



# Technology Innovation Forum for **A**gricultural **N**urturing

An Engineering Students' Event for Agricultural Solutions

## RULE BOOK

(Rev 2.2, 25<sup>th</sup> January 2024)

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## **A. Part A: ADMINISTRATIVE REGULATIONS**

### **A.1 General information**

The Rules for SAEINDIA-OFFHIGHWAY BOARD- TIFAN (Technology Innovation for Agricultural Nurturing) 2024 events conducted in India are comprised of the TIFAN Official Rule 2024, hereinafter referred to as can be downloaded from the participants from the SAEINDIA TIFAN website <http://saeindia.org/tifan/>.

### **A.2 Functions and roles**

#### **A.2.1 Organizing Authority:**

The SAEINDIA OFFHIGHWAY BOARD (SAEI-OHB) that organizes the TIFAN event and all the personnel acting on its behalf.

#### **A.2.2 Team:**

The group of individual students with a team name and one Machine that team has developed and that has been accepted for entry to the TIFAN Event.

#### **A.2.3 Participant:**

Student member of the participating team.

#### **A.2.4 Team Captain:**

A Participant from the team appointed on the event registration document as a single focal point for his/her team towards the Organizing Authority.

#### **A.2.5 Technical Head:**

The person appointed by the Organizing Authority, responsible for managing and sanctioning all static and field technical activities of TIFAN Event.

#### **A.2.6 Field Marshall:**

A person appointed by the Organizing Authority to act on their behalf, to ensure field safety and observe on-field rule compliance.

#### **A.2.7 Convener:**

A person appointed by the Organizing Authority, responsible for ensuring the conduct of the TIFAN Event.

#### **A.2.8 Organizing Committee:**

A team comprised of members, from various supporting agencies, organizations institutions etc. and acting as honorary working board for planning, execution and supporting this TIFAN event.

#### **A.2.9 Steering Committee:**

An advisory committee usually made up of high-level stakeholders and/or experts from various supporting agencies, organizations institutions etc. who provide guidance and direction on key issues such as policy and objectives, budgetary control, marketing strategy, resource allocation, and decisions involving large expenditures.

### **A.3 Overview of Event**

#### **A.3.1 Event Objective:**

The SAEI-OHB TIFAN Event challenges teams of undergraduate engineering students to conceive, design, fabricate, develop, and compete with implement-based farm machinery, in an event with field demonstration. This engineering event gives teams the maximum design flexibility and the freedom to

express their creativity and imaginations, however there are very few specifications or requirements on the overall machine design as explained in this rule book.

#### **A.3.2 TIFAN 2024 Theme:**

The TIFAN 2024 Event is designed to evolve around the theme of challenges in Vegetable Transplanting and thereby the theme chosen for this year is “Automated Multi Vegetable Transplanter”, For Chili, Brinjal and Tomato saplings. Teams are expected to conceive, design, develop and demonstrate a working level prototype of farm machine at the specified venue following all the requirements mentioned in this rule book. The very design objectives of this Event are as below.

- i. The teams are to assume that they work for a design firm that is designing, fabricating, testing, and demonstrating a prototype of tractor mounted automated multi vegetable transplanter for a new and emerging market.
- ii. The Machine should have good performance in terms of productivity, coverage, damage to crops, cleanliness of crop, operator comfort, and safe to the operator as well as bystander. It should be sufficiently durable to successfully complete all the events described in the TIFAN Event rules.
- iii. Once the Machine has been completed and tested, your design firm will attempt to “sell” the design to a fictitious “company” that is considering the production of Automated Multi Vegetable Transplanter.
- iv. Each design will be judged and evaluated against other competing designs to determine the best overall Transplanter.
- v. Machines entered to TIFAN Events are expected to be designed and fabricated in accordance with good engineering practices by the engineering students without professional help.
- vi. The team which has participated more than a year and qualified for the final event will be called as old team.
- vii. Teams are also encouraged to explore addition of features, enabling the machine’s utility for transplanting Chili, Brinjal, Tomato saplings.

#### **A.3.3 Open Registration:**

TIFAN Event has open registration policies and accept registrations by student teams representing universities duly recognized by UGC/AICTE/ICAR which have a SAEINDIA Collegiate Chapter/club.

#### **A.3.4 Official announcement and Event information**

Teams are required to read the articles posted on the SAE India homepage ([www.saeindia.org](http://www.saeindia.org)) published by TIFAN Organizing Committee. Teams must also be familiar with all official announcements concerning the Events and rule interpretations released by the TIFAN Organizing Committee.

#### **A.3.5 Official language:**

The official language of the TIFAN Event is English. Document submissions, presentations and discussions in English are acceptable at all parts of the Events.

### **A.4 TIFAN Event and Organizing Authority**

#### **A.4.1 Rules Authority & Validity**

The rules for the Event are issued under the authority of TIFAN Organizing Committee and valid for the event's calendar year. Ambiguities or questions concerning the meaning or intent of these rules will be resolved by the TIFAN Organizing Committee and the organizing committee decisions will be final in such cases.

#### **A.4.2 Rule's compliance**

By entering the TIFAN Event, the team, members of the team as individuals, faculty advisors and the University agree to comply with and be bound by, these rules and all rule interpretations or procedures issued or announced by SAEINDIA, the TIFAN Organizing committee and the other organizing bodies.

The Organizing Authority reserves the right to rescind machine approval upon further or more detailed checks. The Organizing Authority must be notified of any modifications to the machine after inspection. Non-compliance with the rulebook will be penalized by points or can lead to Machine disqualification.

#### **A.4.3 Understanding the Rules**

Teams are responsible for reading and understanding the rules in entirety. The section and paragraph headings in these rules are provided to facilitate reading and they do not fully explain all the paragraph contents.

#### **A.4.4 Loopholes**

It is impossible for a set of rules to be so comprehensive that it covers all questions about the machine's design parameters or the conduct of the Event. Please remember safety remains paramount during TIFAN Event, so any perceived loopholes should be resolved in the direction of increased safety. All teams should comply and adhere to all government rules and regulations applicable.

#### **A.4.5 Participating in the Event**

Registered teams, team members as individuals, faculty advisors and other representatives of a registered university/institute who are present on-site at an Event are "participating in the Event" from the time they arrive at the event site until they depart the site at the end of the Event or earlier by withdrawing.

#### **A.4.6 Violations of the Intent**

Violations of a rule's intent will be considered a violation of it itself. Questions about the intent or meaning of a rule may be addressed to the TIFAN Organizing Committee or Technical Inspectors.

#### **A.4.7 Right to Impound**

SAEINDIA and TIFAN Organizing Committee reserves the right to impound any onsite registered machines at any time during an Event for inspection and examination by the Organizing Authority, officials, and technical Inspectors.

#### **A.4.8 General Authority**

SAEINDIA and TIFAN organizing committee reserve the right to revise the schedule of any Event and/or interpret or modify the Event rules at any time and in any manner that is, in their sole judgement, required for the efficient operation of the TIFAN event.

#### **A.4.9 Restriction on machine use**

Teams are cautioned that the machine designed in compliance with the TIFAN rules are intended for Event operation only at the official TIFAN Event and students are refrained to operate such prototype at Event site only. The TIFAN organizing committee will not be responsible for any inappropriate usage of this machine.

### **A.5 Individual Participation requirements**

#### **A.5.1 Eligibility Limits**

Eligibility is limited to undergraduate students to ensure that this is an engineering design Event. Team members must be enrolled as degree seeking undergraduates in the college or university of the team with which they are participating. Team members who graduated before the physical round are NOT eligible to participate.



**ID card For Student:** Valid College ID card is required as proof to ensure that participant is an engineering student at a recognized university/college.

Members, for participation, mix of male and female team members are welcomed. A team with all female members is also encouraged to participate.

**TEAM MAIL ID:** Each team is required to have their unique mail ID for communication with TIFAN. The mail id shall be created in the following format only.

**TIFAN23teamname@gmail.com**

Any query or communication other than this email id will not be entertained.

Note: Any communication done by personal email ID of any team member or faculty advisor will not be entertained once the team has been registered.

Every team must have a representative, preferably team captain or vice-captain while communicating with TIFAN organizing committee, to prevent any kind of miss communication.

Team representatives should communicate through registered team Email ID only.

#### **A.5.2 Society Membership**

Team members must be members of SAE or SAE affiliate society. Proof of membership, such as membership card, is required at the Event. Note: Students can join SAEINDIA online at: <http://www.saeindia.org>

#### **A.5.3 Age**

Team members must be at least eighteen (18) years of age at the time of Event.

#### **A.5.4 Liability Waiver**

All on-site participants, including students, faculty, and volunteers, are required to sign a liability waiver upon registering on-site during the time of registration for the event.

Indemnity form: Every team including faculty advisors must fill indemnity in the format sent and submit the same at the registration counter before entering the event site.

#### **A.5.5 Insurance**

Individual medical and accident insurance coverage is the sole responsibility of the participant.

