Unit 5

DANGEROUS MACHINES (REGULATION) ACT

13. Introduction

Traditional agriculture uses mainly human, animal and mechanical power. Human are also used to control and operate hand tools, self-propelled and power operated agricultural machines. Improper and careless use of agricultural machinery increases chance of casualties due to agricultural accidents. Threshers were introduced during seventies in Indian agriculture. Due to various benefits of threshers like saving in time, cost and human energy, the farmers adopted it to a very large extent. The newly introduced thrashers were basically designed for functional performance and the human safety aspects were lacking. This resulted in a large number of thresher accidents and many workers lost their lives/limbs. Verma *et al.* (1978) conducted a survey on thresher related accidents causing injuries in Punjab state and reported that about 73% of these were due to human factors, 13% due to machine factors and 14% due to crop and other factors. The survey also mentioned that 59% of the victims were hired labourers. Safe feeding devices for power threshers were designed and included in BIS standards. In 1983, the Govt. of India enacted the "Dangerous Machines (Regulation) Act-1983" (DMRA-1983) and made the safe feeding chutes/safe feeding system compulsory on power threshers (Anonymous, 2000).

13.2. Dangerous Machines (Regulation) Act - 1983

In 1983, the Parliament passed an act to provide for the regulation of trade and commerce in and production, supply, distribution and use of the product of any industry producing dangerous machines with a view to securing the welfare of labour operating any such machines and for payment of compensation for the death or bodily injury suffered by any labourers while operating any such machine, and for matters connected therewith or incidental thereto. Various sections of DMRA-1983 are listed in Table 13.1.

Table 13.1. List of various chapters and sections of DMRA-1983.

Section No.	**Title**
Chapter I - Preliminary	
1	Short title, extent and commencement
2	Declaration as to expediency of control by Union
3	Definitions
4	Act to override all other enactments

Chapter II – Administration of the act	
5	Appointment and functions of controller
6	Power of controller to issue orders
7	Appointment of Inspectors
8	Controller, etc., to be public servants
Chapter III – Issue, renewal and cancellation of licences to manufacturers and dealers	
9	Licensing of manufacturers and dealers
10	Suspension and cancellation of licences
11	Cancellation of licence on application by manufacture or dealer
12	Licence to a firm to be invalid on the change of partnership
Chapter IV – Duties and responsibilities of manufacturer or dealer of a dangerous machine	
13	Manufacturer to ensure that every part of a dangerous machine conforms to prescribed standards
14	Particulars to be specified on very dangerous machine
15	Duties of the manufacturer to supply operator’s manual with each dangerous machine
16	Certificate and guarantee by manufacturers and dealers
17	Liability of the manufacturer for reimbursement
18	Manufacturers and dealers to maintain records
Chapter V – Duties and obligations of users of dangerous machine	

19	User to get each dangerous machine registered
20	Matters to be ensured by users
21	Modification of existing dangerous machine
22	Employer's liability for compensation
23	Notice of accident
24	Duty of employer to take out insurance policies
25	Omission or failure of the employer to take out insurance policies
Chapter VI – Inspection, search and seizure	
26	Examination of machine causing death or injury
27	Inspection of records etc.
28	Power to enter and search
29	Power of seizure
30	Search and seizure to be made in accordance with the code of "Criminal Procedure, 1973"
Chapter VII – Offence and their trial	
31	Punishment for contravention of the provisions of the Act
32	Offences by companies
33	Cognizance and trial of offences
Chapter VIII - Miscellaneous	

34	Appeals
35	Protection of action taken in good faith
36	Power of Central Government to make rules
37	Power of State Government to make rules
38	Power to give directions

13.2.1. Duties and responsibilities of manufacturers of dangerous machines

The salient points mentioned under chapter IV of the DMRA-1983 are:

Section No.	**Title**	**Salient points**
13	Manufacturer to ensure that every part of dangerous machine conforms to prescribed standards	• Manufacturing a dangerous machine as per standards laid down by the Indian Standards Institution. • Providing safety guards for prime mover, transmission machinery and every other dangerous part, such as, rollers, blowers, sieves, and elevator. • Providing the machine with danger signals indicating the point beyond which no limb shall be inserted for the purpose of feeding the machine or for any other purpose.
14	Particulars to be specified on every dangerous machine	• The direction of the rotation and the number of rotations per minute. • Its power requirement and the name and address of the manufacturer, the year of its manufacture, and the date, number and other particulars of the licence of the manufacturer.
15	Duties of the manufacturer to supply operator's manual with each dangerous machine	• Every manufacturer shall supply along with each dangerous machine a manual containing general instructions regarding the operation of such machine, and shall also include cautions.
16	Certificate and guarantee by manufacturers and dealers	• Every manufacturer and dealer shall deliver a declaration to the effect that the machine conforms to the standards laid down by or under this Act and also complies with the provisions of this Act and the rules and orders made thereafter.

