The RESEARCH REPORT TEMPLATE

Draft 1 – November 2011

During the UNAPCAEM Technical Committee Meeting in Bali, 27 October, the following "priority Focus Areas and Responsibility Country Assignments were decided and agreed upon:

Primary focus areas

- Agricultural Tractors (all sizes/types, 2-or 4-wheel)
  (**Responsible Countries – Russia; China; India**?[1])
- Paddy Threshers
  (**Responsible Countries – Sri Lanka; the Philippines; Bangladesh; Viet Nam; Myanmar**)
- Hand Tools (non-mechanical / non-motorized equipment)
  (**Responsible Countries – PNG; Nepal**?[2])
- Knapsack Sprayers
  (**Responsible Countries – Sri Lanka; Viet Nam**)
- Mechanical harvesters / Combine harvesters
  (**Responsible Countries – Malaysia; Russia; India**?)
- Post-harvest Machinery, Milling and Dryers etc
  (**Responsible Countries – Indonesia; the Philippines**)

  [Indonesia and Sri Lanka are TWG members as of 27 October 2011]

Secondary Priority Focus Areas (to be addresses if sufficient human and financial resources are available)

Self-propelled Machinery
Field/Boom Sprayers
Transport-related Machinery
Engines
Soil Tillage Implements, Drills
Power Tillers
Water Pumps

To proceed with the scheduled work, every Country should prepare a document based on the following template for all primary focus areas:

[1] Russia and China shall contact India seeking their participation, as India was not present at the TC meeting.

[2] PNG shall contact Nepal seeking their participation, as India was not present at the TC meeting.

www.unapcaem.org

1. General information concerning all machines being used in every country

Please fill the statistical data in the box below related to the consistency of machines operating in each country and average age.

How to fill the boxes:

- Number in use – indicate the consistency for each "Focus Area" with data coming from official sources as manufacturers or farmers associations, etc. If no data is available, consider an estimate.
- Source of data – indicate the source of the data; if there is no source, the estimation method used.
- Average age – indicate the average age of each type of machine or tools.
- Other machines – indicate the date of all other machines in use and, if possible, their average age; this data will probably be based on an estimation, but it is necessary in order to have an overview of the size of machines being used by farmers.

Focus Area	Number in use (amount)	Source of data	Average Age (years)	Source of data
Agricultural Tractors *	3463972 (2007-08)	Singh et al. (2010)	12	-
Paddy Threshers	1609000	FICCI, 2007	5	
Hand Tools				
Knapsack Sprayers				
Mechanical Harvesters	427000	FICCI, 2007	5	
Post- Harvest Machinery				
Other machines				
Total machines				

Singh Surendra, Singh RS, Singh SP (2010). Farm Power Availability and Agriculture Production Scenario in India. Agricultural Engineering Today, 34(1), 9-20; Agricultural Machinery Sector In India (2007), (Federation of Indian Chamber of Commerce and Industry) FICCI

Addendum for tractors: ……
……
……
……

- Consider all agricultural and forestry tractors and specify their use in the addendum. For example, if they are used mainly on the road for towing or in the field, then specify the average power in kW of the engines.

2. Information related to the use of agricultural machinery

Please fill the statistical data in the empty spaces below related to the injuries (primarily addressing safety, bearing in mind impacts on the environment as well as social issues) caused by agricultural machines; existence of any subsidy system for

www.unapcaem.org

farmers, i.e., how it works and indicate an estimation of the social cost of injuries for the public and private sector as well as the existence of testing procedures used in every country.

Agricultural tractors (data related only to this typology of machine):
- total amount of injuries and % of fatalities …
-source of data (organization or indicate if estimation)
- existence of any subsidy system for farmers, i.e., how it works ……**Yes**…….
Department of Agriculture and Cooperation, Ministry of Agriculture has a provision of subsidy for promoting agricultural mechanization under the mechanization component of the Macro-Management Scheme of Agriculture. This scheme is open to all the categories of farmers. It has provision of subsidy @25% of the cost limited to Rs.30,000/- for tractors of upto 35 PTO hp. It is disbursed through Department of Agriculture/Agricultural Engineering of State Governments
- estimation of the social cost of injuries for the public and private sector …….
(This data is very useful to motivate the use of safer machines and to reduce the cost for Governments)

- existence of testing procedures used in every country (if there is and indicate if it is a national system or an international system and the standards being used – ISO, Asabe, En or other) …
…**National IS 5994 (1998) - Test Code for Agricultural Tractors**
- collection of proposals (describe any proposal you have for a better use of agricultural tractors and for the development of an international testing system) ……..
……..
……..

