MODEL GUIDELINES

for

Quality Control Laboratory at Mandis under e-NAM

2025

Government of India

Ministry of Agriculture and Farmers Welfare

Department of Agriculture and Farmers Welfare

Directorate of Marketing & Inspection (DMI)

CONTENTS

1. **Introduction**

National Agriculture Market is a virtual market with a physical market (mandi) at the back end. Electronic-National Agriculture market (e-NAM) networks the existing Agricultural Produce Market Committees (APMC)/mandis to create a unified national market for agricultural commodities for pan-India electronic trading. A critical component of e-NAM is the establishment of quality assaying systems, which help in assuring the quality of produce and support informed bidding by buyers. The assaying of agricultural produce at the market level is of utmost importance to enhance its marketability and enable the farmers to realize price commensurate to the quality of their agricultural produce. Directorate of Marketing and Inspection (DMI), an attached office of Department of Agriculture and Farmers Welfare, Ministry of Agriculture and Farmers Welfare has formulated tradable parameters for agricultural commodities, based on which trading of these commodities is done under e-NAM. DMI continues to provide technical support and facilitate quality testing of notified commodities for trading on e-NAM platform.

2. **Purpose of Quality Control Laboratories in Mandi**

The establishment of quality control laboratories at APMCs for testing of agricultural produce will be beneficial for farmers to get better price for their produce. The purpose to set up Quality testing laboratories is to strengthen the quality assaying system and develop trade reliable grades and standards which will promote inter-mandi and inter-state e-trade.

These guidelines have been prepared to frame required standards and specifications for setting up quality control laboratories with requisite equipment in mandi, wherein major components are mentioned below: -

(a) Commodities to be analyzed
(b) Building facilities and physical infrastructure
(c) Safety and Hygiene
(d) Selection and purchase of equipment/chemicals
(e) Manpower requirement and their training and capacity building
(f) Establishing standard operational and working procedures.
(g) NABL accreditation within 12 months from the date of issue of these guidelines.
(h) In these guidelines, minimum requirements for establishing a quality control laboratory have been mentioned. However, the laboratories may have additional facilities, be continuously upgraded / modernized. Mandis may set up additional labs, increase instruments, man power depending upon volumes of arrivals in the market.

3. **Functions of Quality Control Laboratory**

3.1 Quality control laboratory shall test the quality parameters of agricultural produce traded on e-NAM as per the tradable parameters' specifications.

3.2 Quality control laboratory should follow the scientific protocols laid down for the analysis of any agricultural commodity.

3.3. The laboratory should follow the BIS standards and method developed in AI based technology after carrying out proper method validation protocol.

3.4 The laboratory shall analyze the agricultural commodities received at their end for analysis immediately.

3.5. The laboratory results are required to be accurate and reliable.

3.6. Quality control laboratories are to be equipped with modern equipments which are fast, accurate, easy to use, compact, reliable and acceptable to all stakeholders.

3.7. Capacity building by way of organizing professional training, workshops and seminars for the analysts and laboratory personnel in the mandis specified by the State Agricultural Marketing Board (SAMB) should be carried out at regular intervals.

3.8 The reports of analysis shall be signed by the authorized signatory who may be a different person than the person who is analyzing the sample. He should also upload the results on e-NAM portal immediately after completion and approval of analytical result.

3.9 All the documents shall be properly maintained and updated in the state that it can be reproduced at any time if required by lab officials.

3.10 The quality control laboratory shall submit the following statements at a periodicity decided by the SAMB:

i. Number of samples received for testing and number of samples tested.

ii. Number of samples range wise, specifying the parameter/test.

iii. Other relevant technical details as required.

4. **Commodities to be analyzed**
    1. Food Grains and Allied Products
    2. Oilseeds
    3. Fruits
    4. Vegetables
    5. Spices
    6. Miscellaneous produce

5. **Physical Infrastructure**

5.1 The laboratory is generally designed on the basis of the analysis to be carried out and the methods to be used, keeping in mind future analytical requirements and expansions. Laboratories must have separate zones/rooms, depending on types of analysis and functionality. The separation of laboratory space to perform various activities is primarily required to avoid cross-contamination with undesirable substances and to maximize the use of space. The infrastructural design of the laboratory may be made by approved engineers of State for better working condition and environment.

5.2 Proper walk-in entry door provisions at the entrance of laboratory should be there to prevent the infiltration of outside impurities. This is followed by pre-testing storage areas (commodity inspection area) to oversee the presence of insects, pests, diseases, and other potential contaminants.

5.3 The quality control laboratory should have two separate cemented rooms of adequate size preferably 15 feet x 10 feet as per the need and estimated working load. One room would be required for receiving and storing the samples (in refrigerated condition to prevent deterioration) and maintaining the scanned pictures of sample at arrival to prevent any future dispute. The second room will be used for report generation and record maintenance. The rooms should have proper ventilation and a proper door with which it can be securely closed.

5.4 The laboratory room should have a side working table of adequate size preferably 2 to 2.5 feet in breadth with 3 feet in height covering the entire length and breadth of each side of the room with at least one wash basin at each end of the table with proper drainage facilities.

5.5 The quality control laboratory should be arranged in such a way that test procedures can be carried out in sequential manner and risk of contamination can be reduced.

5.6 The laboratory room should be provided with running water supply and electricity. The power backup may be installed.

5.7 A wooden/steel almirah, a working table and a chair should be provided.

5.8 Storage of the sample must not alter the sample in any significant way – whether through contamination, loss, deterioration or any other means. Proper storage arrangements must be there for remnant or counter samples.

5.9 Special provisions/rooms shall be available for weighing balance, sensitive instruments, etc., wherein air conditioner should be installed.

5.10 Quality control laboratory shall have at least 300 lux light intensity for working places except particular condition mentioned for any equipment or method.

6. **Safety and Hygiene**

6.1 The laboratory should have good ventilation and should be protected from rain water.

6.2 Laboratory should be well-lit for smooth operations.

6.3 All materials used in the lab should be resistant to chemicals.

6.4 Authorized personnel only should be allowed in the Laboratory.

6.5 Flooring needs to be of a non-slip material.

6.6 The laboratory should always be kept clean and be practically free from insect, rodents etc.

6.7 The waste materials generated during grading and or other operations should be disposed of immediately so as to avoid any type of contamination.

