome tanning is equally hazardous because of the high level of toxicity of chemicals. Irrespective of the techniques of processing leather, tanning is an accident prone industry, for all workers have to work with wet skins/hides, and that too when the machine is in motion. In other words it could be said that both techniques of tanning are hazardous but in different ways.

On the whole the tanning industry is chemical intensive. Nearly 225 chemicals are used. The combination of an unorganised industrial and labour structure, subhuman conditions of work (unguarded machines, improper handling of raw materials and chemical, leather dust, wet floors, heavy noise etc.), creates specific hazards. It has been noted elsewhere⁴⁰ that the accident and illness rate is five times higher in tanneries than the average for all other industries; it has also been estimated that on an average, every year, one in every five tannery workers will be victims of work related injury or illness.⁴¹

In Dindigul, vegetable (EI) tanning method is more prevalent and therefore the operations are more labour-intensive, especially in the case of hides.

According to statistics provided by the trade unions in Dindigul, there are about 3000 labourers directly employed in tanneries and nearly 7000 persons indirectly involved with tanneries. Among the labourers directly employed women workers constitute more than 25 percent of the direct labour force in tanneries. It is important to note here that almost all women and children working in tanneries are grouped under indirect employment for various reasons.

We have visited 60 tanning units⁴² that were functioning at Dindigul during the time of our survey. These tanning units can be grouped into vegetable (EI) and chrome (wet blue) tanning units.⁴³ Out of the 60 units, 15 units were EI units processing hides; 25 units were chrome tanning units processing skins and remaining 20 units did both EI and chrome tanning according to the need of the hour.⁴⁴

We had mentioned above about the science of ergonomics which tries to fit the job/machine to the workers. As a social scientist we tried to assess the suitability of the machines in tanneries from the workers' point of view. We found the machines used in tanneries quite big for an average Indian to operate comfortably. Further in the name of increasing production and efficiency, machine guards are removed when the work

is in progress. Automatic sensor systems to avoid accidents are also switched off or disconnected to prevent break in production. Almost all employers perceive "safety and ill-health" as an additional expenditure to be reduced at any cost.

From our interviews we were able to gather that, over the years, in order to increase the pace and reduce the time taken in production more and newer chemicals are used. From the leather technicians of each unit we have got a list and an estimate of the quantity of each chemical used in the various processes of production. This information is being corroborated with data from the purchase side and also from the workers directly involved in handling these chemicals. Toxicologists have estimated the harmful effects of different chemicals for humans; they have also specified acceptable TLV limits. We hope to use these standards to find out the level and toxicity of the chemicals that the workers come into contact directly and indirectly in the tanneries.

A thorough clinical survey of workers is not possible. However medical information on the state of health of the workers is being collected at two levels: from (i) medical practitioners and (ii) workers. This is being supplemented with medical statistics available with the government hospitals at Dindigul, the primary health centres, the mobile medical units (MMU) and the ESIS hospital.