Paddy Threshers (data related only to this typology of machine):
- total amount of injuries and % of fatalities
- source of data (organization or indicate if estimation)
- existence of any subsidy system for farmers, i.e., how it works **Yes**…….
Department of Agriculture and Cooperation, Ministry of Agriculture has a provision of subsidy for promoting agricultural mechanization under the mechanization component of the Macro-Management Scheme of Agriculture. This scheme is open to all the categories of farmers. It has provision of subsidy @25% of the cost limited to Rs. 10,000/-. It is disbursed through Department of Agriculture/Agricultural Engineering of State Governments
- estimation of the social cost of injuries for the public and private sector …….
(This data is very useful in order to motivate the use of safer machines in order to reduce the cost for Governments)

- existence of testing procedures used in every country (if there is and indicate if it is a national system or an international system and the standards being used – ISO, Asabe, En or other) …
IS 6284 - Test Code for Power Thresher for Cereals
IS: 9020- 2002 - Power Threshers-safety requirements
- collection of proposals (describe any proposal you have for a better use of paddy threshers and for the development of an international testing system) ……
……..

……..

Hand Tools (data related only to this typology of machine):

- total amount of injuries and % of fatalities
- source of data (organization or indicate if estimation)

- existence of any subsidy system for farmers, i.e., how it works **Yes**…….

Department of Agriculture and Cooperation, Ministry of Agriculture has a provision of subsidy for promoting agricultural mechanization under the mechanization component of the Macro-Management Scheme of Agriculture. This scheme is open to all the categories of farmers. It has provision of subsidy @25% of the cost limited to Rs. 2,000/-. It is disbursed through Department of Agriculture/Agricultural Engineering of State Governments

- estimation of the social cost of injuries for the public and private sector …….
(This data is very useful in order to motivate the use of safer machines in order to reduce the cost for Governments)

- existence of testing procedures used in every country (if there is and indicate if it is a national system or an international system and the standards being used – ISO, Asabe, En or other) …

Testing procedure developed by R&D institutions is followed

- collection of proposals (describe any proposal you have for a better use of hand tools and for the development of an international testing system)……...
……..
……..

Knapsack Sprayers (data related only to this typology of machine):

- total amount of injuries and % of fatalities -
source of (organization or indicate if estimation)

- existence of any subsidy system for farmers, i.e., how it works ……**Yes**…….

Department of Agriculture and Cooperation, Ministry of Agriculture has a provision of subsidy for promoting agricultural mechanization under the mechanization component of the Macro-Management Scheme of Agriculture. This scheme is open to all the categories of farmers. It has provision of subsidy @25% of the cost limited to Rs. 800/ (manual) and Rs. 2,000/-(power operated). It is disbursed through Department of Agriculture/Agricultural Engineering of State Governments

- estimation of the social cost of injuries for the public and private sector …….
(This data is very useful in order to motivate the use of safer machines in order to reduce the cost for Governments)

- existence of testing procedures used in every country (if there is and indicate if it is a national system or an international system and the standards being used – ISO, Asabe, En or other) …

IS 1970 (1995) Crop Protection Equipment - Hand- Operated Compression Knapsack Sprayer - Specification

IS 3906 (1995) Crop Protection Equipment - Hand-operated Knapsack Sprayer, Piston Type - Specification

IS 7593 (Part 1) -1986 - Specification for Power-Operated Pneumatic

Sprayer-Cum-Duster - Part 1 : Knapsack Type

- collection of proposals (describe any proposal you have for a better use of knapsack sprayers and for the development of an international testing system)……..

……..

……..

Mechanical Harvesters (data related only to this typology of machine):

- total amount of injuries and % of fatalities …. **Included under other machines**

source of data …….

…… (organization or indicate if estimation)

- existence of any subsidy system for farmers, i.e., how it works ……Yes

Department of Agriculture and Cooperation, Ministry of Agriculture has a provision of subsidy for promoting agricultural mechanization under the mechanization component of the Macro-Management Scheme of Agriculture. This scheme is open to all the categories of farmers. It has provision of subsidy @25% of the cost limited to Rs. 20,000/ (potato digger, groundnut digger, straw reaper, tractor drawn reaper, mobile fruit harvester etc) and Rs. 30,000/-(self propelled reaper and combines). It is disbursed through Department of Agriculture/Agricultural Engineering of State Governments

- estimation of the social cost of injuries for the public and private sector …….