13.2.2. Duties and obligations of users of dangerous machines

The salient points mentioned under chapter V of the DMRA-1983 are:

Section No.	Title	Salient points
19	User to get each dangerous machine registered	• No dangerous machine shall be operated until it has been registered.
20	Matters to be ensured by users	• Such machine conforms to the standards. • No child is employed for the operation of such machine. • Adequate arrangements exist for rendering first aid to any person who may suffer any injury while operating such machine.
22	Employer's liability for compensation	• If death or dismemberment of any limb or any other bodily injury is caused to operator, his employer shall be liable to pay compensation. • The employer shall not be liable if injury does not result in disablement of the operator for a period exceeding three days; or is directly attributable to influence of any intoxicant or drug, or willful removal of any safety guard or other device by the worker.
24	Duty of employer to take out insurance policies	• Every employer shall take out insurance policies to make payment of compensation to operator of a dangerous machine.

13.2.3. Offences and their trial

The salient points mentioned under chapter VII of the DMRA-1983 are:

Section No.	Title	Salient points
31	Punishment for contravention of the provisions of the Act	• Imprisonment for a term which may extend to six months, or with fine which may extend to one thousand rupees

13.3. Changes suggested in DMRA-1983

In spite of passing of this act in 1983, it was adopted by some states only. As agriculture is a state subject, the implementation of this act is the prerogative of the state Govt. The agricultural machinery manufacturers were also not in favour of the act and demanded repeal of the same. Gite *et al.* (2006) suggested following modifications for better implementation of the act by the Government:

1. It is more appropriate if the Controller notified by the State Govt. is Agricultural Engineering/Agricultural Department official.

2. It is not practical for the users to get the threshers registered with the Controller due to various logistics problems. There should be registration

at Panchayat level only. Also the procedure of registration needs to be simplified.

3. The manufacturer may provide first aid kit along with thresher itself.

4. The clause about employer's liability for compensation is not justified and therefore, needs to be modified. Compensation may be provided through State Agricultural Marketing Board as prevalent in Punjab, Haryana, Rajasthan, Gujarat and Uttar Pradesh.

5. The present system of giving notice of the accident creates disharmony in the rural society and needs to be modified. The Punjab pattern of reporting the accident to Agricultural Marketing Board is recommended.

6. The clause about duty of employer to take out insurance policies is not practical and needs to be modified.

7. The clause about omission or failure of employer to take out insurance policies is not justified and therefore, needs to be modified.

8. The examination of machine causing death or injury needs to be modified. The accident may be reported to Agricultural Marketing Board through local agricultural extension workers.

9. The clause on power of Inspector about seizure is difficult to implement and needs to be modified.

10. The clause about search and seizure procedure is difficult to implement and needs to be modified.

11. The provisions given in the clause about punishment for contravention of the act are unrealistic and needs modifications. The clause about imprisonment may be removed.

13.4. Dangerous Machines (Regulation) Rules-2007

DMRA-1983 was amended by Central Government in 2007. Apart from power thresher, as mentioned earlier, power operated chaff cutter and sugarcane crushers were also added in the list of dangerous machines. A list of BIS standards were given for compliance in case of each of dangerous machines, as under:

Sr. No.	Dangerous machine	BIS standards for compliance
1	Power thresher	• IS 9020: 2002 (Power threshers – safety requirements)
2	Power operated chaff cutter	• IS 15542: 2005 (Power operated chaff cutter – safety requirements) • IS11459: 1985 (Specifications for power operated chaff cutter)
3	Sugarcane crusher	• IS 15561 : 2005 (Sugarcane crushers – safety requirements) • IS 1973: 1999(Sugarcane crushers - specifications)