6.8 The testing personnel shall strictly abide by the instructions given in the manual and follow the methods and procedures as per the trading parameters of respective commodities.

6.9 Due care and precautions should be taken while storing /handling hazardous chemicals.

6.10 Electrical apparatus should have proper earthing to avoid fire due to short-circuiting. Electricity must either be a stable supply, or the voltage must be stabilized by either one large stabilizer for the whole laboratory. The lab should have sufficient number of electrical sockets.

6.11 Inflammable and poisonous chemicals should be kept away from the sources of heat and naked flame.

6.12 Eating, drinking, and smoking are always discouraged, and should be prohibited, in the laboratory.

6.13 Fire extinguisher for laboratory purposes should be provided.

6.14 At least two entrances/exits should be provided for each laboratory whenever possible.

6.15 First aid box should be available in the lab, along with emergency telephone no. of hospital/doctors/contact person.

6.16 The laboratory building should be clean and maintained in a hygienic condition.

6.17. Laboratory shall follow good housekeeping activities such as floor and wall cleaning, washrooms, dustbins, fume hoods, freezers, refrigerators, air conditioners, air filters, flies killer lamp. The laboratory shall be liable to maintain safety measures and pest control measures.

6.18 Appropriate personal protective equipments such as lab coat, gloves, safety goggles should be worn at all times in the lab. Lab coats or aprons, goggles, hand gloves and foot covers must be kept at the entrance. The visitors must wear these safety wears for their safety and to avoid contamination.

7. Equipment

7.1. The details of equipment and appliances required for quality control of agricultural commodities are listed out mainly on the basis of method adopted for analysis of commodities as specified in BIS, AOAC, CODEX etc. which are given at Annexure-2 as mentioned below. -

a. Common equipments at Table-I

b. Food Grains at Table-II

c. Oil seeds at Table III

d. Cotton at Table-IV

e. Fruits & Vegetables at Table-V

f. Spices at Table-VI

g. Miscellaneous commodities at Table-VII.

7.2. The traditional methods used for analysis of tradable parameters are time consuming and it may not be feasible on various occasions to conduct the tests of large number of commodities arriving at mandi. In this scenario, the use of rapid quality testing equipment and AI technology-based equipment will be beneficial. But the accuracy of results obtained from these equipments should be verified, which may be ascertained by participating in proficiency tests and comparing the results with those of other labs. It is also possible to analyze a set of samples at a second independent lab and calculate the standard deviation between the two labs at regular intervals. Over the years, quick assaying instruments are widely adopted in worldwide laboratories, as it offers significant benefits over the chemical analysis methods it replaces. These instruments should have secured internal storage for dissemination of analytical data at any time. The list of few AI technology based equipments is given in Annexure-2, Table- VIII.

7.3. Maintenance of equipment/instrument: -

7.3.1. All the equipment should be under permanent control of the laboratory and should be capable in context of the tests performed.

7.3.2 It is advised that the location of equipment should be properly decided prior to installation considering inter-instrumental disturbances such as heat generation, vibrations and radiations, sound and light.

7.3.3 The equipment must be calibrated from NABL accredited lab and/or internally by Certified Reference Materials, produced by accredited RMP as per ISO 17034.

7.3.4 IQ/OQ/PQ, Instruction manual, operation manual and other details of the equipment like calibration, due date of calibration, safety precaution, etc. must be available alongside the equipment.

7.3.5 All the equipment should be uniquely identifiable.

7.3.6 The equipment should be placed and test must be performed under proper environmental condition as prescribed by manufacturer.

7.3.7 Equipments, which are not working should be placed under a tag “out of order”.

7.3.8 Maintenance plan of the equipment should be available and should be done under annual maintenance contract.

7.3.9 The equipment should be handled by technically competent and approved personnel only.

7.3.10 Proper procedure as prescribed by the manufacturer should be followed for cleaning of the equipment and its accessories before and after use.

7.3.11 Dos and don’ts regarding important instructions should be available alongside the equipment and should be visible all the time.

7.3.12 Software of equipment should be upgraded and validated from time to time.

7.3.13 The equipment should be placed on a vibration free platform.

7.4. Procurement of Instrument: - The quality control of commodities is directly related to the income of farmers and therefore the equipment, machinery, tools and materials used in quality control laboratories need to be safe, robust and reliable capable of working safely. The equipment needs to remain safe under prolonged usage may be even in adverse conditions. All equipment, machinery, appliances and other materials has been broadly categorized in section 7.1.

The SAMBs/APMCs may purchase the equipment as per their requirement from DMI empanelled vendor. The detailed procedure for empanelment of manufacturers and vendors of quality control equipment is annexed in Annexure-III. Equipment should be procured from DMI empanelled vendors who are registered on GeM.

8. Manpower requirement and training

8.1 The laboratory shall have sufficient numbers (2 min.) of approved analysts based on arrivals of agricultural produce (no. of lots) in mandi.

8.2 Analyst should be a graduate in science and have studied either Chemistry/Biochemistry/Microbiology/Dairy Chemistry/Agriculture Science/Animal Science/Fisheries Science/Biotechnology/ Food safety/ Food Technology/Dairy Technology/Oil Technology/Veterinary Sciences/Entomology/Pathology as one of the subjects at graduation level. He should be suitably trained and having knowledge of laboratory work with minimum 1 year experience. He shall report to concerned official as decided by Market Committee/ SAMB.

8.3 The laboratory shall have multi-tasking staff/attendant who should possess XIIth Class pass educational qualification and suitably trained.

