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A Survey on Tractor Safety System for Data Analysis : a Comprehensive Investigation

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Abstract : The high rate of injuries occurring due to Tractor operation is of major concern in most of the countries, despite the ever-increasing efforts made at normative levels. In particular, the use of agricultural tractors is recognized as the most hazardous activity for farmers due to the large number of fatalities occurring every year in India. *T*he huge advantages of Survey and its analysis in improving Tractor Safety systems and further to its rating efficiency have become a research focus in the Tractor industry. Tractor have made significant progress in recent years, but it is still face great challenges in order to be accepted by users on a large scale in the area of Safety. In this regard, propose that the research of developing and investigating the can be developed along the lines of safety system using in for tractors gradually overcoming existing dilemmas. First of all in this research sort out the key technologies and challenges of the basic architecture of tractor Safety systems. Secondly, comfort is more about people's subjective feelings. From two aspects of physiological comfort and psychological comfort, the paper studies the anthropomorphic decision-making to overcome the mechanized safety control. Finally, the summarized the challenges and future development directions in the three stages of tractor safety development.

Massive Open google form Online forms hold the potential to open up tractor safety system and its review to a global audience. This paper reports a survey study of 264 participants enrolled from Tractor OEM, Tractors Service professionals, Fleet tractor owners , Operators , farmers and others who were encouraged to take a Open google form Online forms of their own choice as part of their authentic experienced .

Keywords: Tractor Safety, smart Survey, Data Analysis, Tractor Seat, ROPS etc.

Introduction: Agriculture tractors are used for farm activities. However there are serious risks of injuries involved while operating a tractors as they can either roll over sideways or backwards. At the same time, there is only little chance to prevent tractors from rolling over. Tractor rollover occurs when a tractor tips sideways or backwards and overturns, and it may potentially crush the operator. Rollovers are more frequently reported to have occurred on

sloping terrains, often during a sharp turn at high speed, although data show that rollovers do occur on flat land after hitting obstacles or through inappropriate use and hitching of implements. Accident involving an overturning tractor always has serious consequences on the operator. For instance, the tractor driver/ operator may be killed or seriously injured and unable to return to work, perhaps for months. The tractor itself and other equipment may be severely damaged and need major repairs. Even when damage is slight, time is lost in repairing the tractor and making it serviceable again. Although the risk of death or injury has certainly been reduced by fitting safety cabs to most agricultural tractors, the safety measure has not eliminated the causes for overturning tractors due to several reasons such as the high centre of gravity and tractors are often used on sloping or uneven ground.

This paper mainly collected the information and views of various data from Tractor Professionals in the form of google questionnaire and after getting such huge information made the data analysis.

Research Methodology :

Initiall made the literature of review from following charts and processes :