REHABILITATION AND COMPENSATION TO AGRICULTURAL ACCIDENT VICTIMS

Introduction

Agriculture is the mainstay of Indian economy and it contributes nearly 17 per cent of Gross Domestic Product (GDP). About sixty percent of Indian population is dependent on agriculture for their livelihood. In India, the numbers of cultivators are about 12.73 crores alongwith 10.68 crores agricultural labourers. More changes have occurred in agriculture during the last five decades and increasing use of farm machinery is one of the examples. Farm mechanization alongwith increased application of other agricultural inputs such as seeds, pump sets, fertilizers, pesticides, etc. have enhanced the productivity and production on the farms. But on the other hand accidents and causalities in the agricultural sector have increased tremendously. A number of steps including legislations were taken with the objective to reduce agriculture related accidents and rehabilitation of victims and their family members. These legislative actions included:

- BIS standards for safety aspects of various agricultural machines,
- Dangerous Machines (Regulation) Act,
- Rehabilitation and compensation to agricultural accident victims.

Rehabilitation scheme for agricultural accident victims

Most of the workers in Indian agriculture are in unorganized sector and, therefore, accidents and safety don't get due importance either at farm level or at organizational level. Though nationwide efforts are being made to reduce accidents, yet it is not possible to totally eliminate them. The majority of agricultural accidents are due to human factors viz. lack of awareness, lack of formal training, long working hours, restlessness, carelessness, fatigue, seasonal operations of agriculture, etc. Therefore, monetary relief for rehabilitation of agricultural accidents victims and their family members is justified beyond doubt. In 1983, the Indian Parliament passed DMRA to regulate dangerous machines with a view to securing the welfare of operator and for payment of compensation for the death or bodily injury suffered by any labourers while operating such machines. As per DMRA, the manufacturer was fixed responsibility for providing compensation to user in case of accidents due to manufacturing fault. The employer was also asked to take accident insurance policy for users. Further, this act covered only the power threshers and its implementation was lacking in different states of India.

Punjab State took a lead for rehabilitation of accident victims by providing blanket insurance coverage to all concerned engaged in agriculture and marketing operations at any time during the year. This social welfare scheme has been widely appreciated all over the country and some other states have also adopted similar schemes.

14.2.1. Rehabilitation scheme for agricultural accidents victims – Punjab Model

Compensation policy was formulated and proposal was submitted way back in 1978 and monetary aid was started in 1984 through Punjab State Marketing Board.

14.2.1.1. Basic policy

The Government of Punjab through Punjab State Marketing Board formulated policy and procedural rules for providing monetary relief for rehabilitation of agricultural accidents victims. It defined in detail the various terms and procedures for the effective implementation of policy. Among the various rules and regulations, it also formulated a

quantitative percentage of loss of earning capacity depending upon the injury (Table 14.1).

Table 14.1. Loss of earning capacity depending upon injury.

S.N.	Description of injury	Loss of earning capacity (%)
1.	Loss of both hands or amputation at higher sites	100
2.	Loss of a hand and a foot	100
3.	Double amputation through leg or amputation through leg on one side and loss of other foot	100
4.	Loss of sight such that victim is unable to perform any work	100
5.	Very severe facial disfigurement	100
6.	Absolute deafness	100
7.	Amputation of upper or lower limbs depending upon its extent	10 - 45
8.	Loss of one eye or its vision depending upon its extent	15 - 20
9.	Loss of finger or its parts depending upon its extent	1 - 7

Punjab State Marketing Board provides financial help to all the farmers, their family members, agricultural labourers and marketing committee workers, while:

- Working on agricultural machinery and implements like threshers, tractor, trolleys, chaff cutters, spray pumps, etc. in field.
- Digging of wells or electrocution while operating tube wells on the farm.
- Using pesticides or due to snake bite in the field.
- Use of agricultural implements in the notified market committees in the state of Punjab.

- All accidents happening during agricultural operations in field or at farm house or in registered marketing committee or during transportation of agricultural produce to marketing committee.

Insurance scheme was started with collaboration of Insurance Company for coverage of accidents leading to death or disablement to agricultural workers. At the start, the policy was named as 'Compensation in case of thresher accidents' and covered only threshers and chaff cutter. However, later on other agricultural accidents as stated above and also due to crop produce or lightening, etc. were included to cover the gaps. Punjab State Marketing Board is, thus, covering about 21 lakhs cultivators, 15 lakh agricultural labourers and also the family members of the cultivators in the Punjab state.