#### **A.5.6 Individual Registration Requirement**

All participating team members and faculty advisors must register themselves at the Event site along with appropriate ID proof, SAE membership Card and Letter from College in college letter Head.

#### **A.5.7 Team Composition**

The total number of members on the team needs to be at least 15 and a maximum 25. It is advised to have a good mix of final year students with earlier year students as well.

Each team can also have one non-student member from farming background or farmer and consider his inputs while design and development of the Event machine. This member should be different than the assigned faculty advisor for the team. Appropriate evidence of inputs and interactions of this member must be clearly reflected. There will be an assessment of regional agronomy knowledge/farm machinery know-how and cultivation practices during the presentation events for each team. Physical presence is optional for this member, no mandatory SAE membership required for this member.

NOTE: Teams are advised to take proper care while forming the team and refrain from further modification later. Any change in team composition i.e., addition of new members or deletion of old members is NOT ALLOWED after registration. Any exceptional cases like death, natural calamity etc. could be dealt with separately. For such cases, a letter of declaration shall be provided from the Institution Head / Principal on institution letter head. Backing out or withdrawal of any member from

the team, due to any reason other than the exceptional ones mentioned above, is NOT allowed and the entire team will be responsible for the consequences, if any, arise due to this.

If you are not an SAE member, go to [www.sae.org](http://www.sae.org) and select the “Join SAE/Membership Renewal” link under “Quick links”, and then select the “Join SAE” link in the top right column. Students will need to select the “Student Membership” link and then follow the series of questions that are asked. Faculty members who wish to become SAE members should choose the “Professional Membership” link. Please note all student participants must be SAE members to participate in the events; this is not mandatory for faculty advisors.

Team name: The meaningful and inspirational team name is required to distinguish the team

Team logo: An attractive team logo (not downloaded from the internet) is required from the Participating team. Teams are required to use their team logo in Reports, on their implement and Videos.

## **A.6 Faculty Advisor**

### **A.6.1 Faculty Advisor Status**

Each team is expected to have a Faculty Advisor appointed by the institute/college. The faculty advisor is expected to accompany the team to the Event and will be considered by Event officials to be the official institute/college representative.

### **A.6.2 Responsibilities**

Faculty Advisors are expected to advise their teams on general engineering and engineering project management theory.

### **A.6.3 Limitations**

Faculty advisors should neither design any part of the machine nor should directly participate in the development of any documentation or presentation. Faculty Advisors should not fabricate nor assemble any components nor assist in the machine's preparation, maintenance, testing or operation.

Faculty Advisors are not allowed to participate during technical inspection, design evaluation, cost, marketing, and sales presentations. The team captain or other designated members of the team must do all the presentation although faculty advisors may silently observe.

In brief –Faculty Advisors should not design, build, or repair any part of the machine.

## **A.7 Eligibility machine prototype**

### **A.7.1 Student Developed machine.**

Machines entered TIFAN Events must be conceived, designed, fabricated, and maintained by the student team members without direct involvement from professional engineers, automotive engineers, machinists, or related professionals. Proof of manufacturing location must be furnished by the teams on-site upon being asked for by the TIFAN organizing committee.

#### **The machine used for multiple year:**

Universities/Colleges/Industries may enter the same implement for multiple years but must document substantial improvements and/or upgrades to the implement as used In The previous year’s Event, provided they fulfill the requirements of the TIFAN theme of that year. There should be specific mention about following aspects on improvement with respect to earlier machine in Event.

- i. Productivity
- ii. Innovation
- iii. Performance
- iv. Cost of Operation

Any team who is participating repeatedly under the same theme, if unable to present their uniqueness in the newer design will attract penalties in the evaluation by judges. Team can always choose to design new machine form, in case they wish to participate, without using the same machine architecture of previous events.

There is no direct entry in the field events for the previous year participating and the team will have to pass through all the evaluation stages as that of for other teams.

#### **A.7.2 Information Resource**

The student team may use any literature or knowledge related to Automated Multi Vegetable Transplanter design and information from professionals or from academics as long as the information is given as a discussion of alternatives with their pros and cons. due citation for the source is to be provided wherever such information is used or referred.

#### **A.7.3 Professional Assistance**

Professionals may not make design decisions or drawings, and the Faculty Advisor may sign a statement of compliance with this restriction.

Each team needs to give an undertaking signed by the Head of Department (HOD) mentioning the manufacturing done in-house using workshop facilities. Also, teams need to submit a list of facilities / equipment in operating condition with the college facilities which will be used to fabricate & assemble the machine as per design presented in Virtual TIFAN event.

During the manufacturing and fabrication process, the video clips that cover students working in college must be shared as a soft copy, to be furnished anytime throughout the project. The clip is required to cover each of the manufacturing processes carried out in college.

The TIFAN Event aims to provide a direct hands-on experience to the students. Therefore, students should perform all fabrication tasks. The Fabrication should be done on-campus using in-house facilities of college / university.

All work done outside the Campus needs to be informed to the TIFAN organizing Committee and prior approval acquired for the same. Appropriate documentation with consent and approval from Faculty and HOD (Head of Department), to maintain for using facilities outside of campus.

Machines, which have been professionally fabricated, may be penalized or even disqualified from the Event. The decision of the TIFAN organizing committee in this regard will be final. The registration fee would NOT be refunded in any case.

Machines fabricated from designs already available in the market are ineligible to compete. Machines which have been professionally fabricated may be disqualified from the Event and may not be allowed in the Event if a team does not have access to machine.

Shop facilities, they can use support of professional fabrication shop with declaration by faculty advisor. Any outsourcing must be reflected in cost reporting, with supporting receipts or invoices from your outsourced vendor.

### **A.8 Registration**

#### **A.8.1 General information**

Registration for TIFAN Events held in 2024 must be completed by submitting the on-line google registration form or appropriate method as communicated to teams mentioning all the details correctly. Online registration must be done by either (a) team captain who needs to be an SAEINDIA member or (b) the official faculty advisor.

Note: It typically may take at least 5 working days between the time you complete an on-line SAEINDIA membership application, and our system recognizes you as eligible to register your team.

After sending the online registration form along with the payment details a copy of the registration form attested by Head of Department or Principal of the respective University/College must be mailed to [tifan@saeindia.org](mailto:tifan@saeindia.org) within 5 working days after submitting the google form.

Note: If there is need of change in Team Captain/Faculty Advisor/Team member, team need to send an application with the details and signature of Previous Team captain /Faculty Advisor and current Team Leader/Faculty Advisor through Team Mail Id.

Changing of such team structure is allowed maximum till Virtual TIFAN event only, any change after that is not permissible. There could be drop possible but additional members are not allowed to the team.

#### **A.8.2 Entries per college/University**

Registration for TIFAN Event allows more than one machine per college / institute location, provided each team fulfills all requirements of this rule book. All team members from the team should have valid SAE membership throughout TIFAN event dates till completion.

#### **A.8.3 Registration limits**

TIFAN 2024 Event, the registration limit will be posted on the <http://saeindia.org/tifan/>. The registration will close as soon as the registration limit is reached. We strongly advise teams to register as soon as registration opens. (First come First Serve Basis). There are no exceptions to this registration policy.

#### **A.8.4 Registration Dates**

Teams must register for TIFAN Event between following dates:

Last day for registration is 15<sup>th</sup> September 2023

#### **A.8.5 Registration Fees**

Registration fees must be paid by each participating team by the deadlines Registration fees are not refundable and may not be transferred to a subsequent year's Event. Any change will be notified and will be declared on the official web site.

For the TIFAN2024, the registration fees are to be paid in a phased manner as below.

<b>Format --&gt;</b>	<b>(At identified location)</b>
Qualifying Round	₹ 7000+GST
Final Round	₹ 5000+GST

*Table 1. Fees Structure*

#### **Mode of Payment:**

Mode of transfer: Online transfer, Direct Bank Deposit or Demand Draft (DD) (DD shall be drawn in favor of TIFAN SAEINDIA, Payable at Chennai)

Account Name: TIFAN SAEINDIA

Acc. No. 1550101083972

IFSC Code: CNRB0001550

Bank: Canara Bank

Payable At: Chennai

\*Students are requested to upload a photo of payment details while completing the registration form.

Demand draft should be sent by courier to the address below. Mention “TIFAN 2024 Registration” on the envelope.

SAEINDIA | No 1/17Ceebros Arcade, 3rd Cross, Kasturba Nagar, Adyar, Chennai - 600020

**Registration Fees confirmation:**

Registration fees will be confirmed within 48 hrs. Of payment. If the payment day is followed by a Bank Holiday, then confirmation will be done before the end of the day.

**Registration fee deadline and refund:**

Registration fees must be paid to the SAEINDIA by/before the deadlines. Registration fees are not refundable and will not be transferred to a subsequent year's Event.

**A.8.6 Withdrawals**

Registered teams, unable to attend the Event are requested to officially withdraw by notifying to the Organizing Committee at least one Month before the virtual event. All communication in this regard needs to be sent to [tifan@saeindia.org](mailto:tifan@saeindia.org). Registration fees are not refundable and will not be transferred to a subsequent year's Event.