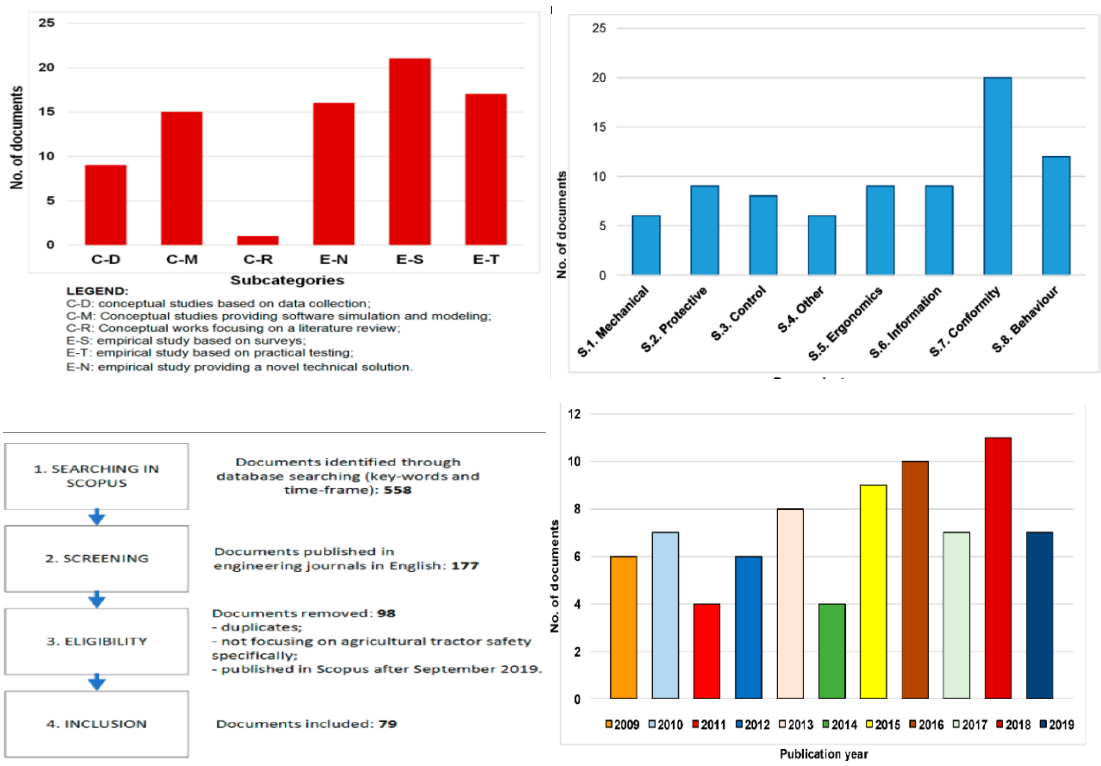

Fig.No .1.Chart and Processes of Literature review

From literature review , explored the various essential parameters useful in this research work which can be contributing the framework of usefulness in propoer search engine methodology.That also determines the population ,sample size etc .

Higher productivity and greater output are the two major requirement or constraints in farm mechanization. Tractors are an integral part of mechanization and have a crucial role to play to enhance agricultural productivity. By advancement in manufacturing of tractors, there's possibility that could lead India to another green revolution. In 1961 since tractor manufacturing in India started, the industry has grown at a phenomenal pace in the three decades to achieve a record production of over five lakh units per year . Tractor is a highly versatile piece of machinery for multi use both for land reclamation and for carrying out various crop cultivation and also employed for carrying out various operations connected with raising the crops by attaching suitable implements and to provide the necessary energy for performing various crop production operations involved in the production of agricultural crops. Tractors are capital intensive also. This is generally used as a mode of transport, in electricity generation, in construction industry and for haulage operation. It has now become an integral part of farm structure. The application of tractor for agricultural activities which swept India during the last twenty years has erased the problem of farmers. Farm mechanization program in India aims to integrate the use of available human and animal farm power with mechanical sources of power like tractors for increasing the productivity.

After considering all the facts and realiteis finalised the data to be recoreded and provide the same in google form to various tracto professionals and related tractor safety issues , challenges has been captured .The questioneerised in the form of Question and not agree, Neutral ,Agree and strongly agree in this pattern design that gives propoer and coreect information thru.tractor experts.

