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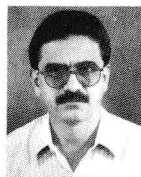


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# Farm Accidents in South India: A Critical Analysis

by

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## Abstract

Modern technology is gradually finding its place in agriculture, with still large-scale dependence on family scale farming. With the introduction of modern technology, human engineering becomes essential for its successful application. Human inattention and negligence in various tasks and operations look like innocent mistakes. Agricultural accidents are of very serious concern. A survey of agricultural accidents was conducted in 12 selected villages from 7 agro-climatic regions of Tamil Nadu State. Based on the analysis of the results of the survey the following inferences are drawn: The accident incidence rate/1,000 workers/year was 10.6. About 95.7% of the total accidents: were not fatal and the remaining 4.3% were of fatal nature. Majority of the fatal accidents were due to tractors, cane crushers, threshers, chaff cutters, drowning in the open wells and pesticide poisoning. Some 77.48% of all agricultural accidents were related to farm machinery; 9.92% were related to hand tools; and 13.60% were related to other sources. Accidents due to hand tools were not fatal. The highest incidence rate per 1,000 machines per year was

found in the case of cane crushers (58.67); followed by thresher (42.5); sprayer (14.5); tractor (14.3); chaff cutter (8.94); spade (0.48); and sickle (0.38). Based on the survey it is estimated that in the year 2000 there may be about 94,478 agricultural accidents in Tamil Nadu causing death of about 4,128 workers and injuries to about 90,350 workers which includes finger cuts, amputation of limbs, crushing of body parts, etc.

## Introduction

Farm mechanization along with increased application of other agricultural inputs such as seeds, fertilizers, pesticides, insecticides, etc. has enhanced the productivity and production on farms. It also needs energy, suitable tools and implements along with operators for carrying out different agricultural operations. Human workers are the main forms of energy used in agriculture for various activities besides the use of electric power, mechanical power and other non-conventional energy sources. The use of agricultural tools and implements and other machines is always risky to human safety, if they are not used properly.

Accidents are very common in various agricultural operations due to ignorance, lack of training, lack of knowledge about the operation and improper design of tools and implements. To avoid these accidents and to study on the safer design and use of tools and implements, the science called human engineering or ergonomics is used. Human inattention and negligence in various tasks and operations look like innocent mistakes. Surprisingly, there are indications that people accept accidents as fate and uncontrollable and thus not compelled to eliminate them systematically. However, practically all the accidents - at least their chances and severity can be controlled or minimized by adequate consideration and strategic applications of human factors.

## Review of Literature

Gite (1983) reviewed that accidents and injuries of operators involved in various agricultural operations account for nearly a third of all rural injuries. One of the major equipment on which majority of accidents take place is the thresher. Tandon et al. (1988) reported data for 96 accidents hap-

**Table 1.** Agricultural accidents reported in selected 12 villages of Tamil Nadu

Accidents	Number
Total number of agricultural accidents	
Population engaged in agricultural / allied activities	26,522
Number of accidents during 1995-99	373
Accident incidence rate /1000 workers / year	2.812
Farm machinery related accidents	
Accident prone agricultural machinery population in the village	3,096
Farm machinery accidents during 1995-99	289
Accident incidence rate/1000 machines/year	10.6
Hand tool related accidents	
Number of hand tools in the village	36,698
Hand tools related accidents during 1995-99	37
Accident incidence rate/ 1000 hand tools /year	0.29
Other accidents	
Population of agricultural workers in the village	26,522
Other accidents during 1995-99	47
Accident incidence rate/1000 workers/year	0.2125

**Table 2.** Source Wise Classification of Agricultural Accidents

Source of agricultural accidents	Total No. of accidents	Total No. of machines	Incidence rate /1000 machine/ year
Accident prone agricultural machinery			
Tractor	102 (27.3)	1,424	14.33
Cane crusher	44 (11.8)	150	58.67
Chaff cutter	22 (5.9)	492	8.94
Thresher	69 (18.5)	325	42.46
Sprayer	51 (13.6)	705	14.47
Hand tools			
Spade	11 (2.9)	4,517	0.48
Sickle	25 (6.7)	13,122	0.38
Other accidents			
Snake bite	5 (1.34)	26,522	0.038
Chemicals	45 (12.06)	26,522	0.34
Total	374 (100)		

pened during 1986-88 around Delhi. The maximum accidents were due to threshers (43%), followed by tractor (35%), sugarcane crushers (10%), chaff cutters and other machines (4%). Mittal et al. (1996) conducted a study in Punjab state. According to them about 47% of accidents were caused due to sprayers followed by tractors (25%), electric motors (14%), chaff cutters (8%) and threshers (8%).

## Materials and Methods

Twelve villages (including a hilly region) were selected from seven agro-climatic regions of Tamil Nadu State such that they use agricultural machinery extensively for various operations in crop production and processing activities. Contacts were established with key informants viz., village administrative officer, revenue inspectors, agricultural extension officials, etc. in the selected twelve villages through the assistant director of agriculture/ revenue au-

thorities. All the 12 villages were visited with the help of key informants, information on agricultural accidents and related aspects were collected. Then the individual victims were contacted and the details were recorded in the proforma prescribed.