**A.8.7 On-site Reporting**

All team members and faculty advisors must complete the on-site reporting procedures after they arrive at the Event site. All the site reporting credentials and/or other identification issued by the Organizing Authority are properly worn before the machine prototype can be unloaded or worked upon in any manner.

**A.8.8 Machine prototype Shipping**

Machine prototype shipments by commercial carrier must comply with the local laws and regulations of location from which, and to which, the machine is being sent. Teams are advised to consult with their transporter to make sure their shipment fully complies with all relevant documentation and shipping requirements.

Shipments must be sent with the participating team name listed as the receiving party.

Neither the TIFAN organizing Committee, nor the Event sites can be listed as the receiving party for your machine. Your team should be available while unloading/loading of the machine.

**A.9 Rule book related Questions**

**A.9.1 General**

By submitting a question to TIFAN, you and your team agree that both your question and the Committee's answer can be reproduced and distributed by TIFAN, in both complete and edited versions, in any medium or format anywhere in the world.

**A.9.2 Question Types**

TIFAN Organizing Committee will answer questions that are not already answered in the rules or FAQs or that require new or novel rule interpretations. The committee will not respond to questions that are already answered in the rules. For example, if a rule specifies a minimum dimension for a part the committee will not answer questions asking if a smaller dimension can be used.

**A.9.3 Question Format**

All rules' questions must include (1) the full name and email address of the student submitting the question, (2) the name of the university/college, no abbreviations, (3) Clear and crisp brief description of the question. The attachment, if any along with the question must not exceed 2MB size.

#### **A.9.4 Question Submission**

The teams can send their technical queries and doubts to the official Email ID [tifan@saeindia.org](mailto:tifan@saeindia.org) for the clarification of any rule.

#### **A.9.5 Question Documentation**

Teams submitting questions are required to bring copies of the questions and answers with them to technical inspection.

#### **A.9.6 Response Time**

Please allow a minimum of two (2) weeks for a response. The Organizing Committee will respond as quickly as possible, but responses to questions presenting new issues, or unusual complexity, may take over two weeks.

#### **A.9.7 Event Related Questions**

Questions pertaining to the operation and schedules of TIFAN Event should be emailed to [tifan@saeindia.org](mailto:tifan@saeindia.org).

### **A.10 Protest**

It is recognized that thousands of hours of work have gone into building a machine and that teams are entitled to all the points they can earn. We also recognize that there can be differences in the interpretation of rules, the application of penalties and the understanding of procedures. The TIFAN Organizing committee and SAEINDIA staff will make every effort to fully review all questions and resolve problems and discrepancies quickly and equitably.

#### **A.10.1 Preliminary Review - Required**

If a team has a question about scoring, judging, policies, or any official action it must be brought to the Organizing Authority's attention for an informal preliminary review before a protest can be filed.

#### **A.10.2 Cause for Protest**

A team may protest any rule interpretation, score, or official action (unless specifically excluded from protest) which they feel has caused some actual, non-trivial, harm to their team, or has had a substantive effect on their score. Teams may not protest rule interpretations or actions that have not caused them any substantive damage.

#### **A.10.3 Protest Format and Forfeit**

All protests must be filed in writing and presented to the Organizing Authority by the team captain. To have a protest considered, a team must post a twenty-five (25) point protest bond which will be forfeited if their protest is rejected. The Organizing Authority, judges or volunteers will not review any video footage as part of the protest.

#### **A.10.4 Protest Period**

Protests concerning any aspect of the Event must be filed within half an hour (30 minutes) of the end of the event to which the protest relates.

#### **A.10.5 Decision**

The decision of the Event protest committee / Organizing Authority regarding any protest is final.

#### **A.10.6 Penalties**

Non-compliance with the Event rules will result in a formal warning, invalidation of the best overall attempt or disqualification of the Team, depending on the severity of the breach. The Organizing Authority will exclude, disqualify, or otherwise penalize any Participant who, in the judgement of the Technical Head, has gained an unfair advantage because of any breach of the Official Rules, hindrance

of other Participants, departure from the normal course, or any act or omission capable of misrepresenting performance.

## **B. PART B: TECHNICAL REQUIREMENTS AND REGULATIONS**

### **B.1 Phase 1 - Preliminary/Qualifying Round**

The SAEINDIA TIFAN Qualifying Round is a filtration criterion, through which all the registered teams are evaluated for their knowledge and capability to participate successfully in the field /main event. This round acts as a qualifier to participate in the main event TIFAN 2024. Depending upon guidelines and competent approvals, the Organizing Committee will decide the main event (Physical Round) to be conducted and will be communicated in due course of time. The Qualifying Round for TIFAN2024 will be conducted through Digital platforms only. There is no requirement for any team mates to be together. Digital platforms such as Microsoft Teams, Google meet, WebEx, etc. will be utilized to conduct this Event. The exact details of the same will be communicated. Student teams are encouraged to get acquainted with these tools to have smooth execution of Qualifying Round. Teams need to submit the presentations / reports in the template provided by TIFAN OC and in given timelines for respective rounds of evaluations. Late entries will have a penalty.

The various objectives of the Qualifying Round TIFAN 2024 event are as follows:

1. Familiarize teams with the rule book, technical guidelines, and limits for the design of the machine for the main event TIFAN 2024.
2. Guide the teams to conceive and design the complete layout of the farm machine with CAD (Computer Aided Design) tools. The machine design should be complete in all aspects to the extent of being considered ready-to-the-make manufacturing.
3. Enabling the students to Gain knowledge about planting methods, connect with farmers early to understand automation requirements, and estimating budget. All of this would help the teams to holistically plan and prepare for the main event.

The design presented during the event shall be considered as final and the team shall be considered to proceed towards fabrication activity using the same design. If any teams have made some changes to the final machine, depending upon the quantum of changes teams may be penalized in terms of score. If the fabricated machine does not correlate with the virtual round design presentation, the team needs to prepare a design deviation report and justify the reasons. The following are the suggested but not exhaustive items to be present for the virtual event. Each team needs to follow the guidelines on number of slides, font size, ppt template etc.

- Implement Overall technical specifications.
- Design Comparison (Only applicable to team that participated in TIFAN23)
- Implement frame/Chassis design.
- Design of Sapling pick up system.
- Design of Conveying system
- Design of digging and covering of soil system
- Design of planting system
- Hitch system specifications
- Machine safety and ergonomics
- Machine sub-system and cost



- Risk assessment and action plan to mitigate it (DFMEA aka. Design Failure Modes and Effects Analysis)
- Design Validation plan
- Team Composition- Allocation of roles and responsibilities to each team member
- Plan on manufacturing of the prototype (in-house /outsourced)
- Innovation - Machine utility enhancement for additional farm operations/crops (optional).

Based on the performance in the Qualifying Round, the teams would be selected for participation in the main event. The selection would be purely based on merit and evaluation by the panel of judges.

- Note: The preliminary round is a qualifier for physical round, thus, no scores or awards would be issued to any of the teams, only list of qualifying teams will be published on SAE INDIA website or TIFAN Facebook/LinkedIn page.

### Reporting to Qualifying Round

The date, venue, team slots etc. will be communicated to all registered teams. Teams must report for the online evaluation before time to avoid inconveniences. Only 5 team members are permitted for the online meeting. Teams should follow the guidelines issued for the Online evaluation from time to time.

All your presentation will be available with the coordinators of Online evaluation for presenting during event.

***TIFAN ORGANIZATION COMMITTEE (OC Team) RESERVES THE RIGHT TO CONFISCATE ANY ELECTRONIC DEVICE WHICH CAN BREACH THE CONFIDENTIALITY OF THE VIRTUAL TIFAN EVENT. TEAMS FOUND GUILTY OF ANY MISCONDUCT WILL BE DISQUALIFIED FROM THE EVENT.***

## B.2 Basic Design considerations

The general design consideration for the theme of “Automated Multi Vegetable Transplanter”, could employ the following machine operation principles with no manual intervention. This information is just to aid teams in determining their scope, however each team is free to make and choose their own design of system if the ultimate objectives of the TIFAN Event are met.



Fig. 1 Design Consideration Layout

### B.2.1 Machine sub-systems

The machine should be as simple in construction as feasible and easy to operate. In general, the machine for the given theme can comprise of the following major systems to consider, however teams can produce other mechanisms as well to accomplish the given objective of TIFAN Event.

#### I. Raised Bed Formation:

Prepared beds would be provided by TIFAN committee as per the guidelines mentioned in section B.3.1 Designed planting machine or implement should be able to plant the saplings in those raised bed field. Machines should be able to adjust the ground clearance as per the bed height considered.



## II. Pickup Sapling – Pick-up System:

The main function of this system is to pick up sapling cups from tray or buckets without any manual intervention. The pickup systems can be one or multiple depending upon the machine row configuration.