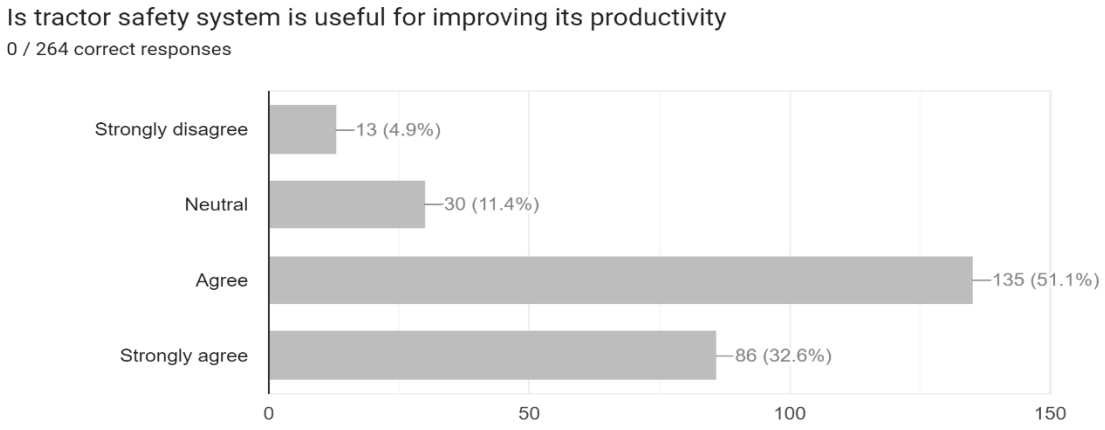

Fig.No.2. Analysis of Tractor Safety system is useful for improving its Productivity

Tractor Safety System and its Role in Farm ： Similar to Automobile Tractor also required high quality and precise tractor safety systems to enhance the operators driving comfort, confidence and safety

and he can use the tractor more effectively.

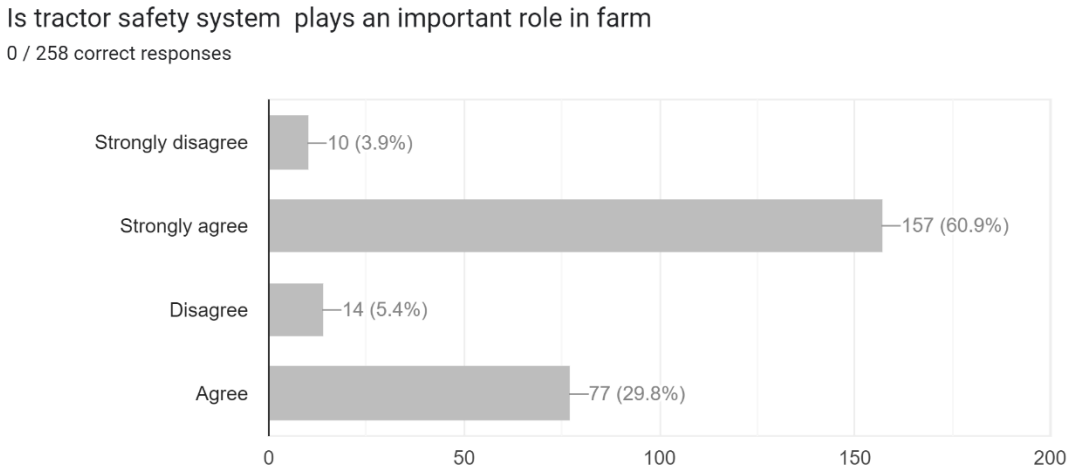

Fig.No.3. Tractor Safety System and its Role in Farm

The influence of the Rollover Protection structure ROPS type mounted on the tractor on its lateral stability was studied in stationary conditions. A rollover event may occur if the tractor reaches an unstable condition. The static stability of the tractor is mainly based on its dimensions and the centre of gravity (CoG). The mass of the tractor and its dimensions are correlated to the inertia and therefore to its propensity to maintain the position on the ground. To evaluate the stability the following tractor parameters were measured: mass, wheelbase, track-width, centre of gravity height and moments of inertia. Twenty-two tractors specifically designed for use in orchards and vineyards were analysed. The safety assessment of the effect of ROPS type on tractor stability performance needs to be recorded by tractor professionals.