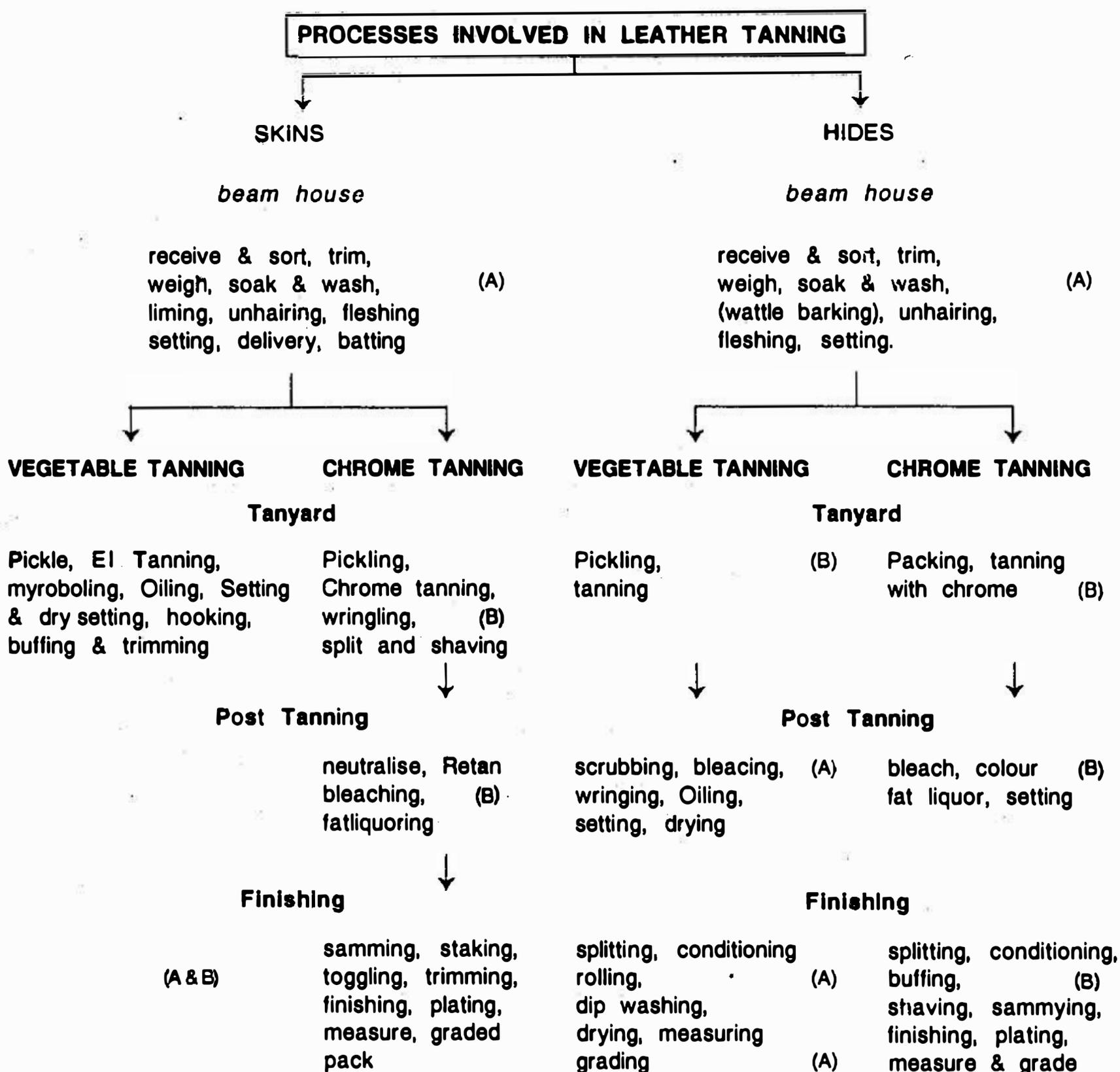
Our preliminary findings reveal:

- (a) Almost 95 percent of the women workers are concentrated in processes that are not even recognised as pre-tanning operations but which are, nevertheless, indispensable for subsequent tanning operations to be performed. The work done by these women workers constitute the most hazardous part in the entire tanning industry. Further, these women do not form part of the work force reported in the Factories Act, nor included in other official sources. If at all, they are recorded as sweeper or coolie and not as tannery worker. Besides all of them are casual labourers. They are made to work outside the tannery premises.
- b) Given the above nature of the job aspect of women, they are not entitled to any facilities - starting from literally no roof over their heads, no provision of personal protective equipment of any type, no compensation for accidents or injuries arising during their work. The question of maternity benefit, ESI, fixed working hours and such allowances does not arise since they are not counted as labourers at all under any of the Acts that apply to the tanning industry.
- c) We found that the tannery workers' (men and women) perception of ill-health coincided with that of the toxicologists' estimate of harmful effects of chemicals on humans. For example, sodium sulfide is a chemical used for unhairing. As per toxicologists' findings, contact with this chemical continuously would lead to morbidities like dermatitis, ulceration and burns, inhalation leads to irritation in respiratory tract and damage lung tissue etc. Many workers who are engaged in the unhairing process however, in the course of the interview, reported the prevalence of dermatitis, ulcer, respiratory tract infection.
- d) State intervention in the tanning industry is purely curative in nature. ESIS and MMU are the two sources of preventive health. Less than 40 percent of the total tannery workers in Dindigul have been covered by ESIS. Three primary health centres in Dindigul have been directed by the collectorate of Dindigul since February 1990 to send a mobile team to tannery pockets once every week. This MMU whose mobility is very erratic merely dispenses medicine, nothing else. The preventive aspect of health is completely missing in the state's approach. The few rules and regulation to monitor working conditions are not enforced and monitored even less. The socio-political set up has encouraged violation widely. Individual officials cannot be blamed where a total systematic violation takes place. At the most, a penalty can be imposed, which is peanuts to the employers. It does not help to prevent health hazards at worksites for labourers.

e) The way the industry is presently organized makes it extremely difficult to build-in hazard preventing measures. With the increase in demand for finished leather, cases of processing of leather being finished in three days has been reported. But this in turn means an extremely chemical intensive operation. In such cases the labourer has to be present in front of the drums (which do the leather processing in highly toxic chemicals) round the clock. This increase in demand is directly linked to the export market, where the emphasis is on increasing the share in interantional market to the complete neglect of what this implies to the workers of the industry.