### Sapling Tray Dimension:

Sapling cup diameter- 3.5cm

Tray Length- 52.5 cm

Tray Width – 27 cm

Tray Depth- 4 cm

Total Sapling in a tray –  $7 \times 14 = 98$



Fig. 2- Sapling Tray

### Sapling Size Considerations

- Teams are provided with Sapling (Chili, Brinjal or Tomato) that can range from 10cm to 25 cm in height. Height should be measured from the top of the tray.

### Customized Tray Requirements

- Teams are free to design their own Sapling tray based on the requirements.
- Customized tray should have a minimum holding capacity of 90 saplings.
- Customized tray should have a minimum cup diameter of 40mm and minimum depth of 40mm.
- Team should have minimum 4 customized trays available at physical event.
- Customized tray should be easily removable from implement.
- No manual intervention is allowed once the tray is placed on the implement with loaded saplings.
- Placing the customized tray into the implement does not count in manual intervention.
- Teams can also opt to use sapling tray provided by TIFAN OC as per section B.2.1
- Teams are free to decide X, Y, L and H dimensions per their requirement.

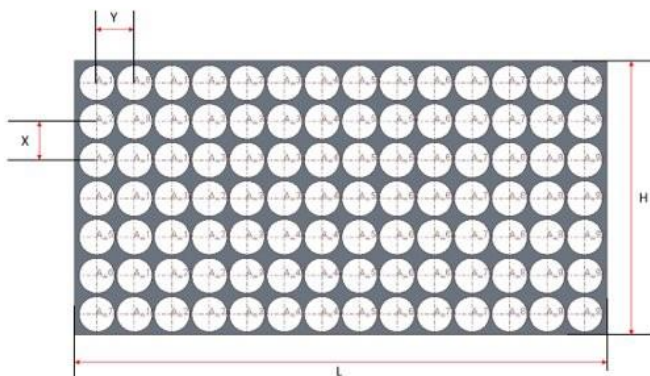


Fig. 3- Customized Sapling Tray

- Sapling Transfer
  - Saplings will be provided by the TIFAN organizing committee.
  - Sapling transfer from provided tray to customized tray should be done Infront of the OC member.
  - Sapling transfer should be done carefully, without damaging the bottom bulb holding the roots of saplings.

### III. Hold and Convey - conveying system:

The main function of conveyor is to convey the saplings picked from trays/buckets to digging system. The system should be designed such that it holds the saplings at predetermined spacing and then passes to the other end of digging unit.

**Following are the suggested design considerations involved in this system. However, this list is not exhaustive, every team has its freedom to design and use any system that performs the intended function.**

- Conveying maximum number of saplings, with no or minimum damage.
- Proper picking of saplings from tray/bucket and thus ensuring smooth transfer.
- Channelize the pickup saplings towards digging system.
- Choose an appropriate type of conveyor belt like a slat type belt, flat belt, metal rod with chains etc.
- Proper angle of the system to enable material movement.
- Speed of conveyor and liner speed of travel of material
- Saplings flow rate
- Power consumption for conveying unit.
- Diameter and spacing of conveyer belts.

### IV. Dig a hole in soil:

A digging system consists of breaking the compact surface of earth to a certain depth and loosening the soil mass, to enable the roots of the crops to penetrate and spread into the soil.

**Following are the suggested design considerations involved in this system. However, this list is not exhaustive, every team has its freedom to design and use any system that performs the intended function.**

- Proper selection of blade shape and geometry
- Selection of appropriate blade material.
- Selection of proper rack angle.
- Throat clearance calculations
- Draft force calculations for the given soil
- Provision of depth change to adjust draft variation requirements.
- Choosing optimum machine travel speed to make best use of machine power and efficiency of system.

### V. Drop the sapling:

Sapling with cups must be dropped into the holes dug by the machine. The team should try to avoid any damage to the saplings in this overall process.

### VI. Cover the soil:

Machines should have the ability to cover up the soil such that the sapling is rooted well. Making sure that the roots are not visible, and plants are not shaken due to wind flow.

### VII. Auxiliary Items:

Students must have at least 4 mandatory sapling trays to hold them on the machine. The number of sapling requirements would depend based on productivity and sapling type chosen by the teams.

Teams are asked to carry at least 20% extra saplings all the time on the machine/implement for any loss of sapling during the field/dynamic evaluation. (Sapling trays will be provided by TIFAN team).

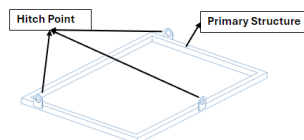
### B.3 General Design Requirements

#### B.3.1 Machine Configuration

- I. The farm machine must be a tractor pulled attachment. No Operator seating arrangement should be allowed on tractor pulled attachment. Attachments which are powered by PTO (Power Take Off). Timing/Ground wheels can be used to take power from machine movement to operate specific functions of the implement. The machine should be provided with at least 3 Tie-Down points to enable lifting with a crane or other means. A reference image has been added below (this is only a reference and in no way mimics the actual machine). The Tie-Down point opening should be minimum 50.8 mm in diameter or any other equivalent cross section and should be structurally strong enough to withstand the weight of the machine while transporting, loading, and unloading.

##### Tie Down Point Specification

1. Minimum 3 tie down points are needed. Either Sheetmetal or bend Rod
2. It should be welded on Primary structures.
3. Straps and hooks will be used to load and unload through this tie down points.



Note: This image is just for reference, not meant to made this way.

Dimension	Symbol	Minimum	Remarks
Plate Thickness	None	8 mm	Either of the two design can be used
Rod Dia	None	Ø10mm	
Hole Diameter	B	50 mm	
Hole-to-Tube/Structure Offset	C	40 mm	Clearance
Edge Distance	D	Unrestricted	Weld Length Dependent
Outer Geometry Diameter	A	90 mm	
Material	None	steel 1018	

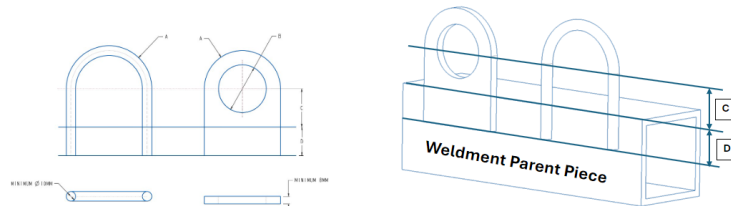


Fig. 4- Tie-Down Points

#### II. Automated Multi Vegetable Transplanter Machine Dimensions

1. Track (tread) width: 1300 up to 1600 mm
2. Overall Length: Should be less than 2500 mm.
3. Attachment Width: Should be less than 1800 mm.
4. Overall, Height: Should be less than 2000 mm.
5. Attachment kerb weight\* < 400 kgs
6. Tractor operating speed – 1.5 – 2 km/h
7. PTO rpm – 540 RPM

\* Kerb Weight: The total mass of a transplanter with all standard attachments and auxiliaries.

#### III. Field layout:

The Field Layout for the Event will be as follows, however there could be some changes possible based upon the climatic conditions. The team needs to use below layout (Fig.4) as reference information for designing the best possible configuration:

1. The equipment should be operated for 50 meters either in a straight line or it will be split into two 25 meters path. The 50m length may also change due to field conditions.

- The row to row and plant to plant distance is mentioned in Table 2.
- Students are expected to demonstrate the functioning of the equipment with any one of the crop's row-row and plant-plant distance as mentioned in Table 2.
- Table 2 below shows the sapling count and estimate its total weight.
- Once the equipment testing starts the teams will be allowed only once per attempt for swapping trays and no other manual intervention will be allowed.

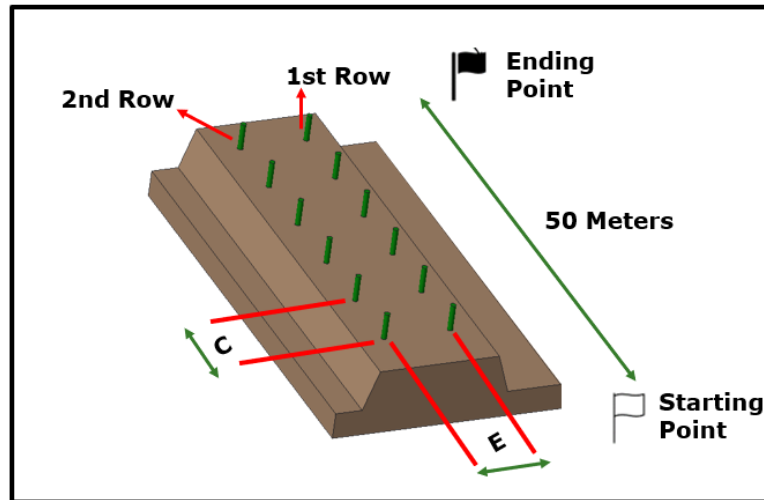


Fig. 5 Field Layout (Schematics)

- A sapling weight of approx. 168 grams is considered but students can measure the actual weight of sapling beforehand and can estimate the total weight of the saplings beforehand.
- All the dimensions in the figure below are in mm or as per indicated in the chart.
- The bed width is shown in the indicative picture as below:

Chili Plant (Bed Width: 1200 and Height: 300 Length: 50,000)							
Row- Row Distance ( E )	Plant to Plan Distance ( C )	Total Bed Length	No of Sappling (2 Row)- 50 mts	No of Sappling (4 Row)- 100 mts	Approx. Weight of 1 Sappling (grms)	Total Approx Weight (2 Rows)- 50 mts (Kgs)	Total Approx Weight (4 Rows)- 100 mts (Kgs)
600	600	50,000	167	333	168	28	56
750	750	50,000	133	267	168	22	45
900	900	50,000	111	222	168	19	37
Tomato Plant (Bed Width: 1200 and Height: 300 Length: 50,000)							
Row- Row Distance ( E )	Plant to Plan Distance ( C )	Total Bed Length	No of Sappling (2 Row)- 50 mts	No of Sappling (4 Row)- 100 mts	Approx. Weight of 1 Sappling (grms)	Total Approx Weight (2 Rows)- 50 mts (Kgs)	Total Approx Weight (4 Rows)- 100 mts (Kgs)
450	300	50,000	333	667	168	56	112
600	350	50,000	286	571	168	48	96
600	450	50,000	222	444	168	37	75
Brinjal Plant (Bed Width: 1200 and Height: 300 Length: 50,000)							
Row- Row Distance ( E )	Plant to Plan Distance ( C )	Total Bed Length	No of Sappling (2 Row)- 50 mts	No of Sappling (4 Row)- 100 mts	Approx. Weight of 1 Sappling (grms)	Total Approx Weight (2 Rows)- 50 mts (Kgs)	Total Approx Weight (4 Rows)- 100 mts (Kgs)
600	450	50,000	222	444	168	37	75
750	600	50,000	167	333	168	28	56
900	900	50,000	111	222	168	19	37

Table 2: Handy Calculations Chart

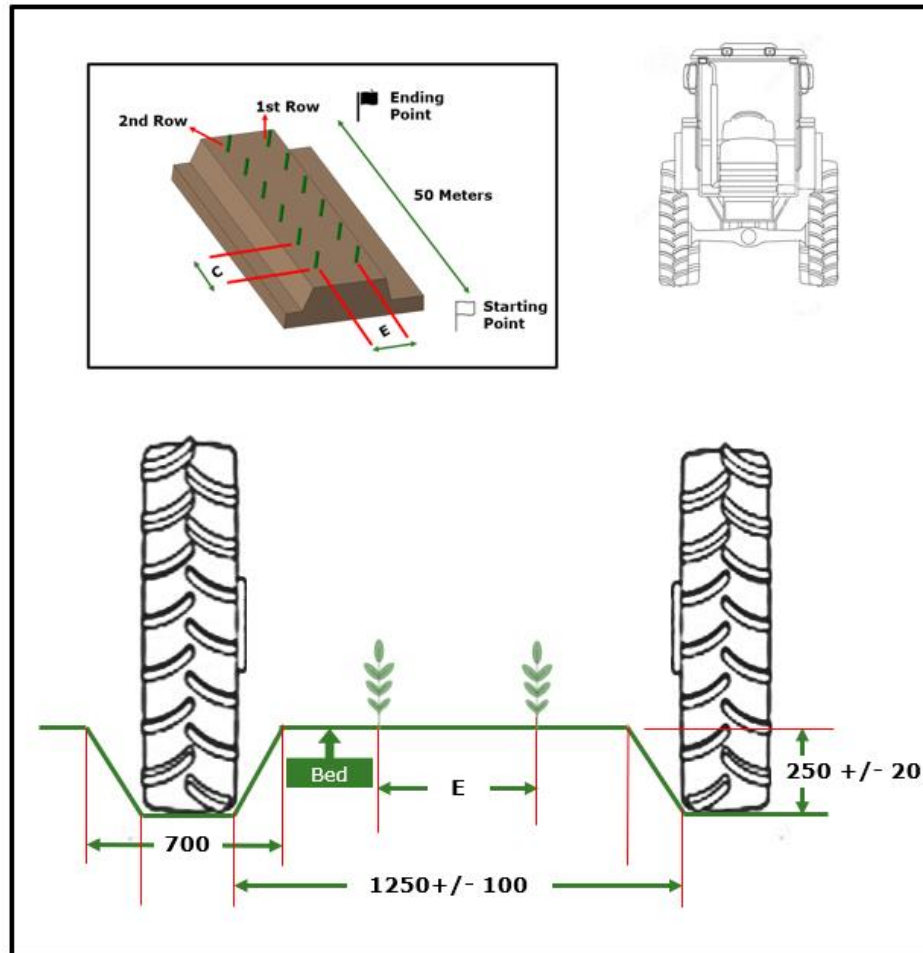


Fig. 6 Bed Dimensions (in mm)

### B.3.2 Tractor Driven Attachment

The prime mover for tractor pulling the attachment would be in the range of 35-50 HP. Tractor will be provided by SAE TIFAN committee. Students need to make sure that the implement is compatible with 35-50 HP and 3-point linkage driven tractors.

I. The attachment should be compatible with both ISO-730 CAT I and CAT II hitch geometry.

a. CAT I:

- i. Mast height 460 +/- 1.5 mm,
- ii. Lower Hitch distance: 683 +/- 1.5 mm,
- iii. Diameter of Top hitch pin 19 mm,
- iv. Diameter of lower hitch pin 22 mm,
- v. Clevis 65 mm

b. CAT II:

- vi. Mast height 610 +/- 1.5 mm,
- vii. Lower Hitch distance: 825 +/- 1.5 mm,
- viii. Diameter of Top hitch pin 25.5 mm,
- ix. Diameter of lower hitch pin 28 mm,
- x. Clevis 65 mm

II. Tractor wheels reactions: 20%:80 % (Front: Rear) by mass

- III. Turning radius: < 2m
- IV. Attachment should be transported through tractor 3-point linkage.
- V. The sapling planting can be driven through ground wheel drive or PTO drive shaft.
- VI. PTO output should be the only source of power for any auxiliary application/attachment.
- VII. Once the implement is attached and ready to perform work, no other connections/controls would be possible from tractor except the speed that can be varied based on requirement.

### **B.3.3 Electrical System**

- I. For safety reasons, the maximum voltage on board of any Machine at any point must not exceed 48 Volts, 88Ah nominal (this includes on-board batteries, external batteries, Super Capacitors).
- II. Batteries or other electric energy storage devices for conveying rotors, shaking of windrowing are allowed within defined specifications.
- III. Teams are recommended to choose off the shelf batteries available from OEM and refrain from making any self-designed prototypes for safety reasons.
- IV. Batteries must be mounted with sound engineering practice and not come loose during a roll-over of machine. There should not be any positive contact with the exhaust unit of the fuel system. The battery must be safely placed & concealed. Failing this, the technical inspectors may debar the team from dynamic events.
- V. The batteries must be factory sealed (incapable of being opened or serviced) and not leak in the event of roll over.
- VI. Use any Low voltage Automotive Wires (Ex- FLRY-B from ISO 6722/DIN72551)
- VII. Sealed Connector must be use for inline and at Device termination.
- VIII. Use any type of Electrical switch works on 12V electrical supply.
- IX. Harness should be properly insulated (Ex- Conduit, PVC hose, Tape) and bare wires should not be visible from outside.
- X. Use any type of DC motors which are driven through battery or through controller supply.
- XI. Wiring harnesses should not be clustered and clumsy in an area. Proper design optimization & layout design should be available.
- XII. Teams should use a safety cut-off switch for battery.
- XIII. Teams are prohibited to use pneumatic for any operation.

### **B.3.4 Usage of Electronics in Automated Multi Vegetable Transplanter**

From TIFAN20 Event onwards, all teams are encouraged to incorporate at least one electronics based or electronics assisted system into the planting machine. This is to promote digitalization and modernization of agricultural equipment. Teams which build concepts based on electronics will be considered for bonus score in innovation and design evaluation.

Below is the suggested list of automation that team can think of, however this list is not exhaustive, and more items could be added to it. Any team incorporating such electronics features with value addition for end customer will get appropriate credits for their efforts during the evaluation.

- Depth of hole adjustment
- Load cell-based sapling handling volume display
- Sapling loading-unloading tray handling aids
- Sapling Loss/damage/Quality monitoring aids
- GPS (GLOBAL POSITIONING SYSTEM) assisted machine location.
- GPS assisted machine crop productivity/yield mapping etc.
- Any other feature that brings value to the end user of this machine

Teams are free to use batteries powered by renewable energy sources such as wind, solar etc.

#### **B.3.5 Trailing tires for attachment (if used)**

Teams are free to use tires for their attachment based on their requirement.

- Tire Size: 8 inch to 16 inch
- Remolded tires are not allowed for TIFAN 2024 Event.
- No tracks or chains to be used. Only traction tires are acceptable.