## Results and Discussion

### Total number of accidents

The total number of agricultural accidents, farm machinery related accidents, hand tool related accidents and other accidents reported in selected 12 villages during 1995-99 is furnished in **Table 1**.

Tractor accidents were the highest in number which contributed 27.3 per cent of total accidents followed by threshers (18.5%), sprayers (12.5%), chemicals (12.06%), cane crushers (11.8%), sickle (6.7%), chaff cutter (5.9%) and spade (2.9%). Machine-wise accident incidence rates were calculated on the basis of total number of each type of machine in all the

villages. The highest incidence rate per 1000 machines per year was in the case of cane crusher (58.67), followed by thresher (42.5), sprayer (14.5), tractor (14.3), chaff cutter (8.94), spade (0.48) and sickle (0.38).

### Classification of agricultural accidents according to type of primary events involved

Majority of the accidents resulted in cut (24.66%) of body parts while feeding cane in sugarcane crushers, removing bagasse from the bagasse outlet, feeding crop in threshers removing sugarcane stubble in the field after harvesting and digging of root crops from the soil followed by bruise (15.55%), rashes in the body (15.55%) due to the allergy in handling operation of crops in mostly sugarcane fields, crushing of body parts in cane crushers (13.13%). The sprains/strains account for 9.75% of the accidents. This can be attributed to the operation of tools in bending and awkward posture adopted by the subjects. Boils and wounds (7.23%) was mainly due to the operation with hand tools. Fracture of body parts (6.97%) was observed while operation with sugarcane crushers, threshers, getting down from the tractor without stopping the engine.

### Classification of accident victims according to severity, occupational status, age and sex

The classification of accident victims according to severity, occupational status and age and sex are presented in **Table 4**. Of the total 373 accident victims reported in the 12 villages survey 16 accidents which constituted 4.28 % of total accidents were of fatal nature. The remaining 357 accidents (95.72%) were of non-fatal nature.

Majority of accident victims (78.27%) were labourers. Family labours (farmers) constituted (21.73%) of total accident victims. Male victims constituted 90.33% of total accident victims while the per-

**Table 3.** Classification of Agricultural Accidents According to Nature Of Injury

Type of injury	Number of accidents		
	Fatal	Non fatal	Total
Crushing	9	40	49 (13.14)
Bruise	-	58	58 (15.55)
Cut	-	92	92 (24.66)
Amputation	-	14	14 (3.75)
Sprain/strain	-	36	36 (9.75)
Fracture	-	26	26 (6.97)
Burns	-	5	5 (1.34)
Drowning	2	3	5 (1.34)
Rashes	-	56	56 (15.01)
Boils /wounds	-	27	27 (7.24)
Others – Swallowing of pesticides	5	-	5(1.34)
Total	16	357	373 (100)

Figures in parentheses represent percent of total accidents.

**Table 4.** Classification of Accident Victims

Classification of accident victims	Value
Severity-wise classification of agricultural accidents	
Fatal	16 (4.28)*
Non fatal	357(95.72)
Total	373 (100)
Occupational status-wise distribution of accident/victims	
Family labour	90 (21.73)*
Labourer	324 (78.27)
Total	414 (100)
Educational status wise classification of accident victims	
Illiterate	255 (61.60)*
Literate below matriculation	116 (28.02)
Matric	34 (8.21)
Graduate	9 (2.17)
Total	414 (100)
Age and sex wise classification of accident victims	
< 15	8 (1.93)*
15 –29	130 (31.40)
30 –45	180 (43.47)
> 45	96 (23.20)
Male	(90.34)
Female	(9.66)

The figure in parentheses indicates the percent of total accidents.

**Table 5.** Different Categories of Agricultural Accidents Reported during Village Survey

Source wise category	No. of accidents reported		
	Total	Fatal	Non fatal
Farm machinery related accidents	289	9	280
Agricultural hand tools related accidents	37	-	37
Other accidents (snake bites, drowning etc.)	47	7	40
Total	373	16	357

centage of female victims was 9.67%. The highest percentage of accident victims (43.47%) was in the age group of 30-45, followed by 15-29 group (31.40%), over 45 group (23.20%) and under 15 group (1.93%). It is apparent that the highest percentage of accident victims was in the group of illiterate

(61.60%) followed by literate below matriculation (28.02%), matriculation (8.21%) and graduates (2.17%).