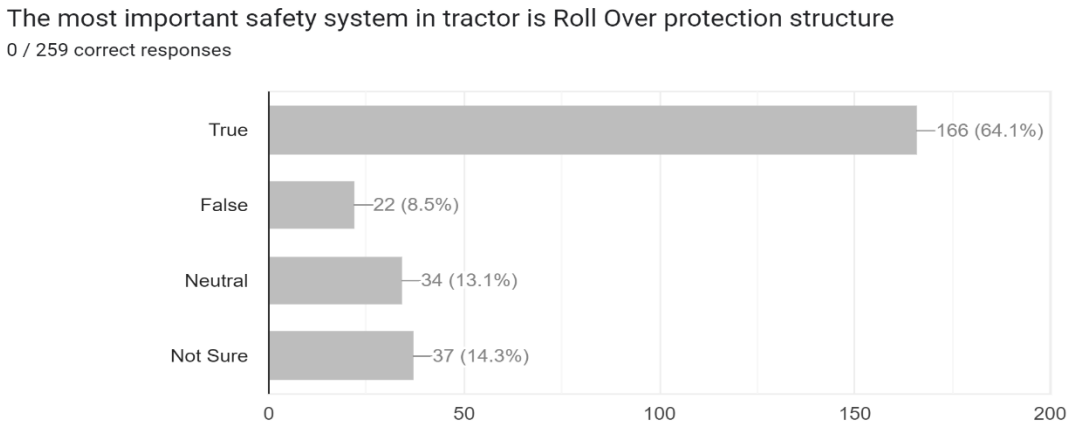

Fig.No.4.Data Analysis of Roll Over Protection Structure

Tractor-trailer finds widespread use as a means of transportation in rural like agriculture field and in urban like goods transport as it is often cheaper. The effective design of any

mechanical device or assembly demands the predictive knowledge of its behaviour in working condition. It becomes a dire necessity for the designer to know the forces and stresses developed during its operation. This is also important from the view of selecting the right material. In recent years, the failure of assemblies due to stress accumulation has been a major concern for design engineers.

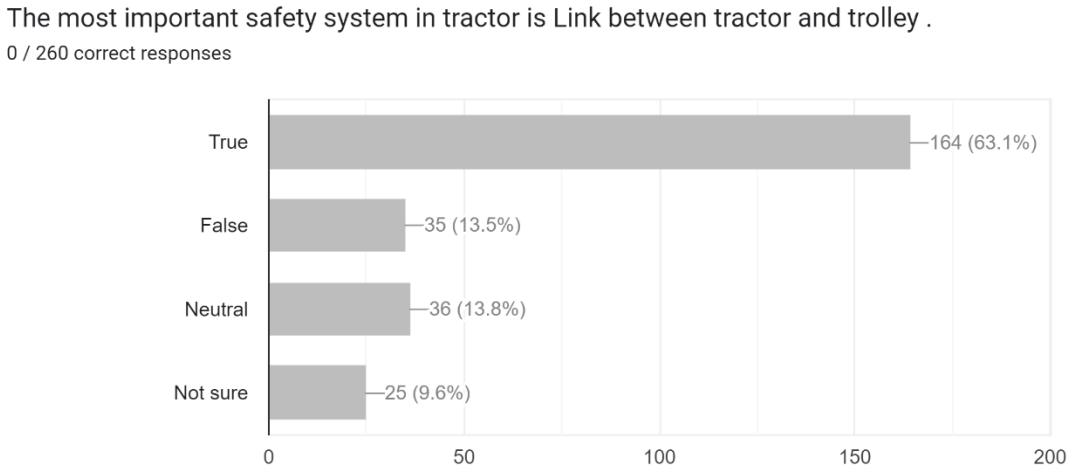

Fig.No.5.Data Analysis between Tractor and Trolley

Seat with Suspension : The Tractor is only suspension available with seat assy.which is useful not only for comfort but also for ergonomics . o obtain safety and ride-comfort conditions for tractor operators, the tractor seat suspension system was analyzed and modified to attenuate the vibration transmission. Experiments were conducted on a standard test track to investigate the effect of seat vibration on operators using a small 4-wheel tractor, and to develop a suitable seat suspension system following ISO guidelines. Dynamic and ergonomic effects of vibration on operator using conventional seat and the new design were compared ensuing standard test procedures. The supportive observations on ergonomic aspects were also made, viz. the operator heart rate, postural comfort survey, and Cornell ergonomic seating evaluation. The vibration of existing seat in vertical direction had the highest amplitude followed by the lateral and longitudinal components sequentially while the new design could significantly reduce the vertical vibration and performed well within the vibration frequencies between 2 to 8 Hz with variable damping constants. This is also very require data from various recombinants.