8.4 Alternative arrangement of personnel should exist in case one is not available.

8.5. Training

8.5.1 The analyst should have undergone training in the grading of the agricultural commodities from any DMI approved laboratory.
8.5.2 Analyst should be experienced in correct use of equipment and should be fully trained and have understanding of the principles of tradable parameters. The training on equipment should be provided by manufacturer from time to time. The SAMB/APMC may enter into contract with manufacturer for training.
8.5.3. The analyst should be provided commodity specific training at various training institutes like CFTRI, Mysore; CIPHET, Ludhiana; NIFTEM, Sonipat and Thanjavur; IGMRI, Hapur; CIRCOT, Mumbai, commodity specific ICAR institutes etc. The schedule for training should be prepared by SAMB/APMCs.
8.5.4. The analyst should be trained in BIS/other reputed organization regarding requirement of ISO-17025.
8.5.5 Refresher training should be organized at competent labs/training centers to keep the personnel updated on new tradable commodities. The SAMB/APMCs should prepare the yearly training calendar.
8.5.6. The training records of lab personnel should be maintained properly.

8.5.7 In addition to the analyst, the attendant may also be provided training in grading of agricultural commodities and for maintaining proper record of analysis from any DMI approved laboratory.

9. Working procedures

9.1 The farmer/producer gets paid based on the grain quality/range and the amount of grain/agricultural produce delivered; hence it is critical that results are accurate and comparable regardless of location of the quality control lab /APMC. Awareness among farmers and suppliers about desired quality of produce must be generated so that they come with produce of acceptable quality.

9.2. The laboratory shall use test and/or calibration methods available in BIS/AOAC/CODEX/other accepted standards, including methods for sampling, which meet the needs of the customer and which are appropriate for the tests and/or calibrations it undertakes. Further when the customer does not specify the method to be used, the laboratory shall select appropriate validated methods.

9.3. Method validation is an important requirement in the practice of chemical analysis. The methods, which are not available in BIS/AOAC/CODEX/other accepted standards, should be validated internally as per NABL norms before using it for analysis purposes.

9.4. The quick assaying equipment facilities developed in quality control laboratories should be standardized with the available reference methods like IS, AOAC, CODEX etc. at a laboratory approved by NABL for their performance, accuracy, repeatability, reproducibility etc.

9.5. Internal audit of the laboratory shall be conducted at least once in 12 months and shall cover all the applicable requirements of ISO/IEC 17025:2017.

9.6. Analytical register should be maintained by analyst and it may be produced to higher authorities as and when required for verification purposes.

9.7. The SOP, log books of all instruments/equipment should be maintained as per NABL norms.

9.8. ILC/PT should be conducted at regular intervals. All laboratories should prepare a schedule for 2 years to cover entire scope of analysis of that particular laboratory.

10. Sampling:

10.1 From Bins: Samples should be drawn from different depths with the help of a probe sampler. The small quantity samples so drawn should be mixed together to obtain a composite sample of a lot.

10.2 From Bagged / Packed commodities: Samples may be taken with a sampler /Parkhi or by inserting hand or by means of a long scoop after cutting open the seams. An equal number of scoops should be taken out from the top and center of the packages. The quantity of sample drawn from each bag should be as recommended in the standards. The sample so drawn should be thoroughly mixed to form composite mixture.

10.3 From Loose Heap, sample might be drawn by inserting hand into the heap up to elbow or more, with the palm upward. The palm should then be cupped with fingers holding tightly together so that the dirt does not strain from the commodity. The arm should be withdrawn slowly. Commodity should be transferred into a sample bag. Such samples should be taken out from different sides and depths. A required quantity as mentioned for particular commodity in Tradable Parameters should be collected. This should be mixed thoroughly to ensure a homogeneous mixture. Each lot should be separately sampled.

11. **Public-Private Partnership model**

During the peak season, when markets are flooded with commodities, quality testing becomes a major challenge in mandis with unskilled and limited manpower. To overcome this, State government may set up third party Quality Control laboratories in the mandi under Public Private Partnership Model. The said firm should assure the quality of product or commodities. The commodity wise rates for testing may be fixed by the State Government. The cost of testing may be borne by the State Government to avoid financial burden to farmers.

12. NABL Accreditation

DMI officials may inspect the quality control laboratories at regular intervals and give suggestions for improvement, if any. Further to build the confidence among buyers and sellers for trading especially for inter-mandi/ inter-state trade, NABL accreditation as per ISO-17025/2017 of quality control laboratories should be completed within 12 months from the date of final publication of these guidelines.

13. Reporting & Progress review

13.1 All the analytical records must be documented as per NABL norms.

13.2 The analyst will carry out the quality control of agricultural commodities and shall keep all records pertaining to grading of commodities and issue report, etc.

13.3 Backup copies of records may be held in electronic form.

13.4 Random checking of the results should be done through inter-laboratory and intra-laboratory checks to check the proficiency of the personnel.

13.5 The format for laboratory report is at Annexure- IV.

13.6. List of monthly status of instruments is at Annexure-V.

14. **Redressal Mechanism:** In case of any dispute arising in analytical result of agricultural commodities analyzed by the lab, the matter may be resolved at the mandi level as per the mandate of mandi bye-laws. In case where reanalysis is required, the remnant or controlled sample in the control condition may be sent by mandi to the NABL accredited laboratory. The sample must be stored in deep freezer or controlled environment till its disposal to maintain initial produce quality.
15. **Review and Amendments**: The model quality control laboratory guidelines may be reviewed periodically in every five years, but, if required update/amendments may be done earlier also with the approval of competent authority.

Annexure 1

Tradable Parameters of Agriculture Commodities under e-NAM

FOOD GRAINS/ CEREALS

1. Arhar
2. Moong whole
3. Masoor whole
4. Urad whole
5. Wheat
6. Maize
7. Chana whole
8. Bajra
9. Barley
10. Jowar
11. Paddy
12. Rajma
13. Ragi
14. Lobia
15. Basmati rice
16. White Peas
17. Moth
18. Buck Wheat
19. Horse Gram
20. Arhar Dal-Split
21. Moong Dal-Split
22. Chana Dal-Split
23. Urad Dal- Split
24. Kabuli Chana-Chola
25. Oats-Raw
26. Black Scented Rice
27. Foxtail millet
28. Little Millet,
29. Kodo Millet,
30. Barnyard Millet
31. Browntop Millet
32. Proso Millet
33. Amaranth Seed
34. Khesari dal
35. Mushk budji rice

OILSEEDS

36. Castor seed
37. Mustard seed
38. Soyabean
39. Peanut kernel
40. Sunflower seed
41. Kusum seed
42. Sesame seed
43. Niger Seed
44. Sal Seed
45. Cotton Seed
46. Pongam seeds
47. Linseed
48. Mahua Seed
49. Rape seed

