TERMS OF REFERENCE FOR THE R&D PROJECT

Food and Agriculture Department

Agricultural Machinery and Equipment Sectional Committee, FAD 11

1 Title of the Project

Study on Performance and Safety Requirements of Tractor-Operated Potato Digger Shaker

2 Background

Potato digger shaker is an agricultural machinery used for harvesting potatoes. The machine operated by tractor harvests the potatoes by lifting them up from the soil bed using a soil cutting blade called as share. The lifted potatoes along with soil are then transferred onto a series of sieves (shaker mechanism) where the potatoes are separated from the soil. Potato harvesting is a labor-intensive process, therefore by using a potato digger shaker, farmers save time and labor costs, as well as minimize damage to the potatoes during the harvesting process.

Currently, several Agricultural Machinery Companies manufactures Potato Digger Shaker which are being tested at different testing centers [Farm Machinery Training and Testing Institutes (FMTTIs) and recognized Institutions by Department of Agriculture and Farmers Welfare, Ministry of Agriculture and farmers Welfare, Government of India]. Based on the testing and certification, these machines are sold to farmers at subsidized price. BIS has developed IS 13818: 1993 'Harvesting equipment — Tractor-operated potato digger shakers — Test code' which covers method of testing for potato digger shaker. However, the test code being a pre-2000 standard needs to be updated. Furthermore, there is no standard developed for establishing the performance of the potato digger shaker. In this regard, it has been decided to take up a research project to study performance and safety requirements of potato digger shaker.

3 Objective

To study the performance and safety requirements and operational aspects of tractor operated Potato Digger Shaker to develop a minimum performance standard for usage at the Testing Centres.

4 Scope

4.1 Thorough review of the available literature on tractor operated Potato Digger Shaker, including but not restricted to the following and provide comparative analysis:

a) International and National guidelines;
b) Regulatory stipulations;
c) Research publications;
d) National import export data;
e) National infrastructure for manufacturing; and
f) Any other sources.

4.2 Identification of manufacturing base of Potato Digger Shaker in India along with categorization of large and MSME scale industries. To identify and assess the existing technologies and innovations in potato digger shaker, with a focus on performance and safety related features. Collection of data on the performance metrics, efficiency, and operational characteristics of various potato digger shaker models available in the market. Industry visit to study manufacturing process of potato digger shaker. Interaction with the technical personnel and taking their feedback on operation, maintenance, safety and performance of potato digger shaker. Study of sustainability aspects of the potato digger shaker being manufactured such as its environmental impact, energy conservation, etc. Prepare a questionnaire for this purpose.

4.3 Identification and interaction with testing centres i.e., various Farm Machinery Training and Testing Centres and State Agricultural University's/Institutions authorized for testing potato digger shaker. Collection and study of Test methods being followed and test reports issued.

4.4 Identification and interaction with research and academic institutions working on potato digger shaker for collecting research-based evidence for better understanding the working of potato digger shaker.

4.5 Identification of farmer base using potato digger shaker. Focused Group Discussions with the farmers and taking their feedback on operation, maintenance, safety and performance of potato digger shaker. Prepare a questionnaire for this purpose.

5 Research Methodology:

5.1 Undertake thorough literature review as per **4.1** and prepare summary report including comparative analysis.

5.2 Identify manufacturing base categorized into large, medium, small, and micro. Contact the manufacturers and collect information using a structured questionnaire. Inform them about requirement of industry visit and collection of shareable data.

5.3 Identify exporters and importers of potato digger shaker. Contact them and collect information using a structured questionnaire,

5.4 Undertake visit to identified manufacturing units (4 large and 3 MSME) and Testing Centres (At least 7 testing centres where tractor operated potato digger shaker are being tested shall be visited).

NOTES
1 In case large manufacturers are not there, at least 5 MSMEs shall be visited.
2 Testing centres identified for visit must include at least 2 FMTTIs where tractor operated potato digger shaker are being tested.