#### **B.3.6 Suspension**

Usage of suspension is not mandatory for TIFAN Event purpose, and teams may or may not use suspension system in their Machine depending on their choice. Any team using suspension needs to design and fabricate it using sound engineering practice. OEM configuration may be used. Approval from TIFAN technical committee will be must before such machine enters the field for evaluation.

#### **B.3.7 Lighting**

Other than lighting requirement specified in electrical section of this rule book, other devices for lighting to Machines are optional for prototype made for TIFAN Event purpose.

#### **B.3.8 Machine identification**

- I. Machine Number Assignment  
Numbers will be assigned by TIFAN organizing committee as part of the final list of selected teams after Virtual event and will be published on <http://saeindia.org/tifan/>.
- II. Every team must provide its machine number marking before bringing the machine to the Event.
- III. This machine number plate shall include machine number painted with black letters on white background on a sheet metal plate of size 25x105 mm shall be mounted on front and rear of machines like tractors such that it is clearly visible to all technical evaluation members.
- IV. The numbers must remain readable throughout the Event.
- V. Avoid sharp edges or points on the inner and outer edges of the cutout numbers.
- VI. The coloring scheme, logo, slogans, product name etc., chosen for the machine by each team must not be copied from existing brands already available. Any such violation may attract disqualification from Event at any stage.

#### **B.3.9 Structural members for machine frame**

Teams are free to use the standard sections for fabricating the base frame for the machine, however, they must meet the following criteria:

- I. The wall thickness must be at least 2 mm (0.078 in.), regardless of material or section size and should be able to resist bending moment of 200Nm.

Documents of equivalency must include:

1. Calculations must be presented at Technical Inspection which proves sufficient bending stiffness and bending strength. All calculations must be in SI units.
2. Invoices pertaining to the purchase of material used for machine frames.
3. Material test reports or certifications which specify the carbon content and yield strength.

- II. Reference Calculations:

The bending stiffness and bending moment must be calculated about a neutral axis that gives the minimum values.

Bending stiffness is proportional to the product  $E \& I$ ,



E- Modulus of elasticity (205 GPa)

I- Second moment of area for the structural cross section

The Bending moment is given by equation:  $\frac{S_y \times I}{C}$

$S_y$  is Yield strength (365 MPa for AISI 1018 steel)

$C$  is Distance from neutral axis to extreme fiber

\*Bending moment of AISI 1018 steel (for tube dimension OD Ø25.4 with thickness 3mm and yield strength of 365MPa) = 387.38 Nm

### B.3.10 Welding of members

- I. When machine frame is made of members which are made of multiple tubes, joined by welding, must be reinforced with a welding sleeve.
- II. Sleeves must be designed to fit tightly on the inside of the joint being reinforced. External sleeves are not allowed.
- III. Sleeves must extend into each side of the sleeved joint, a length of at least two times the diameter of the tubes being reinforced and be made from steel at least as thick as the tubes being reinforced.
- IV. The general arrangement of an acceptable sleeved joint is shown in Fig.6 below.

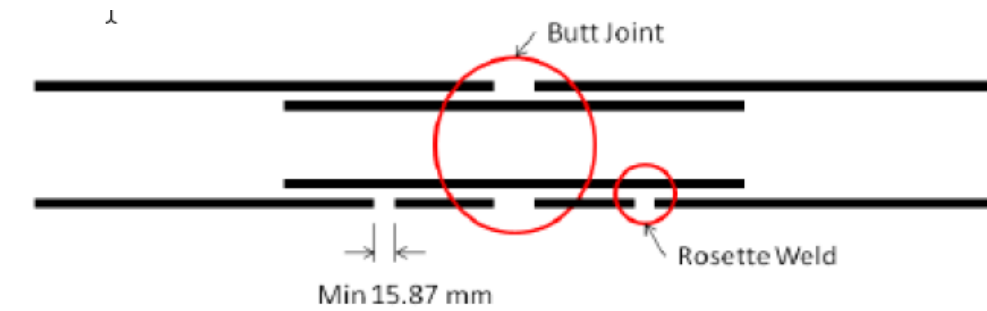


Fig. 7 Sleeved Joint

- V. A butt weld and four rosette welds (two on each tube piece, on holes of a minimum diameter of 16 mm are required.
- VI. A minimum of 4 linear inches of weld is required to secure the sleeve inside the joint, including the butt joint and the rosette welds.
- VII. No professional help for weldment creation is expected. The team needs to produce a video providing details of actual welding done by team members in their workshop.

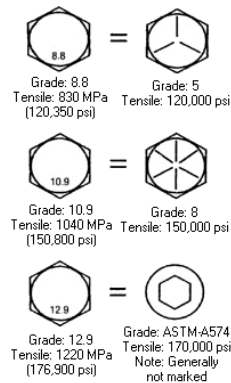
### B.3.11 Fasteners

Fasteners used in the machine systems mounting must meet the following guidelines.

- I. Fasteners must be made captive using NYLON locknuts, cotter nuts or safety wired bolts (in blind applications). Lock washers or thread sealants do not meet this requirement.



- II. Team must use threaded fasteners either ISO (Metric) or SAE which meet or exceed either, SAE Grade 5/ Metric Grade 8.8 specifications. See Figures below.



*Fig 8. Fastener Specification Representation*

- III. Threaded fasteners used must have a minimum of two (2) threads coming out of nuts.

### **B.3.12 Protecting guards**

- I. All rotating parts such as belts, chains, and sprockets that rotate, must be shielded to prevent injury to the operator or bystanders and to avoid the component flying apart due to centrifugal force.
- II. These guards/shields must extend around the periphery of the belt or chain and must be wider than the rotating part they are protecting. They must be mounted with sound engineering practice, to resist vibration.
- III. Material should be at least 250 MPa strength steel with minimum 1.5 mm thick -16 Gauge for fender whereas 1.27 mm thick -18 gauge for another component is allowed.
- IV. Finger guards: Rotating parts must also be guarded all around, in addition to the guard around the periphery. All around guarding (finger guards) must prevent small, searching fingers from getting caught in any rotating part.
- V. Non-rigid, fabric coverings such as “Frog skin”, Ceconite, and neoprene not acceptable for use as finger guards.
- VI. All moving/rotating components must be covered to ensure safety and failure to do so may lead to disqualification of team.

### **B.3.13 Implement Trolley**

To make the implement movement easy in the final event, team are suggested to carry their own trolley. Teams are free to design their own carrier, or they can even buy a compatible carrier. Please go through the following points to support your design or procurement.

#### **A) Wheels**

- Teams are suggested to fabricate/Procure 1/2/3/4 wheeled manually operated trolley to move there implement during the Phase-2 event.
  - One wheel/Two Wheel – In case if the implement is already having 2 ground tires. Adding one/two more wheel with some supporting structure will make the implement easy to move and steer.
  - Three wheel/Four Wheel – In case if the implement is not having any ground tires. Adding Three/Four more wheel with some supporting structure will make the implement easy to move and steer.

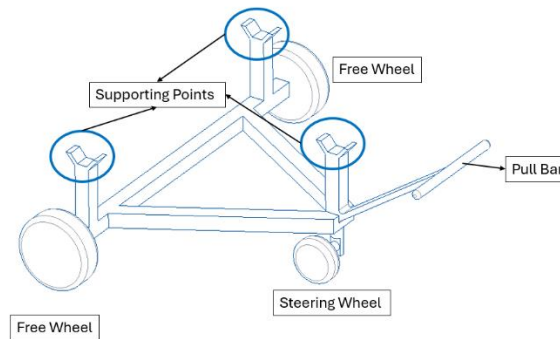
- Trolley should be fabricate/procure in such a manner that it can be load/unload to the tractors hitch system easily.

#### B) Support Points

- It should have at least three supporting points.
- Support points should not be flat, it should be either be half circle shape or C section type, which will restrict the to and fro motion of the implement with respect to carrier.
- Supporting point should be supporting the primary members of the implement, if not, contact point must be strong enough to bear the weight of implements.

#### C) Frame

- Teams are free to use any cross section or material for this carrier frame. It should be able to support the weight of implement while moving in the field. Make sure to integrate it with pull or push bar to move the frame.



*Fig 9. Implement Trolley*

#### B.4 Provision to mount Event Sponsor Authority Logo

- All teams should provide a place for putting logo stickers on their machine. These logos sticker will be provided at the event place and mounting instructions during static events.
- Teams may display advertising from their machine's sponsors, provided it is in good taste and does not conflict with the machine's number.

#### B.5 Additional technical requirements

- During Machine design, construction, and Event planning, participating teams must pay attention to all aspects of safety, i.e., driver safety, the safety of other team members and spectator safety.
- Machine bodies must not be prone to changing shape due to wind and must not include any external accessories/ attachment that might be dangerous to other Team members, e.g., pointed part of the Machine body. Any sharp points must have a radius of 20mm or more, alternatively they should be made of foam or similar deformable material.
- All parts with where potential human contact are possible should not be made of any material which may smash/explode into sharp shards.
- Any rotating part or component should be covered and should be easy to open for quick inspection access.
- All objects in the Machine must be securely connected and well supported.
- Access to the Machine by the driver must be as easy and practical as typically found in common production type Transplanter.
- Any access opening mechanisms must be rigidly attached to the Machine.