#### Extent of agricultural accidents in Tamil Nadu

In order to estimate the total number of agricultural accidents in Tamil Nadu the accident data re-

**Table 6.** Estimated Number of Accidents in Agriculture in Tamil Nadu for the Year 2000

Source	Estimated number of accidents		
	Non fatal	Fatal	Total
Farm machinery related accidents	80794	2597	83391
Agricultural hand tools related accidents	809	0	809
Other accidents (Snake bites, drowning etc.,)	8747	1531	10278
Total	90350	4128	94478

ported from 12 villages have been grouped into three categories based on the source of accidents as shown in **Table 5**. The estimates in Tamil Nadu for each of the above categories determined as follows:

#### a. Estimation of farm machinery related accidents

This category includes accidents due to agricultural machinery excluding hand tools. To estimate the number of farm machinery related accidents the accident incidence rate was calculated from the total number of reported farm machinery related accidents and total number of accident-prone agricultural machines in the selected 12 villages. The accident incidence rate was multiplied by the total number of accident prone agricultural machines in Tamil Nadu State in 2000 for calculating the total number of farm machinery related accidents. Data available from 1991 Live stock census was updated using a 10% annual growth rate in number of accident prone agricultural machinery (excluding manually operated tools).

#### b. Estimation of hand tool related accidents

This category includes accidents caused by agriculture hand tools such as spade/pick axe, sickle, hand hoe etc. To estimate the number of hand tools related accidents the accidents incidence rate was calculated from the total number of reported accidents due to hand tools and total number of these tools in the villages. The accident incidence rate was multiplied by the total number of agricultural hand tools in Tamil Nadu. The population of hand tools in the state was estimated by multiplying the number of hand tools per worker in the surveyed villages by the total number of agricultural workers in the state.

#### c. Estimated number of accidents in agriculture in Tamil Nadu for the year 2000

Estimates for economic impact of agricultural accidents in Tamil

## Nadu

In an effort to place the quantitative value on the cost of accidents, injury prevention, specialists have developed a procedure to establish an estimate of years of potential life lost (YOLL). The Total monetary loss per year due to agricultural accidents in Tamil Nadu was estimated as Rs. 226 crores.

## Conclusion

Agricultural accidents are of very serious concern in Tamil Nadu. The accident incidence rate/1000 workers/year was 10.6. About 95.7% of total accidents are not fatal and the remaining 4.3% are of fatal nature. Majority of fatal accidents are due to tractors, cane crushers, threshers, chaff cutters, drowning in the open wells and pesticide poisoning. About 7.6% agricultural accidents are due to farm machinery, 9.6% due to hand tools and remaining 13.4% are due to other sources. Farm machinery related accidents are of fatal (3.11%) as well as (96.88%) non fatal in nature. Accidents due to hand tools are of non fatal nature. Highest incidence rate per 1000 machines per year was found in case of cane crusher (58.9), followed by thresher (42.5), sprayer (14.5), tractor (14.3), chaff cutter (8.94), spade (0.48) and sickle (0.38). Based on the survey it is estimated that in the year 2000 there may be about 94478 agricultural accidents in Tamil Nadu causing death of about 4,128 workers and injuries to about 90350 workers which includes finger cuts, amputation of limbs, crushing of body parts etc. Total monetary loss due to agricultural accidents in the state of Tamil Nadu has been estimated as Rs.226 crore per year.

## Recommendations

The following recommendations are proposed for safe operation of

farm machinery and implements by enhanced comfort and reduced drudgery and for increased safety of the operator.

### i. Improvement in design features

- \* Provision of roll over protective structure (ROPS) in the tractor can help to reduce the deaths caused in tractor accidents due to crushing of operator in overturning accidents.
- \* A properly designed cab is important to prevent them from dust, noise, rain, heat and cold.
- \* It is necessary to develop a ergonomic work space layout for tractor operator.
- \* Design modifications in tractors and other farm equipment are needed for easy and safe hitching of the equipment with the tractors.
- \* Provision of safe feeding devices in chaff cutters, sugarcane crushers and threshers.
- \* Proper lubrication system for the transmission system of sugarcane thresher.
- \* Proper guards /shields to cover the rotating parts of various prime movers and farm equipment.
- \* Separate brake system and danger lights with reflectors for the trailer is necessary to avoid accidents.
- \* Use of personnel protective equipment during operation of sprayers, operation in sugar cane fields.

### ii. Training

- \* Formal, informal and non-formal education and training programme may be conducted by the government and non-government organization to improve the skills, knowledge and attitude of the users in a positive way.
- \* Training courses should be organized for tractor operators at block levels for proper and safe operation of tractors and tractor operated equipment.
- \* Periodical trainings need to be conducted in proper and safe operation of sprayers and dusters.
- \* In any of the farmers meeting at

village/block/district level a programme on proper and safe use of various agricultural machines should be incorporated as an integral part.

- \* Extension leaflets/publicity materials for proper and safe use of various machines need to be prepared and circulated on a wider scale.

### iii. Enforcement of rules and regulations by the Government

The government should pay enough attention to this aspect and should put forth some rules and regulations for the human welfare by:

- i. Laying down standards for the tractor vibration, noise, etc. affecting the operator and assuring strict quality control during manufacture.
- ii. Considering agriculture also as an industry. Should give provisions and concessions as given to other industrial workers, to the farmers and tractor operators. It is imperative as they are in a more dangerous environment than the other workers.
- iii. Enforcement of license for the tractor drivers

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