FRUITS

50. Apple
51. Pear
52. Orange
53. Sapota
54. Musk melon
55. Grapes
56. Litchi
57. Pomegranate
58. Banana
59. Plum
60. Peach
61. Mango
62. Sweet orange
63. Custard apple
64. Watermelon
65. Lemon
66. Guava
67. Jackfruit
68. Kinnow
69. Raw Mango (for pickles)
70. Papaya
71. Pineapple
72. Strawberries
73. Amla
74. Apricot
75. Ber
76. Jamun
77. Persimmon-Amarfal
78. Cherry Red/Black
79. Grapefruit
80. Passion Fruit
81. Avocado
82. Rambutan
83. Mangosteen
84. Soursop (रामफल)
85. Baji banana
86. Mysore banana
87. Red banana
88. Lady finger banana
89. Kiwi
90. Sarda

VEGETABLES

91. Onion
92. Potato
93. Tomato
94. Pea
95. Bottle gourd
96. Bitter gourd
97. Cucumber
98. Brinjal
99. Cabbage
100. Cauliflower
101. Green chillies
102. Carrots
103. Sweet potato
104. Spinach
105. Mustard leaf
106. Coriander leaves
107. Garlic
108. Bhindi/Okra
109. Ginger
110. Beetroot
111. Ribbed celery
112. Cluster beans
113. Ridge Gourd

114. Radish
115. Sweet Corn
116. Capsicum
117. Jimikand (Suran)
118. Ivy gourd
119. Colocasia vegetable
120. Pumpkin
121. Fenugreek leaves
122. Drumstick
123. Pointed gourd
124. Snake gourd
125. Lobia pods
126. Sem
127. Ash gourd
128. Tinda
129. Banana Raw
130. Papaya Raw
131. Chappan Kaddu
132. Curry leaves
133. Gherkins
134. Oyster Mushrooms
135. Fresh Button Mushroom
136. Sponge gourd
137. Sugar snap peas
138. Spring Onion
139. Broccoli
140. Alovera leaves
141. Mint leaves
142. Bread fruit
143. Winged bean
144. Lesser yam
145. Bilimbi
146. Raw Turmeric
147. Round chilli (Ramnad Mundu)
148. Garcinia
149. Mootty Fruit
150. Green Amaranthus
151. Red Amaranthus
152. Jackfruit seed
153. Ginger Seed
154. Lotus stem
155. Snow mountain garlic

SPICES

156. Cumin
157. Red chilli
158. Turmeric
159. Ajwain
160. Coriander whole
161. Dried Raw Mango Slices
162. Large cardamom
163. Fennel seed
164. Fenugreek seed
165. Tejpata
166. Dry Ginger
167. Black Pepper
168. Cardamom whole
169. Clove whole
170. Nutmeg whole
171. Poppy seed
172. Mace

MISC.

173. Guar seed
174. Mahua flower
175. Tamarind
176. Jaggery
177. Groundnut with pods
178. Coconut
179. Raw Cashew nut
180. Betel leaves
181. Isabgol
182. Raisins
183. Saffron
184. Tender coconut
185. Areca nut (betelnut)
186. Coconut with Husk
187. Neem Seeds
188. Jute Seeds
189. Walnut (in shell)
190. Chrinoji
191. Safed Musli
192. Fish (Hilsa)
193. Raw Coffee beans
194. Arrowroot
195. Silk cocoon
196. Banana stem
197. Green henna leaf
198. Raw arrowroot powder
199. Raw honey
200. Almond kernel
201. Pinenut
202. Walnut kernel
203. Khandsari
204. Makhana seed
205. Popped makhana

Fiber Crops

206. Cotton
207. Raw Jute

Forest Produce

208. Bamboo
209. Rittha
210. Tapioca

Flowers

211. Tuberose
212. Marigold
213. Carnation
214. Gladiolus
215. Rose cut flower
216. Gerbera
217. Chrysanthemum
218. Anthurium
219. Tulip
220. Spray Chrysanthemum
221. Lilly

Annexure-II

Table I

COMMON EQUIPMENTS REQUIRED FOR QUALITY CONTROL LAB

S. No.	Name of the equipment/appliance/material
1.	Digital Electronic weighing balance (up to 0.0001g) and accessories
2.	Digital top pan balance (up to 0.01g)
3.	Fume hoods connected with exhaust system
4.	Digital temperature and humidity meter
5.	Digital or hand-held grain/seed counter or enumerator
6.	Hot air oven
7.	Mixer/Grinder
8.	Hotplate with thermostatic control
9.	Sieves of different microns
10.	Magnifying glass
11.	Digital vernier calipers
12.	Forceps
13.	Spatula
14.	Sampler
15.	Homogenizer

Table II

EQUIPMENTS REQUIRED FOR QUALITY CONTROL OF CEREALS AND PULSES (35 COMMODITIES)

Sl.No(1)	Name of Commodities (2)	Name of Tradable Parameter (3)	Name of Equipment (4)	Technical Specification, if any (5)
1	Arhar Moong whole Masoor whole Urad whole Wheat Maize Chana whole Bajra Barley Jowar Paddy Rajma Ragi Lobia Basmati rice White Peas Moth Buck Wheat Horse Gram Arhar Dal-Split Moong Dal-Split Chana Dal-Split Urad Dal- Split Kabuli Chana-Chola Oats-Raw etc.	Moisture (i) or (ii)	(i) Near Infra-Red (NIR) spectroscopy Analyzer	Near Infrared Analyzer from reputed original equipment manufacturer Capability to test moisture, oil content, protein, fiber, sugars, starch and other organic compounds which absorbs Infra-red light and/or other desired parameters
			(II) Quick testing Solution	See Table No VIII
			(iii) Digital Moisture meters	1. Digital Moisture meter (3.5 -40%), capacitance technology or 2. Heating element metal tabular with electronic balance (0.01 % readability) or 3. Halogen based heating module/ Infra red radiation based heating module Preferably BIS certified
			Multipurpose Lab Accessories	4. Inkjet/Laser jet printer 5. Grinder 6. Thermometer: Digital (0.1deg least count) 7. Hotplate: Round or rectangular, electrical, Thermostatic control, Max surface temp: 350C
2.		Foreign Matter	Electronic testing	**(i)Electronic Balance:** Digital (electromagnetic type), up to four decimal places **a. Accessories:** 1. Bullion weights (5g, 10g, 50 g, 100 g, 500g) for calibration 2. Sample storage container suitable to sampling size 3. Four Sieves: 4.0mm (mesh No. 5) 3.35mm, (mesh No.6) 1.70mm, (mesh No. 12) 1.00mm (mesh No. 18) 4. Enameled Plates: Flat type with raised rims 5. Forceps: Laboratory grade