14.2.1.2. Economics involved in monetary relief

No insurance premium is collected from anyone covered under the rehabilitation scheme. In fact, Punjab State Marketing Board has 145 principal (regulated) agricultural market committees and a large number of notified committees for facilitating sale and purchase of agricultural produce. A fee @ 2% is collected for providing facilities for sale, purchase, storage and processing of agricultural produce. The collected fee amounts to over 300 crores at present. The fund collected is spent on various development schemes for the social welfare of the farmers and rural mass. The rehabilitation of victims of agricultural accidents is one of these schemes. A budget of 5-10 lakhs is allocated to each of the principal committee to speed up the relief to victims. The monetary relief at the start was fixed at Rs. 12,000/- in case of loss of life and was revised regularly to the maximum of Rs. 2,00,000/- at present. The monetary compensation amount in case of loss of limb was also revised accordingly. Also a new category of type of injury has been introduced in the year 2011. Monetary compensation is also provided to the victims of agricultural accidents who suffer internal injuries leading to disability (more than 25%) of body parts (Table 14.2).

Table 14.2. Rates of monetary compensation by Punjab State Marketing Board

Type of injury	**Rate of monetary compensation (Rs.) w.e.f.**					
	1.4.1984	**1.4.1989**	**1.4.1996**	**1.4.2001**	**1.11.2007**	**29.03.2011**
Loss of life	12,000	30,000	50,000	75,000	1,00,000	2,00,000
Loss of one limb i.e. hand, arm, leg, foot etc./ any other equivalent serious injury	5,000	12,000	20,000	30,000	40,000	40,000
Loss of two limbs i.e. hands, arms, legs, eyes, feet etc./ any other equivalent serious injury	7,000	20,000	30,000	45,000	60,000	60,000
Loss of finger/ finger parts equivalent to amputation of complete one finger.	1,000	3,000	5,000	7,500	10,000	10,000

Loss of four fingers i.e. equivalent to amputation of one body part.	5,000	12,000	20,000	30,000	40,000	40,000
Disability (>25%) of body parts	-	-	-	-	-	50,000-1,00,000

No budget limit is fixed for providing monetary relief to victims of Punjab state. In fact, all the genuine victims are provided relief as per recommended rate. About 1600 agricultural accidents victims of Punjab state were provided with the monetary relief during the recent time (Table 14.3). The amount of relief disbursed under this rehabilitation scheme was about eight crores annually.

Table 14.3. Monetary relief by Punjab State Marketing Board

Financial year	Number of victims	Amount disbursed (Rs. in crores)
1998-1999	1438	2.51
1999-2000	1407	2.39
2000-2001	1539	2.37
2001-2002	1878	4.84
2002-2003	1750	5.04
2003-2004	1663	5.07
2004-2005	1830	5.16
2005-2006	1778	6.31
2006-2007	1818	5.83
2007-2008	1869	6.46
2008-2009	1902	7.39

2009-2010	1946	8.43
2010-2011	1934	8.67
2011-2012	1612	7.89

14.2.1.3. Application procedure

The victim, or the nearest successor in case of loss of life to victim, has to report in written about the accident to the nearest market committee office within 30 days of accident and submit duly verified prescribed application alongwith supporting documents immediately afterwards. The performa includes personal details of the victim, details of accident, nature and extent of injury, medical treatment, etc. The victim or family member has to submit a police report and a medical report. Death certificate needs to be enclosed in case of loss of life. The victim has to submit an affidavit certifying that monetary relief is not being sought from any other agency.

The application and necessary documents after being received in the office are verified confidentially by a three member committee consisting of i) Administrator or Chairman of the market committee, ii) Secretary of market committee, and iii) Assistant or Deputy District Mandi Officer. The monetary aid, after due approval, is distributed among victims at the earliest and without delay in the presence of some reputed persons of the area or competent officials of Marketing Board.

14.3. Status of rehabilitation scheme for agricultural accident victims in India

The Punjab State Govt. took a lead in formulating and implementing monetary compensation scheme for rehabilitation of agricultural accidents victims and their family members. The procedures and amount were revised as per need of time and various legal issues. Some other Indian States followed the Punjab Model and started providing monetary compensation to accident victims. A list of States providing monetary compensation is as given in Table 14.4.

Table 14.4. Rate of monetary compensation in case of death of victims.