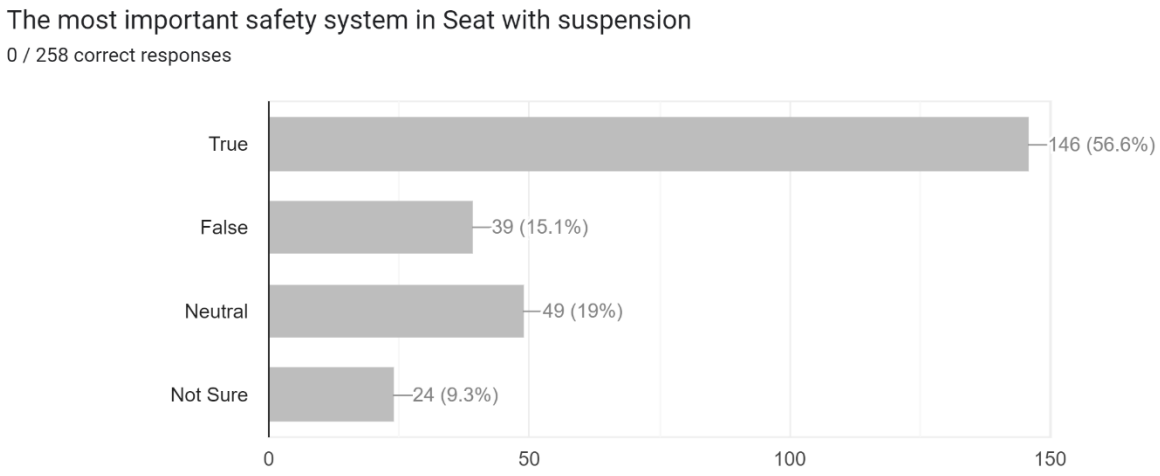

Fig.No.6.Data Analysis about the Seat with Suspension

Need of Development of Tractor Safety System : As compared to Automobile the tractor technology is neglected field but as Indian economy is Agriculture based , Almost our 67 % GDP is based on Agriculture sector, Where the farm mechanisation is utmost important .As per Government Policy Planned in the year 2017 the farmers income doubled in 2022 but unfortunately various reasons like pandemic situation and world economy crises this sector is not grown as planned . In this research work planned the automatization in farm and finally farmers can maximum profit levels out of it.