				6. Magnifying Glass: (magnification of 10X) Laboratory grade
			ii. Computer vision /AI based testing	See Table No VIII and IX
3.		Other Edible grains	As at (2) (i) & (ii) above	Approved Analyst
4.		Slightly Damaged Grains		
5.		Admixture		
6.		Weevilled Grains		
7.		Uric acid	(i) HPLC-U. V/PD A Detector (ii) Spectrophoto meter (iii) Photo electric colorimeter	Double beam Wavelength range: 200-800 nm
8.		Aflatoxin	(i) HPLC-UV Fluore scence Detector (ii) ELISA based kits	
9.		Deoxynivalenol (DON)	HPLC-UV/G.C-FID	

Note: It is important to build strong libraries and prediction tools for the assessment of listed parameters based on NIR data. Further, it is important to assess the parameters in relation to the actual conditions in India, e.g. Moisture levels, mould contamination etc. to determine best practices for suitable and reliable results.

Table III

EQUIPMENT REQUIRED FOR QUALITY CONTROL OF OIL SEEDS (14 COMMODITIES)

Sl. No (1)	Name of Commodities (2)	Name of Tradable Parameter (3)	Name of Equipment (4)	Technical Specification, if any (5)
1.	Castor seed, Mustard seed, Soyabean	Oil Content	(i) Near Infra-Red (NIR) spectroscopy Analyzer As specified at Table II (ii) Digital moisture meter	Near Infrared Analyzer from reputed original equipment manufacturer Capability to test moisture, oil content, protein, fiber, sugars, starch and other organic compounds which absorbs Infra-red light and/or other desired parameters As specified at Table II vide 4(i) and (iii)
2.	Peanut kernel Sunflower seed, Kusum seed, Sesame seed, Niger Seed, Sal Seed, Cotton Seed, Pongam seeds, Linseed Mahua Seed etc.	Moisture		
3.		Foreign Matter	i. Electronic testing	**(i)Electronic Balance:** Digital (electromagnetic type), up to four decimal places **a. Accessories:** i. Bullion weights (5g, 10g, 50 g, 100 g, 500g) for calibration ii. Sample storage container suitable to sampling size iii. Four Sieves: 4.0mm (mesh No. 5) 3.35mm, (mesh No.6) 1.70mm, (mesh No. 12) 1.00mm (mesh No. 18) iv. Enameled Plates: Flat type with raised rims v. Forceps: Laboratory grade vi. Magnifying Glass: (magnification of 10X) Laboratory grade
			ii. Computer vision /AI based testing	See Table No VIII and IX
4.		Other Edible grains	As at (3) (i) & (ii) above	Approved Analyst
5.		Slightly Damaged Grains		
6.		Weevilled Grains		

Table IV

EQUIPMENT REQUIRED FOR QUALITY CONTROL OF COTTON

Sl. No (1)	Name of Tradable Parameter (2)	Name of Equipment (3)	Technical Specification, if any (4)
1.	Staple length	Staple scale HVI/HVT Digilen	1. High Volume Instrument (HVI) 2. High Volume tester (HVT)
2.	Trash	Trash Analyzer	Trash Analyzer
3.	Bundle strength	1. HVI 2.HVT 3. Stelousetor	HVI/HVT: 1. Length/Strength Module 2 Color Trash Module 3 Micronaire Module 4 Printer & printer table 5 Balance 6 Bar Code Reader (optional for USTER® HVI 1000 M700) 7 Length/strength cabinet 8 Micronaire, color and trash cabinet 9 Operating unit
4.	Micronaire	1. HVI/HVT 2.Micronaire Machine	As above at col. 4.
5.	Mature fibre	1.HVI/HVT 2.Projection Microscope	Projection Microscope
6.	Linter	Delinting Machine	Delinting Machine Nanogin/Minigin
7.	Moisture	1.HVI/HVT 2. Moisture meter 3. Digital oven	2.Range: 0-80% Resolution-01. % Probe length-20 inches 3.Temperature range: Ambient to 180° c Accuracy : ± 1° c

Table V

EQUIPMENT REQUIRED FOR QUALITY CONTROL OF FRUITS & VEGETABLES (106)

Sl.No (1)	COMMODITIES (2)	Name of Tradable Parameter (3)	Name of Equipment (4)	Technical Specification, if any (5)
1.	Apple, Pear, Orange, Sapota, Musk Melon, Grapes, Litchi, Pomegranate, Banana, Plum, Peach, Mango, Sweet Orange, Custard Apple, Watermelon, Lemon, Guava, Jackfruit, Kinnow, Raw mango, Papaya, Pineapple, Strawberries, Amla, Apricot, Ber, Jamun, Perisemon-Amrfal, Cherry Red-Black, Onion,Potato, Tomato, peas, Bottle Gourd, Bitter Gourd, Cucumber, Brinjal, Cabbage, Cauliflower, Green Chilli, Carrots, Sweet potato, Spinach, Mustard leaf, Coriander leaves, Garlic, Lady finger, Ginger, Beetroot, Ribbed celery, Cluster beans, Ridge Gourd(Ram Tori), Reddish, Sweet Corn, Capsicum, Jimikand (Suran) Ivy gourd, Colocasia vegetabl, Pumpkin, Fenugreek leaves, Drum stick, Pointed gourd, Snake gourd, Lobia pods, Sem, Ash gourd, Tinda, Banna Raw, Papaya Raw, Chappan Kaddu etc	Appearance	Visual	Approved Analyst
2.		Uniformity	Manual	Approved Analyst
3.		Color	1.Colourimeter/chromameter 2.Visual AI based analyzer	1. Table top or portable instrument from reputed firm 2.Analyst should be free from colour blindness
4.		Size	Digital or Dial Vernier calipers AI based analyzer	Least count: 0.01mm (Measuring Range: 0-300 mm)
5.		Shape	Vernier calipers AI based analyzer	Digital or Dial Roundness ratio/ Ellipsoid ratio
6.		Defects	Manual AI based analyzer	Approved Analyst See Table No VIII