5.5 Following activities shall be carried out and a report shall be prepared:

The primary survey should focus on the following aspects:

i. *Definition of potato digger shaker including various components of it.*
ii. *Applicable Regulatory and Statutory requirements*
iii. *Any other stipulation w.r.t. manufacturing of Potato Digger Shaker*
iv. *Performance criteria for the evaluation of potato digger shaker including (but not limited to):*
    a. *Assessment of improvements/advancement over the different kinds of potato digger shaker (Manual drawn, Animal drawn, Walk behind type engine operated, Tractor Drawn, Self-Propelled);*
    b. *Extent of compliance to the existing regulatory guidelines;*
    c. *Ergonomic compatibility;*
    d. *Different types/variants and models of tractor operated potato digger shaker for the purpose of testing and certification;*
    e. *Information on difference performance and safety parameters based on tests being conducted by testing centres.*

    NOTE — The performance and safety parameters may include raw material requirement for different components of potato digger, details of important dimensions, gigging and conveying efficiency, damage percentage, prime mover performance criteria, soil cutting blade raw material and hardness requirements, windrower performance, harvesting speed, yield, fuel efficiency, maintenance requirements *etc).* However the, observer has to take a note of all the parameters being tested at testing centres.

    NOTE — The proposer should collect test reports issued by the Testing Centres. At least 10% of the total test reports issued by the testing centres in last 3 operational years (during which testing is conducted) should be collected. However, if this percentage yields a count lower than 10 reports, the proposer is obligated to collect a minimum of 10 reports, irrespective of the percentage and stipulated time frame.

v. *Review during the Site visit to Testing Centre (Observe the complete process of testing of potato digger shaker)*
vi. *Effectiveness of the potato digger shaker –*
vii. *a) Extent to which it is economical as compared to Manual Harvesting of potatoes.*
    b) Improvement in harvesting of potatoes as compared to Manual Harvesting of potatoes.
    c) Sustainability aspects addressed through potato digger shaker in comparison with manual harvesting of potatoes.
    d) *Examination of technological features if present: automation, precision farming capabilities, safety features, and any other advanced functionalities.*
viii. *Compliance to any guidelines issued by Ministry of Agriculture.*
ix. *Challenges faced.*

Any other important issue to be shared by the proposer.

5.6 Collation of information and data collected from various sources.

5.7 Comparative analysis of the potato digger shaker designed and developed by different industries based on date collected during primary and secondary survey.

6 Expected Deliverables:

Detailed project report of the work done, in hard copy and digital formats, as per the scope specified under 4, with the following as appendices:

a) Research findings and data collected through the secondary as well as primary study including focus group discussions.
b) Primary research findings from industries involved in manufacturing potato digger shaker, testing centres testing it, research and academic institutions working on potato digger shaker as per criteria mentioned under **5.5**.
c) Sustainability report of the potato digger shaker after life cycle approach analysis.
d) Engineering drawings/layout for various structures/ designs of potato digger shaker in the report.
e) Comparative analysis report of potato digger shaker designed and developed by different industries

7 Timeline and Method of Progress Review

a) Timeline for the project is 6 months from the date of award of the project.
b) The different stages of review along with its timeline is given as follows:

Stage	**Timeline**
Stage I : Review of the literatures and existing stipulations, identification of key stakeholders in different parts of India, conduct of Focused Group Discussions with various stakeholders working in this field including farmers.	First 2 Months
Submission of Progress Report	End of 2nd Month
Stage II : Primary research findings from Industries/Testing Centers/ Research and Academic institutions working involved in manufacturing, testing and research on potato digger shaker.	3rd to 5th Month
Submission of interim report to Sectional Committee	End of 4th Month
Stage III : Draft report submission – Sectional Committee will evaluate the draft report and provide feedback/recommend changes, if required.	End of 5th Month

At the end of 6th month, project allottee to submit final project report incorporating recommendations/feedback of Committee.

***Note**: The timelines given above are indicative and calculation of time will start from the date of award of sanction letter for the project to the Project leader.*

8 Support from BIS

a. Access to Indian and International Standards
b. Letters from BIS to concerned stakeholders for support in research project.

9 Nodal Officer

Shri Vikrant Chauhan, Scientist-B/ Assistant Director, FAD, BIS may be contacted at fad11@bis.gov.in for any queries on the research project