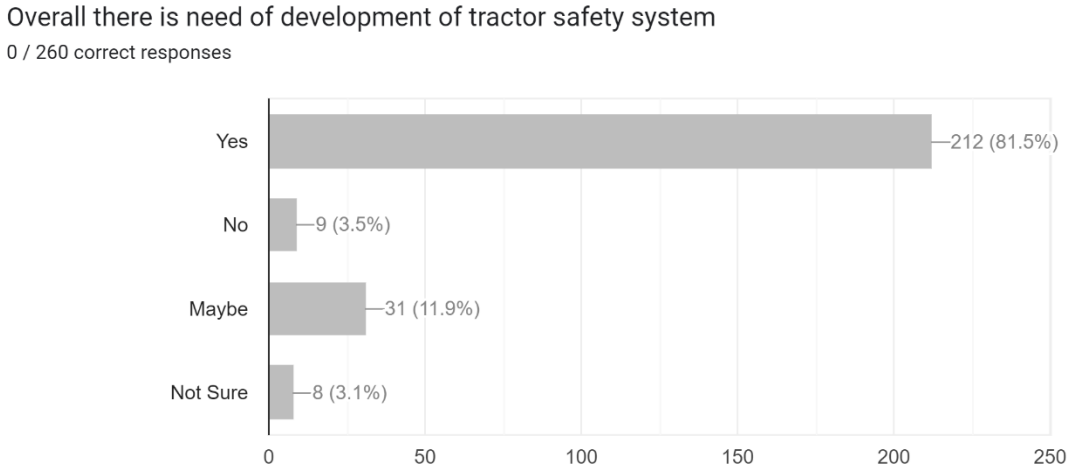

Fig.No.7.Need of Development of Tractor Safety System

Tractor Exhaust System : Working the fields is less enjoyable if you must listen to a loud tractor all day. Plus, loud noises can be damaging to your hearing. If your muffler system is losing its effectiveness, it's time to repair or replace it. Complete Tractor carries all the parts you'll need, such as mufflers, exhaust pipes, caps, clamps and other components.