Table VI

EQUIPMENT REQUIRED FOR QUALITY CONTROL OF SPICES (17 COMMODITIES)

Sl.No (1)	Commodities (2)	Name of Tradable Parameter (3)	Name of Equipment (4)	Technical Specification, if any (5)
1.	Cumin Red chilli Turmeric Ajwain Coriander whole Dried Raw Mango Slices Large cardamom Fennel seed Fenugreek seed Tejpata Dry Ginger Black Pepper Cardomom Whole,Clove Whole, Nutmeg etc.	Color	1.Colourimeter/chroma meter 2. Manual	1.Portable or Tabletop instrument from reputed firm 2.Analyst free from colour blindness
2.		Size	Digital or Dial Vernier calipers	Least count 0.01 mm, Measuring Range: 0-300mm
3.		Shape	Digital or Dial Vernier calipers	-do-
4.		Defects	Manual NIR	Approved chemist
5.		Moisture	Digital Moisture meters NIR	As at Table -II
6.		Foreign Matter	Electronic balance and accessories AI based testing	As at Table -II
7.		Shriveled, Immature, Weevilled, Damaged and Discolored seed	-do-	-do-
8.		Insect Damage matter	-do-	-do-
9.		Seed Coatings	Visual	Count
10.		Defective Rizomes (In Turmeric)	-do-	--
11.		Capsaicinoid content (Red Chili)	UV visible Spectrophotometer, NIR AI based testing	Double beam Wavelength range: 200-800 nm See Table No VIII and IX
12.		Curcumin content (Turmeric)	-do-	-do-
13.		Piperine content, %(m/m)	UV visible Spectrophotometer NIR	Double beam Wavelength range: 200-800 nm
14.		Volatile Oil % in Cumin	UV visible Spectrophotometer NIR	-do-
15.		Non Volatile Ether Extract in Cumin, Ajowain, Coriander	Chemical Extraction method, Oven, Analytical Balance NIR	Approved Analyst
16.		Total Ash	Muffle Furnace, Analytical Balance NIR	Approved Analyst

Table VII

EQUIPMENT REQUIRED FOR QUALITY CONTROL OF MISC COMMODITIES (47 COMMODITIES)

Sl.No (1)	Name of Tradable Parameter (2)	Name of Equipment (3)	Technical Specification, if any (4)
1	Moisture	Digital Moisture meter	As specified at Table II
2.	Foreign Matter	As at Table-I	As at Table-II
3.	Protein content (in Guar gum)	NIR Analyzer	As specified at Table I I
4.	Gum content (in Guar gum)	NIR Analyzer	As specified at Table II column 4(i)
5.	Total Sugar plus sucrose(Mahua, Jaggery,	Refractometer	Digital/Optical to Measure the refractive index
6.	Total soluble solids (Honey)		
7.	Damaged pods and seed content	Electronic balance	Approved Analyst
8.	Oil content	NIR Analyzer	As specified at Table II
9.	Immature, Damaged and discolored seed	Electronic balance and accessories	Analyst to be free from color blindness
10.	Defects	Electronic balance and accessories	Approved Analyst
11	Crude fibre, Ash content	As specified at Table I at 1(i)	As specified at Table II -1(i)
15	Void Nuts (Raw Cashewnut)	Manual	-do-
Bamboo			
16	Girth at thin end	Measuring tape	Tape with least count of 1 mm
17	Standard Lengths (In meter)	-do-	-do-
18	Girth Class (In cm)	-do-	-do-

Table VIII

AI and New technology based quality control Solutions for different group of commodities

COMMODITIES (1)	Name of Tradable Parameter (2)	Name of Equipment (3)	Technical Specification, if any (4)
Cereals and Pulses	Moisture, Foreign Matter, Weevilled, Shrivelled and Immature, Admixture, Damaged, Color	Artificial Intelligence with Near-Infrared Spectroscopy technology based portable equipment	Rapid Scientific testing Solutions, battery operated
Oilseeds	Oil, Moisture, Foreign matter	Artificial Intelligence with Near-Infrared Spectroscopy technology based portable equipment	Rapid Scientific testing Solutions, battery operated
Fruits and Vegetable	Size, Color, Defects	Artificial Intelligence with Near-Infrared Spectroscopy technology based portable equipment	Rapid Scientific testing Solutions, battery operated
Turmeric	Curcumin		Rapid Scientific testing Solutions, Size: 6cm*8cm, battery operated
Food Grains/Cereals- All specified in eNAM Oil Seeds- Castor Seed Mustard Seed Peanut Kernel Soyabeen Sunflower Seed Spice Cumin	All Primary Physical Parameter specified by eNAM- Organic Foreign Matter Inorganic Foreign Matter Other Edible Grains Weevileed Grains (% by Count) Damaged Grains Discolored Grains Broken Grains Shrivelled Grains Admixture Immature Grains Red Grains (Rice) Chalky Grains (Rice) Other Parameter for Specific Crop- Point Damaged (Rice) Coat Broken	Visual Technology enabled Advanced version	Works using Artificial Intelligence Covers 320 degree of Grain Surface by multi-dimensional imaging No need of sample preparation or to separate grains for testing Gives complete result in 1 minute Supports upto 15 Crop in One Device without any change Stores complete test result for upto 10,000 tests Linux OS based Encrypted Secure Data Transfer Uploads result directly on eNAM Integrated Weight Balance for Sample Size Inbuilt Computational Device for fast operation Moisture Results Can be Integrated Works without Internet as well 7" Gorilla Glass Touch Screen for Operation Tilt to Clean Mechanism to Clean grains on Testing Tray Direct USB Connection for printing report 1 Year On-Site Warranty. Additional 3 Year CMC Available 24 x 7 On-line cloud based support