## C. Part C: EVALUATION CRITERIA

The students would be scored for their overall progress with respect to static evaluation which would comprise of a total of 400 points, followed by dynamic evaluation of the machine which would comprise of a total of 600 points. Final discretion of the scoring would be totally based on judge's decision satisfying all the criteria mentioned below or otherwise on understanding on the situation at the field.

### C.1 Technical Inspection

- All participating teams must go through a technical inspection and get cleared by the Judges before they are permitted to operate the machine in the field and other dynamic events.
- The inspection will determine if the machine satisfies the requirements and specifications of the TIFAN rulebook.
- Any machine may be re-inspected at any time during the event and correction of any non-compliance will be required.
- Technical inspection will consist of below points:
  - Frame Material Documentation: Receipts documenting the materials purchased, or otherwise acquired, and used to build the frame.
  - Self-Certification Check Sheet: A properly completed Self Certification Check Sheet (format will be shared by TIFAN)
  - On-site technical specifications by Judging panel.
- Self-Certification by Teams
 

Before bringing the machine to technical inspection each team must

  - Pre-inspect the machine for compliance with the rules.
  - Complete the official Self Certification Check Sheet (will be made available on <http://saeindia.org/tifan/>)
- Once a machine has passed technical inspection its configuration may not be modified. All accessory components such as roofs, wings, bumpers, etc. are considered part of the configuration and must always remain on the machine.
- Approved machines must remain in "as-approved" condition throughout the Event. Any replacement of a part that is not identical to the broken part must be approved prior to the repair.
- Non-identical parts not approved will be subject to an appropriate performance penalty.

### C.2 Evaluation Process

#### C.2.1 Judging Categories

The machine developed under TIFAN Event are judged in a series of static and dynamic events including safety scrutiny, technical inspection, cost, sales & marketing presentation, review of engineering design and finally the field performance at TIFAN location. Dynamic events are scored to determine the field performance of the farm machine.

TIFAN 2024 - Scoring	
Static Events	Points
Sales and marketing	75
Cost Presentation	50
Innovation	75
Design presentation	50
Build quality	50
Dynamic Events	
Field Evaluation	450
Durability test	50

Table 3- TIFAN24 Scoring

### **C.3 Static Event Evaluation**

#### **C.3.1 Engineering Design & Innovation Evaluation**

- I. The engineering design and Innovation event's objective is to evaluate the engineering effort that went into the farm machine's design and how the engineering meets the problem statement detailed in the event objective.
- II. Teams will be judged on the development of design per specifications and the ability to meet those specifications, computer aided drafting, analysis, testing and development, manufacturability, serviceability, system integration and how the machine works in field to perform its intended function.
- III. Bonus points will be awarded to teams for any innovative features.

Each of these parts of the engineering product development cycle will be judged within the following subsystems:

1. Soil Opening unit (Digging)
  2. Picking and sapling handling unit (Conveying system for the given crop sapling)
  3. Conveying & drop unit (Final output material collection)
  4. Power transmission system (PTO/Ground wheel/Motor)
  5. Chassis Design
- IV. The engineering design event consists of two parts:
1. Design Evaluation at event site
  2. Design Report that will be used as a part of the design evaluation.

##### **C.3.1.1 Design Report**

- I. The Design Report should contain a brief description of the machine with a review of the team's design objectives, machine concepts, and a discussion of any important design features. Note or describe the application of analysis and testing techniques (FEA (Finite Element Analysis), part/system/machine testing, etc.). Evidence of this analysis and back-up data should be brought to the Event and be available, on request, for review by the judges.
- II. The design report template will be made available on the SAE TIFAN page by 31<sup>st</sup> March 2024.
- III. Design Report
  1. The Design Report must be submitted electronically in Adobe Acrobat Format (PDF). The document must be a single file (text, drawings and optional content are all inclusive).
  2. The design report file must be named as follows:  
Machine # \_College name \_TIFAN \_DesignReport.  
EXAMPLE: Machine# 001\_XYZ University\_TIFAN2024\_DesignReport.pdf.
  3. The maximum size for the file is 5MB.
- IV. WARNING: Failure to exactly follow the above submission requirements may result in exclusion from the Design Event. If your file is not submitted in the required format or not properly named, it cannot be made available to the design judges, and your team may be excluded from the Design Event.
- V. Design reports must be submitted to the email ID communicated on <http://saeindia.org/tifan/> from time to time and described in Part E of these rules. Reports must be received by the due date listed in within the due date only.
- VI. There will be Penalty levied for Late Submission or Non-submission.

#### **C.3.1.2 On Site Design Evaluation**

- I. The design judges will evaluate the engineering effort based upon the team's Design Report, responses to questions, and an inspection of the farm machine.
- II. The design judges will inspect the machine to determine if the design concepts are adequate and appropriate for the application of TIFAN completion theme.
- III. Judges will check the versatility of the equipment to work with different crop settings and bonus points will be awarded to teams which can demonstrate multiple vegetable compatibility as mentioned in Table 2.
- IV. Support Material: Teams may bring with them to Design Evaluation any photographs, drawings, plans, charts, example components, or other materials that they believe are needed to support the presentation of the machine and the discussion of their development process. Use of laptop or notebook computers, posters, and binders is allowed.

#### **C.3.2 Machine Prototype Cost Evaluation & Manufacturing**

##### **C.3.2.1 Machine Cost:**

- I. Prototype Cost Report: The cost report provides all the background information to verify the machine's actual cost.

##### **C.3.2.2 Cost Report**

- I. Costing Sheets: The core of the report is the series of costing sheets. This section must contain the one-page summary sheet broken up into individual subsystems. Each subsystem needs an individual sub-assembly sheet.
- II. Cost Documentation: This section includes copies of receipts, invoices, price tags, catalog pages, on-line prices, or other documentation, to substantiate the costs of the parts and materials of any item costing more than Rs. 200. Cost documentation must be at full retail Indian prices. The report is expected to be comprehensive, well documented, truthful, and accurate.
- III. Penalties will be levied for late or non-submission of cost report.

Every team must download and use the Microsoft Excel template for cost reports which will be made available at <http://saeindia.org/tifan/> page by 31<sup>st</sup> March 2024. This document may not be modified from its current form failing to which will attract zero (0) points for the cost report.

A PDF file with all the cost documentation described above must be submitted to TIFAN organizing committee. The cost report file must be named as follows: Machine#\_College name\_TIFAN2024\_ Cost Report. For example: Machine# 001\_XYZ University\_TIFAN2024\_CostReport.

Cost report and invoices hard copy: Teams must bring a hard copy of their cost report to the cost judges on site. Teams that fail to bring a hard copy to judging may receive zero (0) points for their cost.

##### **C.3.2.3 Cost Correction**

- I. The judges may increase costs and/or fabrication times if they believe that the figures submitted are below current prices for the item, source, or process involved.
- II. Mathematical errors will be penalized. Reports that are highly inaccurate, highly incomplete, or in which the costs cannot be substantiated, may be rejected and their entire cost event will be scored accordingly.

#### **C.3.3 Sales and Marketing presentation**

##### **C.3.3.1 Objective**

The objective of the Sales and Marketing Presentation is for the team is to convince the "Executives" of a hypothetical manufacturing company to purchase the team's farm machine and put it into production at the rate of 5000 units per year. For the presentation, teams must

assume that the judges are to be a mixed group of corporate executives who may have experience in marketing, production, finance, and engineering. Teams will present a cost benefit analysis report for their implement with respect to manual/traditional planting methods.

#### **C.3.3.2 Presentation –Format**

- I. One or more team members may make the presentation to the judges.
- II. The presentation time is limited to ten (10) minutes, followed by Q&A of Five (5) minutes.
- III. Only judges are permitted to ask questions. Any team member on the presentation floor/stage may answer the questions even if that member did not speak during the presentation itself.
- IV. Projection Equipment: Teams planning to use data projection are responsible for bringing their own data and laptops.

### **D. Part D: DYNAMIC EVENTS**

The dynamic events are intended to determine field worthiness and performance machine developed by the student teams. Each team will be given a maximum of two attempts of 15 minutes each subject to conditions and penalty mentioned below and once the evaluation is started no adjustments or repair will be allowed. The preference will be based on a first come first serve basis.

Maximum 3 members are allowed in the field. One member can sit in tractor along with driver provided by TIFAN. Other 2 members can walk along the tractor keeping safe distance. Team should carry 3 safety kits (comprising of but not limited to- Safety cap, Safety shoes, safety goggles, gloves).

The dynamic event will run for 6 hours only (Multiple fields will be available to participate). Please consider below table as a reference for the dynamic event. Actual slots and timings will be shared at the time of registration at physical event site.