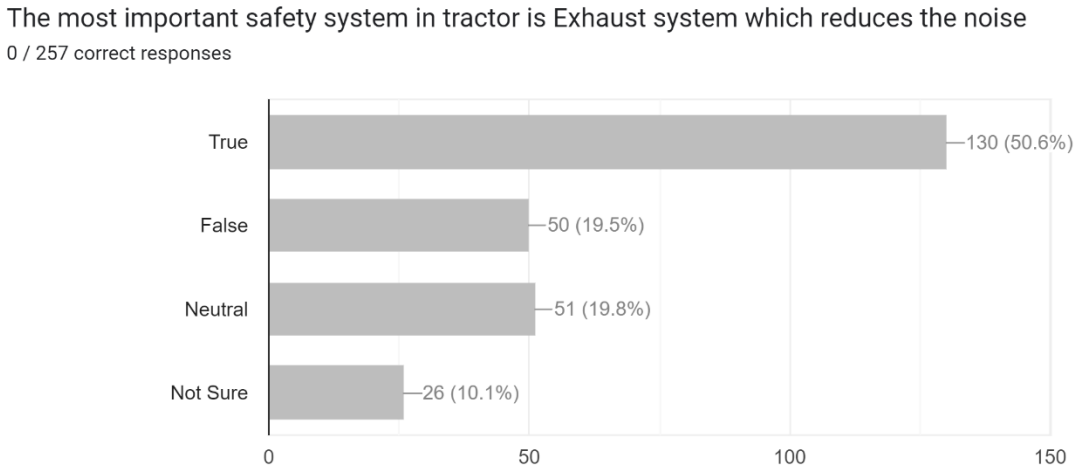

Fig.No.8.Data Analysis on Exhaust system

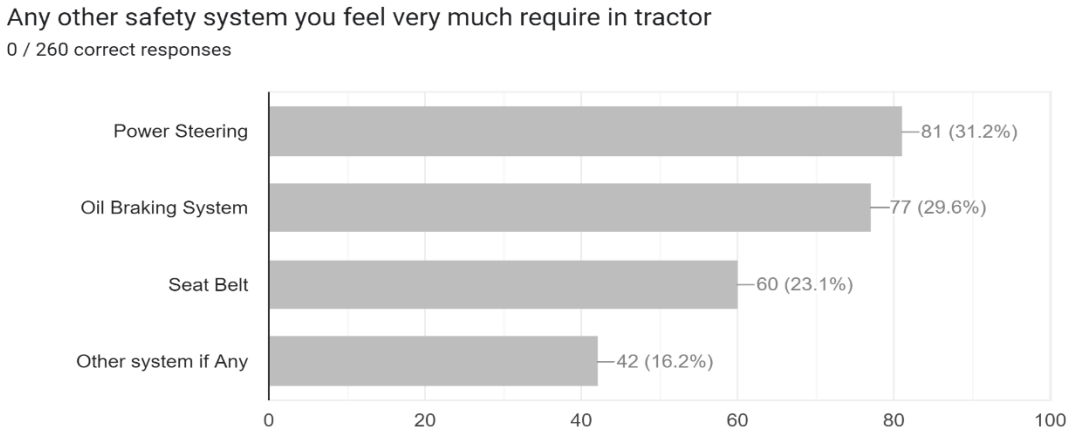

Fig.No.9. Data Analysis any other safety system required more focused

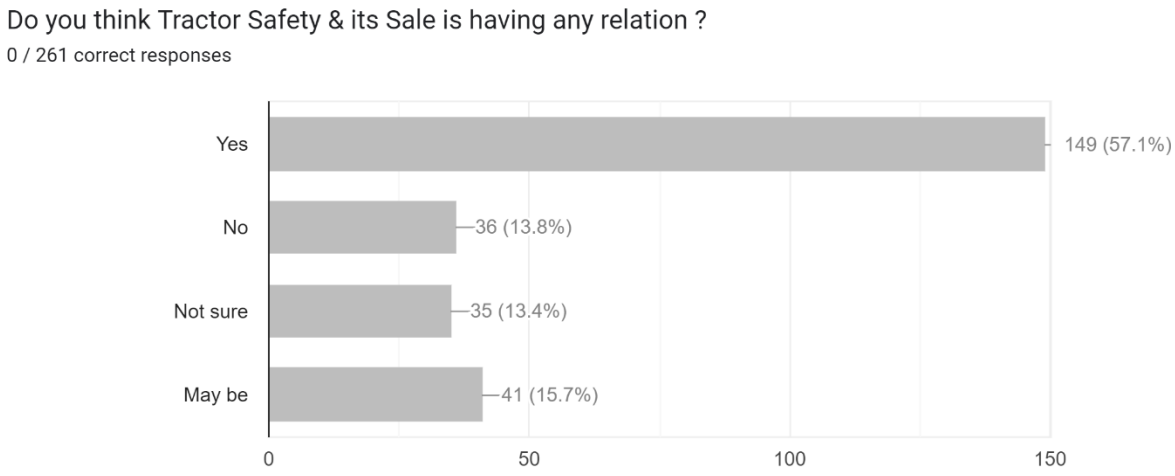

Fig.No.10. Tractor Safety and its Sale Relationship

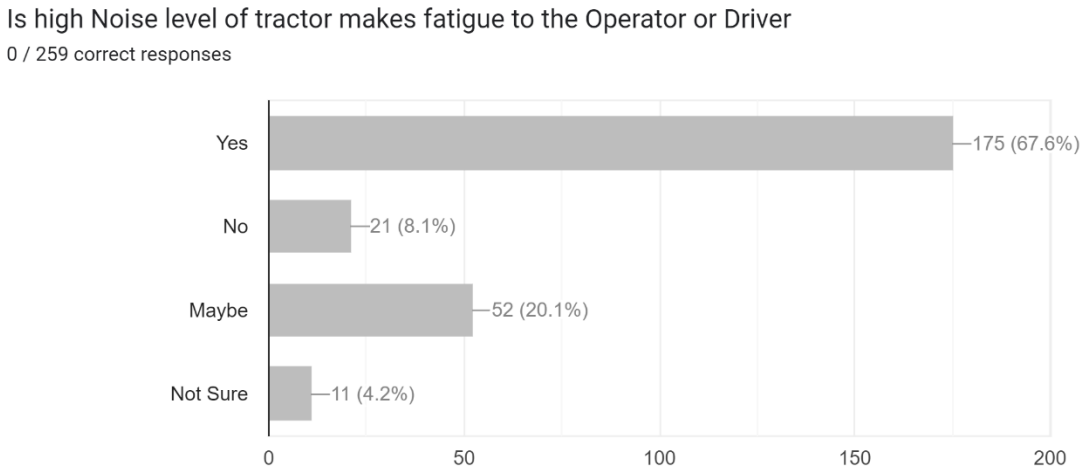

Fig.No.11.Data Analysis based on fatigue to the Operator or Driver

The physical fatigue of the tractor driver directly affects the efficiency and quality of their operation. Therefore, we analyse the physiological characteristics of drivers in different stages of tractor driving fatigue, and study efficient methods for detecting the fatigue state of combine harvesters. This is done in order to effectively identify the fatigue state of the driver, protect the physical and mental health of the driver, and ensure the progress and smoothness of the operation . The result has important practical significance and research value.

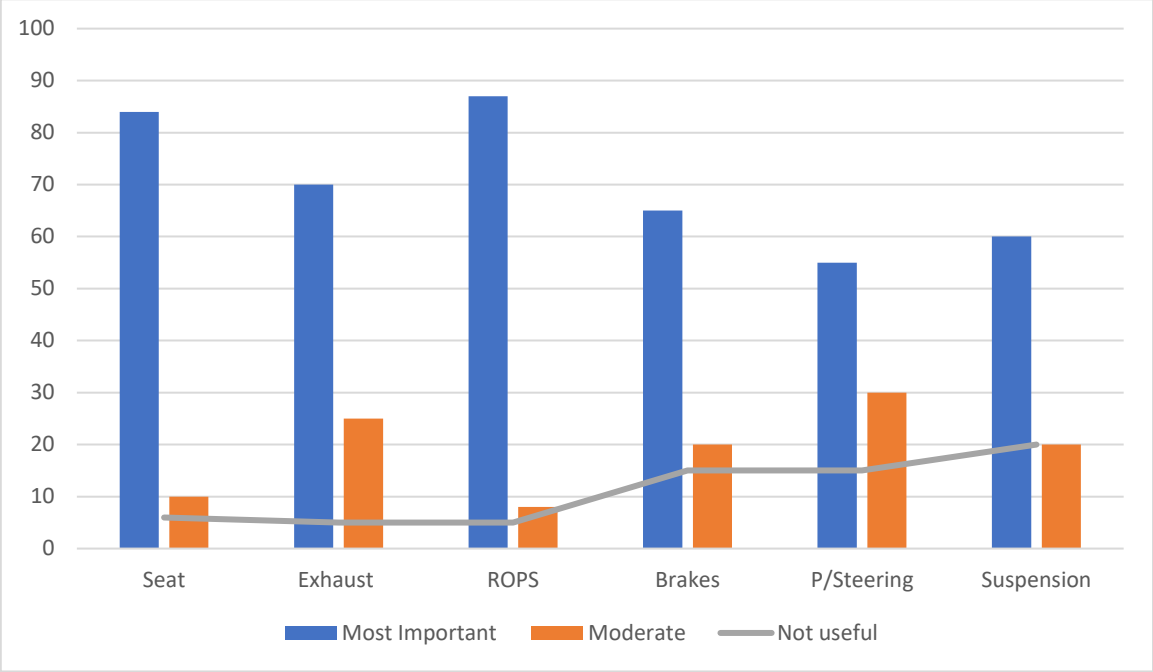

Fig.No.11. Priority wise list of the Safety System used in Tractor

Conclusion :

Therefore, Tractor Seat and rollover prevention structure is an issue of major importance and the subject has become the main focus of several respondents . Rollover protective structure (ROPS) has been one of the most important advances in protecting drivers/operators from tractor overturn accidents. However, one of the most effective ways of minimising farm tractor accidents is through regulation of machinery design, manufacture, supply and operation. In conclusion, the following farm tractor operation safety tips (TOST) are highlighted. After the data analysis and critical review of the survey, the various safety systems explored and require for the upcoming modernisation era of tractor safety system. However, the utmost require in the technology of Tractor seat and Roll over protecting structure needs to be improve these two safety system having major focus area.

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