		Visual Technology enabled Basic version	Covers 320 degree of Grain Surface by multi-dimensional imaging No requirement for sample preparation or to separate grains for testing Gives complete result in 3 minutes Supports upto 5 Crop in One Device without any change Stores complete test result for upto 5,000 tests Linux OS based Encrypted Secure Data Transfer Uploads result directly on eNAM Moisture Results Can be Integrated Works without Internet as well 2 USB Slot for Print Out or Data Transfer 1 Year On-Site Warranty. Additional 2 Year CMC Available 24 x 7 On-line cloud-based support External Laptop provided to operate the device
Pulses (Tur, Bengal Gram, Moong, Kabuli channa etc)	Damage Admixture Immature Good	(A Conveyorised Machine Vision Solution for quality assessment of pulses) Warranty: One Year	a. Bench top conveyor b. Automated sample spreading c. Overhead scanning device for image acquisition d. Computer based automated image capturing and analysis solution e. Configuration of Conveyorized instrument to remain constant for most of the Commodities. f. Software to be different for different pulses/crops. g. Rapid and non-invasive measurement. h. Online data presentation. i. Instant Analysis and Report Generation with email/ printing facility. j. User-friendly operation. k. Estimation of quality based on count and correlation with weight.

Note: These instruments may be reassessed with demonstrations on actual samples at Mandi level and get validated by the buyer. These instruments may have secured internal storage for dissemination of analytical data at any time.

Table IX

AI and New technology based quality control Solutions for different group of commodities and their Name of Equipment Manufacturers/suppliers

COMMODITIES (1)	Name of Tradable Parameter (2)	Name of Equipment (3)	Name of Equipment Manufacturers/suppliers (4)
Cereals and Pulses	Moisture, Foreign Matter, Weevilled, Shrivelled and Immature, Admixture, Damaged, Color	1. Artificial Intelligence with Near-Infrared Spectroscopy technology based portable equipment, 2. NIR 3. Vision based AI technology equipment's	Agnext, Nebulaa Matt Analyzer, EPSON grain analyzer Annadarpan by CDAC Zeutech Perkin Elmer FOSS Perten LCGC Intello labs Osaw Industrial Products Pvt. Ltd.
Oilseeds	Oil, Moisture, Foreign matter	1. Artificial Intelligence with Near-Infrared Spectroscopy technology based portable equipment 2. NIR	
Fruits and Vegetable	Size, Color, Defects	1. Artificial Intelligence with Near-Infrared Spectroscopy technology based portable equipment 2. Colorimeter 3. Vernier callipers	Agricx Intello labs Lovibond and Hunter for color
Turmeric	Curcumin		
Dry Red Chilli	Broken chillies Discolored/ Damage pods Pods without stalks Loose seeds Classification using Pod Length Foreign matter	1. Vision based technology equipment's	CT-VIEU (Chilli Testing Vision Inspection Unit) by CDAC

Note: Ministry of Agriculture and Farmers Welfare/ Directorate of Marketing & Inspection is not recommending any particular type of quality control equipment or any firm, it has just facilitated and provided illustrative list of equipment for usage/ appropriate platforms by this document. SAMB/State/UT authorities may explore suitability and utility of these instruments or may explore other than these equipment as per their actual requirement based on type of agriculture commodities and volumes of arrivals for procurement.

Annexure-III

Empanelment of manufacturers and vendors of quality control equipment. -

Introduction: Validation of quality control equipment/instruments for e-National Agriculture Market was the void space affecting the trust of buyers and seller of agriculture commodities. Without any valid certification and calibration of equipment, neither farmer was assured of their crop quality, nor was the buyer assured of quality he has purchased. Hence competent authority has decided that Directorate of Marketing and Inspection may empanel manufacturers and vendors of quality control equipment/instruments for e-National Agriculture Market so that it is easier for SAMBs/APMCs to purchase the equipment as per their requirement from empanelled vendor.

The document is divided in several sections. Each section is dealing with a particular area of the approval procedure. It is believed that this document will help in clearing many doubts which may arise in course of the approval process and help all concerned in understanding the system in a more comprehensive manner.

Background: As per Operational Guidelines for Promotion of National Agriculture Market (NAM) through Digitization of Agri. Supply Chain Management issued on Oct 2023 para 9.2 stated that Directorate of Marketing and Inspection will "Identify Quality control equipment's manufacturers and suppliers and empanel them" and "Providing technical advice/support to the State Agricultural Marketing Department /Directorate /Board/ APMC/RMC for establishing quality control laboratory, training (skilling/re -skilling/up skilling) of staff for QA parameters and related apparatus and issues incidental thereto, Framing and releasing required standards and specifications for quality control laboratories".

Objective: The objective is to document standard procedure to be followed for empanelment of manufacturers and vendors of equipment, appliances, machinery and other materials used in quality control laboratories in e-National Agriculture Market. The assaying of agricultural produce at the market level is of utmost importance to enhance its marketability and enable the farmers to realize price commensurate to the quality of their agricultural produce. Therefore, the equipment, machinery, tools and materials used in quality control laboratories need to be safe, robust and reliable capable of working safely. The equipment need to remain safe under prolonged usage may be even in adverse conditions.

Equipment and Materials Required

All equipment, machinery, appliances and other materials has been broadly categorized into: -

a. Testing of Food Grains at (Refer-Table-II)

b. Testing of Oil seeds at (Refer -Table-III)

c. Testing of Cotton at (Refer-Table-IV)

d. Testing of Fruits & Vegetables at (Refer-Table-V)

e. Testing of Spices at (Refer-Table-VI)

f. Testing of Miscellaneous commodities at (Refer-Table-VII)

g. AI based quality control Solutions at (Refer-Table-VIII)

Guidelines and how to apply: In case the Original Equipment Manufacturer (OEM)/applicant prefer to get empanelled under DMI, then the following procedure shall be followed.