Slot 1	Team who completes their first attempt within first 4 hours of event will only be eligible for second attempt
Slot 2	The second attempt should be taken within the next 2 hours of first attempt
Slot 3 (With 50% Penalty)	Additional slot will be provided to teams who have not completed their first attempt in the above two slots

*Table 4: Dynamic event Slots*

#### **D.1 Test field for dynamic event**

##### **D.1.1 Overall field size**

As mentioned in section B3.1, subsection VI, the field size adequately fits the single bed configuration aptly. The length of the bed as mentioned in fig.4 would remain 50 meters. Machines should be able to demonstrate the crop to crop or row to row distance appropriately where they would be evaluated as per the capability of the machine to demonstrate flexibility. (As seen in Section B 3.1, subsection VI, the students should have the ability to consider different crops). Judges have rights to ask the students to demonstrate the machine's ability by considering any crop to crop or row to row distance or field scenario during final inspection.

##### **D.1.2 Soil Specification.**

There could be a variety of soil types depending on the event location for that year's theme and crop to be considered during the demonstration. However, the team can refer below values as worst-case scenario for their designs if they would want to consider.

- I. Type of soil- Common cultivable soil

- II. Density of soil-  $1.7 \text{ Kg/m}^3$  approx.

#### **D.2 Major Machine performance Indices during Dynamic event.**

For the TIFAN 2024 Event having theme of Automated Multi vegetable Transplanter development will undergo a series of events to determine their machine performance against various indices as described below.

- **Soil digging**

Soil digging indicates the efficiency of machine to dig the soil to proper depth for sapling to be planted. Judges will take a note of sapling depth from the best 5 sample's, compare with provided sapling cup depth (ideal), and provide points.

- **Planting Efficiency:**

Planting efficiency indicates how efficiently the farm machine plants the saplings in the field. The judges would evaluate how the saplings are routed well (how many were dropped, how many were damaged or failed to plant, how many were successfully planted) in the ground and provide points.

- **Precision of Planting:**

Planting precision indicates how precisely the farm machine plant the saplings in the field. Judges will take note of row-row distance and plant-plant distance of planted saplings from n consecutive saplings.

- **Soil Covering**

Soil Covering indicates the efficiency of machine to cover the planted sapling for certain depth. Judges will take a note of sapling covering depth and provide points-based number of saplings having their roots exposed.

- **Machine handling and operator comfort**

Qualitative assessment of the farm machine operation based on the following.

- I. Ease of handling the machine subsystem (ex- placing the sapling tray on machine)
- II. Accessibility and reach required for serviceability.
- III. Ergonomics aspects considered while designing the various working mechanism in machine.

#### **D.3 Implement Durability Test**

The Intent of durability Test is to assess implement structural integrity when subjected to field and operating condition when tractor moves in uneven terrain while implement is completely lifted and off the ground through hitch system i.e., in transport condition. Test will be conducted after the dynamic round and the event procedure, field layout and scoring point will be shared with the team in advance.

### **E. Part E: EVENT PROCEDURE AND GENERAL RULES**

#### **E.1 Disciplinary items**

- I. All team members identified as captains or operators and all faculty advisors MUST attend all meetings as designated. Attendance at meetings is mandatory. Failure to attend meetings can result in disqualification of members or the entire team.
- II. Tiebreakers: Tiebreakers for dynamic events will be the second-best run time or score for the given tied event. If both scores for tied teams in the event are equal, then the tie remains.
- III. Pre-inspection Operation Prohibited: Machines may not be started or driven prior to passing technical inspection, except as required as part of the inspection process itself.



- IV. When the machine is driven anywhere except within the practice area or on event courses it must move at walking speed with a team member walking along side at a normal pace. During performance events when the excitement is high, it is particularly important that machines move at a walking pace in the paddocks. The walking speed rule will be strictly enforced and point penalties will be assessed for violations.

## E.2 Code of Conduct

- a. Teamwork Area: The team's work area should be clearly defined and should always be kept uncluttered. When a team leaves their area, it must be left clean.
- b. **All teams' members should be wearing PPE (such as eye protection, ear plug, safety shoes) in the paddock when performing any activity involving grinding welding or cutting.**
- c. All the TIFAN participants can be proud of the excellent sportsmanship and co-operation among all teams.
- d. Good conduct and compliance with the rules and the official instructions are expectations and requirements for every team member.
- e. An incident of unsportsmanlike conduct, the organizing committee is authorized to impose an appropriate penalty.
- f. Unsportsmanlike conduct can include arguments with officials, disobedience of official instructions and the use of abusive or threatening language to any official or other participant. Depending on the seriousness of the infraction the penalty for such actions can range from a deduction of up to fifty percent (50%) of the team points to expulsion of the entire team. Penalties of this type will only be imposed after a complete review of the incident by the organizing committee.
- g. Alcohol and Illegal material
- h. Alcoholic beverages, firearms, weapons of any type and illegal materials are prohibited at TIFAN Event site during the Event. The penalty for violation of this rule is the immediate expulsion of the entire team, not just the individual(s) involved. This rule applies to team members, advisors and any individuals working with the team on-site.
- i. Smoking is prohibited in all Event areas.
- j. Parties: Disruptive parties either on or off-site must be prevented by the faculty advisor or team captain.
- k. Trash Clean-up: Clean-up of trash and debris is the responsibility of the teams. Please try to keep your paddock area clean and uncluttered. At the end of the day, each team must clean their work area.
- l. Site Condition: Please help the organizing committee to keep the site clean. The sites used for the TIFAN Event may be Government or Private property and should be treated as such. Competitors are reminded that they are guests of the owners. All trash should be placed in the receptacles provided. Failure to clean the premises will result in an unsportsmanlike conduct penalty.
- m. The use of motorcycles, quads, bicycles, scooters, skateboards, rollerblades or similar person-carrying or motor driven devices by team members and spectators in any part of the Event area, including the paddocks, is prohibited.
- n. Spectator Rule- The Organizing Authority typically do not have a direct line of communication with spectators other than on-the-spot at the Event; thus, the competitors, faculty and volunteers are expected to help inform the spectators of the safety rules and help restrict spectators to the spectator areas.



- o. Access Restrictions: Spectators must keep a specified distance back decided by the Organizing Authority, from any area where the machines are operating under power. Motor machine Events are potentially dangerous and safety rules will be strictly enforced.
- p. Children: An Event site is not a safe place for children and unsupervised young people. Spectators who fail to strictly control their children will be asked to leave the site.
- q. Removal of Spectators: The event officials and Organizing Authority have the absolute right to restrict spectator access to any parts of the site and to eject anyone who violates safety rules or ignores the instructions of officials.
- r. Unsafe Practices and Conduct: All participants are required to exercise safe practices and always avoid unsafe activities during the Event. The event Organizing Authority has the discretionary authority to impose a just penalty for any conduct.
- s. Safety: Team Responsibility
- t. Safety is the primary consideration in the design of TIFAN Event machines and conduct of events during the Events.
- u. Teams need to include safety considerations in all parts of their program.
- v. At all performance events, the team is responsible for ensuring both the machine and operator meet and follow all the rules' requirements and restrictions.

### **E.3 Force Majeure**

The TIFAN Organizing Committee and SAEINDIA shall not be held responsible for non-fulfillment of their obligations under this agreement due to the exigency of one or more of the Force Majeure events such as but not limited to the acts of God, war, flood, earthquake, strikes, lockouts, pandemics, epidemics, riots, civil commotion, scarcity of water, electricity or other such basic facilities etc., and shall inform the participating colleges on the occurrence and cessation of the event within one week of such decision being made. If the Force Majeure conditions continue beyond a reasonable period where running the event is not feasible either due to the Force Majeure conditions or any other reasons, the event may be cancelled for the year.

#### **“Force Majeure Events”: -**

- a) Earthquake, flood, inundation and landslide, storm, tempest, hurricane, cyclone, lightning, thunder, pandemics but not limited to COVID19 or OMICRON, or any other variants beyond control, epidemics or other extreme atmospheric disturbances or any other act of God.
- b) Strikes, labor disruptions or any other industrial disturbances not arising on account of the acts or omissions of the organizers, war, hostilities (whether declared or not), invasion, the act of a foreign enemy, terrorism, rebellion, riots, weapon conflict or military actions, civil war, ionizing radiation, contamination by radioactivity from nuclear fuel, any nuclear waste, radioactive toxic explosion, volcanic eruptions, or other such occurrences beyond the control of the organizers.
- c) Acts of expropriation, compulsory acquisition, or takeover by any government agency of the said venue where the event is to be held or any part thereof.
- d) Any prohibitory order of any Court

### **E.4 References**

- I. Previous TIFAN Rule Books
- II. TIFAN Rule Book Rev 2.2

- III. SAE India BAJA 2023 Rule book
- IV. SAE India SUPRA 2020 Rule book

## **F. PART F: ANNEXURE**

- Annexure-1: Indemnity Format.
  - To be shared in due course of time
- Annexure-2: Octroi Letter.
  - To be shared in due course of time

### **Amendments**

1. New Release 2.2 – 25<sup>th</sup> January 2024