Sr. No.	**State**	**Nodal agency**	**Monetary compensation in case of death (Rs.)**
1	Haryana	Haryana Marketing Board	50,000/-
2	Karnataka	Karnataka State Agricultural Marketing Board	50,000/-
3	Punjab	Punjab State Marketing Board	2,00,000/-
4	Rajasthan	Rajasthan State Agricultural Marketing	1,00,000/-

		Board	
5	Uttar Pradesh	State Agricultural Produce Marketing Board	50,000/-

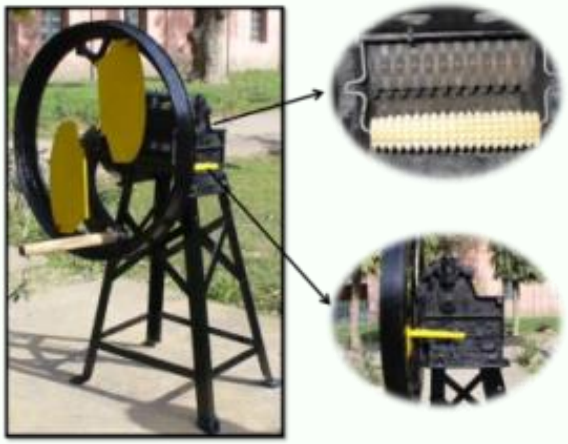
Similar procedure should be adopted all over the country, so that agricultural accidents victims may be rehabilitated. The amount of monetary relief also needs to be increased from the present level.

safety gadgets for farm machines/ activities

The following safety gadgets have been developed/ evaluated to minimize accidents in agricultural activities.

1. Safety gadgets for chaff cutters and sugarcane crushers

The interventions were a metal guard made up of mild steel sheet and can be attached to blade with bolts, spring loaded mechanical lock that prevents rotation of the flywheel in standby mode and a serrated warning wooden roller to forewarn the operator if his/her hand reaches danger zone while feeding the chaff cutter.



2. Lighting system with turning indicators for tractor trailers

In the safe tractor trailer, the body side lights are recessed into side frame member. Turn indicator cum brake and parking light cluster on either side are provided for enhanced night visibility and safety. Slow-moving vehicle **(**SMV) emblem is mounted on the rear door frame of the trailer so that the other vehicle drivers on the road can judge the distance and speed relation.

3. Safety kit for spraying operation

To prevent the operator against exposure to pesticides during spraying, the operator needs to wear the personal protective equipment (PPE) which consists of a face mask, a pair of hand gloves, eye protector, and an apron.

4. Belt and chain type conveyor feeding system for high capacity thresher

To reduce drudgery of workers during feeding of crop in the high capacity thresher and to make it safer, a belt and chain conveyer feeding was developed by PAU centre of AICRP on ESA in collaboration with an industry. The height of belt conveyer was 70 cm from ground level. The thresher with this type of feeding chute was tested for threshing of wheat crop produce of 16 ha i.e. about 700 q of crop. The thresher was operated by a 55 hp tractor. The throughput capacity of the thresher was 33.4 q/h and the output capacity (grain) was 15.2 q/h. The performance of the system was good and drudgery involved in feeding of crop to the thresher was reduced as in this case the crop was to be lifted to waist height only (up to 1000 mm) as against 1800 to 2400 mm i.e. above shoulder height in case of traditional high capacity threshers

5. A tractor trailer with brakes and other safety features

Generally, the trailers are not provided with any separate brake arrangement. They are stopped by the braking action of the tractor alone. When brakes are applied to a tractor with a loaded trailer, the tractor first stops and then the trailer rams into the tractor and stops due to its inertia. Many times, this causes potential jack knifing situation leading to subsequent over turning. To overcome this issue, a hydraulic brake system was developed for two-wheel tractor trailer which is operated by pressing of tractor brake pedal itself. The brake system is powered by tractor hydraulic internal gear pump with flow rate of 32 lpm (at engine rated rpm).