1. All OEM/applicants shall submit an application. Application needs to be submitted in a proper format specified by DMI. The original application must be made by the owner, proprietor, partner of the company seeking approval or a Director in the Board of Directors of the company in case of private or partnership company and small public company. In case of large public company and PSUs the application should be made by a person not less than General Manager or equivalent in rank authorized by the owner or the Director of the company. In case of imported equipment the Chief Executive or an official not below the rank of General Manager or equivalent authorized by the Chief Executive of the OEM should be the original applicant.
2. Equipment needs to conform to relevant Indian Standards. In case there is no Indian Standards, relevant standards of the country of origin may be accepted by DMI on its merit.
3. The performance of the equipment will be tested by CIPHET/BIS/any government authorized test centre. Copy of test certificate to be enclosed.
4. Copy of calibration certificate of the instrument for establishing metrological traceability as per NABL requirements.
5. Equipment design/drawing/flowchart thereof has to be submitted along with the application.
6. If overseas manufacturers conduct business in India through an Indian dealer, the details of such dealers need to be furnished at the time of making applications for approval.
7. Preliminary examination of the application: In the first stage the examination of a particular case involves the following:
    a. Whether the format has been correctly filled,
    b. Whether the company really exists based on the documentary evidence submitted,
    c. Whether all information required has been submitted,

d. Whether all enclosures duly authenticated have been submitted,

e. CIPHET/any other govt. authorized test centre reports,

f. BIS certification/other relevant certification and validity, if applicable,

g. Examination of drawings submitted, scrutiny of test reports,

h. Detailed examination in respect of capability of the manufacturer to provide equipment at a later date with sustained quality assurance.

i. Calibration certificate from NABL accredited laboratory.

8. The applicant/manufacturer shall submit a declaration along with the application form with an undertaking/self-certification that the specifications/ details provided in the application are conforming to the product submitted for test. Any discrepancy in the specifications/details provided by the applicant/ OEM will be the responsibility of the applicant/OEM.

9. Empanelment to be recommended within 30 days if application is complete in all aspects.

Declaration of empanelment: -

After successful completion of preliminary examination and receipt of satisfactory reports, the recommendations will be made for grant of empanelment. In case any shortcomings are observed during examination, the same is communicated to the manufacturer/applicant. The AMA may grant the empanelment on receiving recommendations from the officers of DMI.

Validity of recognition: All approvals are valid for a period of 5 years from the date of grant of approval subject to submission of satisfactory certificates every year. The tests results and validation results of instruments or equipment should be uploaded by concerned laboratory on regular interval for validation purposes.

Renewal: The manufacturer may submit renewal application at least 60 days before the date of expiry of validity.

Renewal process: The renewal process is same as approval process.

Request Letter

To

Date:

Agricultural Marketing Adviser
Directorate of Marketing and Inspection
Department of Agriculture and Farmers Welfare
Ministry of Agriculture and Farmers Welfare
Block “A”, New CGO Complex, NH IV, Faridabad (Haryana)

Sir

I hereby would like to apply for empanelment for the following equipments/Instruments:

1.	Name of Equipment/Instruments	
2.	Category under which it is applied	
3.	Original Equipment Manufacturer: a) Name b) Postal address c) e-mail d) Telephone No.	
4.	Details of importer (if any)	
4.	Unit price of Equipment/Instruments	
5.	Basic Principle of Equipment/Instrument	
6.	Scope of Instrument/equipment	
8.	Detailed specifications (Attach separate sheet if required)	

I have read the regulations for testing of Equipment/Instruments, and hereby agree to stand by all the terms and conditions.

Yours Faithfully
(Name of Applicant, Contact details)
Encl.:- Application form

Application form

Application for empanelment of quality control Equipment/Instruments for e-National Agriculture Market (to be submitted in duplicate)

1.	Name and address of the applicant	
	Address	
	Pin Code	
	Telephone numbers	
	E-mail	
2.	Name of the OEM (if applicant is not manufacturer)	
	Address	
	Pin Code	
	Telephone numbers	
	E-mail	
3.	If the applicant is not the manufacturer, capacity in which the testing has been requested for (as authorized importer/ distributor/ designer/ respective manufacturer)	
4.	Details of the equipment to be submitted for test	
	Type	
	Make	
	Model	
5.	Scope of testing of equipment & special features of the equipment/Instruments, if any	
6.	Nature of firm Proprietorship/ Partnership/LLP/PSU/Pvt./Public company/Others	
7.	BIS Certificate/any other relevant certificate	
8.	Whether equipment has been tested/validated/calibrated earlier in India/foreign country (if so, attach a copy of the report/certificate) preferably NABL approved certificate may be provided	
9.	Two copies of test certificates from reputed laboratory	
10.	Design/drawing/specification in detail	

11.	Availability of spare parts for 5 yrs (Minimum)		
12.	Warranty period (Min. 1 year)		
13.	If Startup, submit the certificate along with capability of manufacturing the Instrument/Equipment		
14.	Make in India Certificate		
15.	MSME registration		
16.	PAN		
17.	TAN		
18.	GST No.		
19.	Income Tax return for last 3 yrs.		
20.	Manufacturing capacity per month		
21.	Check for enclosures		
22.	Enclosures (Compulsory)	Yes	No
	a. Specification of Equipment's/Instruments		
	b. Operator's manual		
	c. Service manual		
	d. Any other printed literature (to e. be specified)		
23.	Any other Additional Information		

Place:
Date:

Signature (with seal of the firm/Industry):
Name of the Signatory:
Designation:
Address:

Annexure-IV

Quality control report (Lot wise)

1. **Name of the commodity:**
2. **Lot ID/Gate ID:**
3. **Name of Farmer/Seller:**

S.No.	Tradable Parameters	Range of Characteristics			Value Obtained	Recommended Range of Lot	Test Method
		Range I	Range II	Range III			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

Remark: This has to be developed separately for each commodity.

Signature of Analyst

Date

Authorized Signatory

Designation

Name of APMC

Annexure-V

Status of Instruments/Equipment (Monthly)

1. **Name of Mandi:**
2. **Date of inspection:**

S.No (1)	Name of the Instrument/Equipment (2)	Whether functional, if No, reasons for the same (3)	Whether under Annual Maintenance Contact (AMC), if no reasons for the same (4)	Remarks (5)

Date:

Authorized Signatory

Designation

Name of APMC