We are still processing our data. However, in our view, if well-being of labour were to assume centre-stage (extremely unlikely in near the future) then we may reach a conclusion that requires banning of this industry, given the toxicity of chemicals used and other physical and biological hazards involved in its operations.

Flow Chart 1



A - LABOUR INTENSIVE
B - MECHANISED

Notes and References

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17. longitudinal studies are of 2 varieties: (1) cohort study-people working in similar conditions are studied and analysed to establish the subsequent morbidity or mortality; (ii) case control study where persons are identified with diseases which are traced to occupational exposure.
18. Randall M Packard, 1989 Op cit.
19. Stallones Reves A, To advance epidemiology, Annual Review of Public Health, 1, 1980, Pp 69-72.
20. Decoufle, Pierre., Cancer Risks Associated with Employment in Leather and Leather Products Industries, Archives of Environmental Health, Jan-Feb 1979, Pp 33-37.

21. Demographic and medical data, occupational history of tobacco consumption for each patient is also obtained.
22. Clarke, Michael and Elizabeth Manson, Leather Work: A Possible Hazard to Reproduction, *British Medical Journal* v 290, Pp 1235-37, 1985.
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33. Nihila, Millie. 'Development process and status of women: Tanning industry in Tamilnadu', *Economic and Political weekly*, 28(41) Pp 2220-28
34. Mehra, Anuray., and Sundeep Agarwal., Politics of Health And Safety, *Socialist Health Review*, 1 (3) p 102 -09, & 125., 1984.
35. It is important to emphasize here we have our focus primarily on the hazards faced by workers in the tanning industry. We are aware that pollution due to this industry is a much wider phenomena and needs to cover things such as effluence discharged from the tanning units, the impact it has on say, soil, drinking water and the environment in general. To the best of our knowledge we have come across relatively more studies dealing generally with environmental hazards/pollution due to tanneries but hardly any studies that relates work processes to the health of workers in tanneries.
36. Tanners can be either owners, persons who have taken a unit on lease, or job-work contractors.

37. Though all tanning units, especially in Dindigul are registered technically and fall under the purview of the Factories Act, the prevalence of job work and leasing and sub-leasing of the premises, prevalence of workers paid on unit basis who are permanently casual workers - make the structure of industry more unorganised than organised.
38. For more details on organisation of tanneries in Dindigul, see Nihla, Millie. 'Development process and status of women: Tanning industry in Tamilnadu', *Economic and Political weekly*, 28(41) Pp 2220-28
39. Dindigul - our study area is between Trichy and Madurai. Dindigul is known for leather tanning for centuries. 90 per cent of tanning unit are engaged only in Tanning - raw to EI/wet blue /chrome crust. Dindigul is the third important place in Tamilnadu for leather tanning. Specialty of Dindigul is, it is one of the oldest centre for leather tanning, and it is the pioneer in starting tannery unit as industry (ie. around 1870's). Still they have not come to finishing.
40. Every three minutes a worker dies of an occupational injury or illness in the world. Each passing second leaves behind at least 3 workers injured. An informed guess is that every year at least 1.8 lakh labourers lose their lives while winning their bread and about 11 crores workers suffer injury. (Bhatt, A K. *The Hindu*, dated June 17 , 1993.)
41. NIOSH, *Good Work Practices for Tannery Workers*, US. Department of Commerce, National Technical Information Service, USA, 1976(b).
42. In Dindigul at a point of time, there are between 50 to 100 units functioning. Some of the tanning units come up only when excess demand from importers.
43. Tanneries can be classified on the basis of location, production, investment, processes, organisation, etc. These classification will be discussed in our dissertation in detail. Since we are viewing the problem from health point in this piece, we have grouped the industry on the basis of tanning process.
44. The 20 tanneries who either do EI or Chrome tanning in Dindigul are the ones who do the work for others. Since they have to follow the specification given in their orders they are flexible. Whatever be the process the structure of the unit never permits them to change the raw material from skin to hide or vice versa.