6. ROPS design for Indian tractors with universal mounting

A test rig for static testing of tractors' ROPS has been developed. The rig has been fabricated as per IS: 11821 (part2)-1992. Components of the test rig include: test bed, reaction frame, hydraulic actuators, control panel, crushing beam and instruments for measurement of force and deflection with data acquisition system. Hydraulic actuators are double-acting and operate at a speed below 5 mm/s. Each actuator has a nominal force rating of 40 kN. Stroke length of 1.2 m was designed for vertical actuator (02 nos.) which provides crushing force while 0.5 m stroke length was selected for lateral and transverse loading. To record the force, 50 kN capacity load cells have been attached at the end of each actuator through M 36×3 tread and a wire sensor was kept for deflection measurement

THRESHING

- **Threshing** is the process of loosening the edible part of cereal grain (or other crop) from the scaly, inedible chaff that surrounds it.
- **Threshing** is the process of removing the grain from the chaff and stems of cereal crops.
- The operation of detaching the grains from the spikes, panicles, ear heads, cobs or pods is called threshing.
- It is basically the removal of grains from the plant by striking, treading or rupturing.
- The threshing is the process of repeated pounding and the dragging of the plant mass over a surface or through an aperture. Due to pounding and wearing action during threshing, the bond between the grain and the spikes is disrupted. Simultaneously , the leaf and stalk portions of the plant mass undergo deformation

PRINCIPLE OF WORKING

- Threshing can be achieved by three methods i. e.
  - rubbing,
  - impact and
  - stripping.

- Threshing is normally done after the grain moisture content is reduced to 15 to 17 per cent.

TRADITIONAL METHODS:

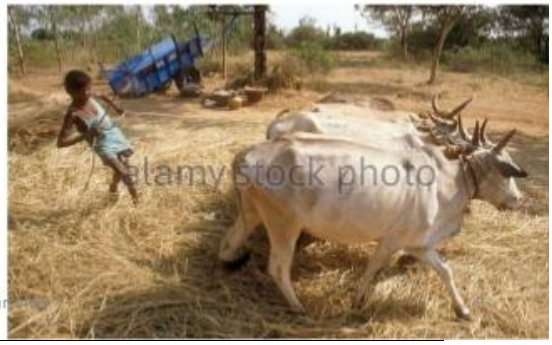
1. Hand beating:

Hand beating methods are normally used for threshing rice that easily shatters (i.e., at lower moisture content).the output obtained by this method is of 17-20kg per hour.

TRADITIONAL METHODS

Treading with bullocks:

In India the indigenous method is bullock treading in which the crop is spread on threshing floor in a circle, and bullocks are made to walk on it in circular path. the output obtained by this method is about **140 kg per hour**.



Disadvantages of Traditional Methods

Threshers are the most important component of farm mechanization. If threshing is not done timely, all efforts made by farmers and inputs given to crop goes wasted.

- Traditional method of threshing by animal or manual is **very slow.**
- It gives **low output**.
- Due to low output, the **cost of operation is high**.
- there is a huge **loss of grains** because of rodents, birds, insects, wind, and untimely rain and fire hazards.

Chaff Cutting

Chaff Cutter Machine is hay or straw cutting machine which is used for uniform chopping of fodder for livestock to agro industries.

A cutting or severing hazard through contact with a cutting edge, such as a band saw or rotating cutting disc; An entanglement hazard with the machinery which grips loose clothing, hair or working material, such as emery paper, around revolving exposed parts of the machinery.

A crushing hazard through being trapped between a moving part of a machine and a fixed structure, such as a wall or any material in a machine; A shearing hazard which traps part of the body, typically a hand or fingers, between moving and fixed parts of the machine;

Cutting tools and blades must be clean and sharp, so that they can be used without force. Safety precautions while working with machinery •Avoid awkward operations and hand positions. A sudden slip could cause the hand to move into the cutting tool or blade. •Keep work area clean. Floors must be level and have a non-slip surface.

Tractor and Trailer operation

If the driver wears a seatbelt and hangs on tightly to the steering wheel, there is a good chance of remaining within the safety triangle if the tractor rolls over. 21. Sideways rollovers Tipping axis The tipping axis is the line that the tractor pivots about when it tips over. In a trawler tractor this is the outside edges of the track. This includes stability, tractor safety decals, operator comfort and control and protection from other hazards. Engine oil and hydraulic fluid levels Check to ensure implements are secure and properly connected. Check carefully for hydraulic leaks by using a piece of cardboard or wood rather than your hands. Human factors – the risks The five human factors that may contribute to hazardous tractor operation are: • Risk taking behaviour • Inadequate safety training • Physical limitations • Impaired function • Psychological limitations .Cast iron weight or water in the tyres can act as a tractor ballast to counteract this weight transfer, The main purpose of tractor ballasting is to reduce wheel slip and increase tyre traction. Adding weight to the front increases steering stability. When adding ballast, do not exceed the manufacturer's recommendation.