……**NA……**

……

(This data is very useful in order to motivate the use of safer machines in order to reduce the cost for Governments)

- existence of testing procedures used in every country (if there is and indicate if it is a national system or an international system and the standards being used – ISO, Asabe, En or other) …

IS 8122 (Part 1) - 1994 - Test Code for Combine Harvester-thresher - Part 1: Terminology

IS 8122 (Part 2) – 2000 - Combine-Harvester-Thresher - Test Code - Part 2 : Performance Test

IS 15806 (2008) Combine-harvester-thresher - Selected performance and other characteristics - Recommendations

- collection of proposals (describe any proposal you have for a better use of mechanical harvesters and for the development of an international testing system)……...

……..

……..

Post harvest Machines (data related only to this typology of machine):

- total amount of injuries and % of fatalities …….

source of data …….

…… (organization or indicate if estimation)

- existence of any subsidy system for farmers, i.e., how it works …….

www.unapcaem.org

……
……
……..
……..
- estimation of the social cost of injuries for the public and private sector …….
……..
……
(This data is very useful in order to motivate the use of safer machines in order to reduce the cost for Governments)

- existence of testing procedures used in every country (if there is and indicate if it is a national system or an international system and the standards being used – ISO, Asabe, En or other) …
……
……
……
- collection of proposals (describe any proposal you have for a better use of post harvest machines and for the development of an international testing system)……...
……..
……..

Other machines (only as general information)
- total amount of injuries and % of fatalities …
  source of data (organization or indicate if estimation)
- existence of any subsidy system for farmers, i.e., how it works ……**Yes**……..
Department of Agriculture and Cooperation, Ministry of Agriculture has a provision of subsidy for promoting agricultural mechanization under the mechanization component of the Macro-Management Scheme of Agriculture. This scheme is open to all the categories of farmers. It has provision of subsidy @25%. It is disbursed through Department of Agriculture/Agricultural Engineering of State Governments
- estimation of the social cost of injuries for the public and private sector …….
(This data is very useful in order to motivate the use of safer machines in order to reduce the cost for Governments).

Details of various Indian Standards for farm machinery, tractors, combine harvesters etc have been detailed below.

List of Indian Standards

A Agricultural Tractors		
Sl.No.	**Title of Indian Standards**	**Reference**
1.	**2.**	**3.**
A	**Agricultural Tractors**	
1.	Test Code for Agricultural Tractors	IS: 5994-1998, Part-I & II
2.	Guidelines for field performance evaluations of Agricultural Tractors	IS: 9253-2001
3.	Dimensions for three point linkage of agricultural wheeled tractors	IS: 4468-1977
4.	Power take-off shaft of agricultural tractors	IS: 4931-1997
5.	Symbols for operator's controls on agricultural Tractors (Part I&II)	IS: 6283-1998
6.	Code of practice for preventive maintenance of agricultural tractors	IS: 6840-1972
7.	Code of practice for installation of agricultural wheeled tractors	IS: 6847-1972
8.	Guidelines for presentation of operator manuals and technical publications for agricultural tractors and machinery	IS: 8132-1999
9.	Guidelines for location and operation of operator controls on agricultural tractors and machinery	IS: 8133-1983
10.	Agricultural Tractors-Recommendations on Selected Performance Characteristics club with previous block	IS: 12207-1999
11.	Agricultural Tractors-operator's seat-Technical Requirements	IS: 12343-1918
12.	Agricultural Tractors and machinery-Lighting devices for travel on public roads	IS: 14683-1999
13.	Glossary of terms relating to agricultural tractors and power tillers	IS: 9939-1981
14.	Agricultural Tractors-Maximum actuating forces required to operate controls	IS: 10703
15.	Technical requirements of agricultural tractors for wetland cultivation	IS: 11082-1984
16.	Guidelines for declaration of power and specific fuel consumption, labeling of tractors	IS: 10273-1987
B Self Propelled Combine Harvesters		
1.	Combine Harvester-Thresher, - Test Code	IS: 8122(Pt-1)-1994
2.	Combine Harvester-Thresher, - Test Code	IS: 8122(Pt-2)-2000

LIST OF CURRENT BIS CODES ON FARM MACHINERY	
BIS Code No.	**Title of Code**
A. PRIMARY TILLAGE EQUIPMENT	
IS 2192 : 1998	Soil Working Equipment - Animal Drawn Mouldboard Plough, Fixed Type - Specification
IS 2565 : 1979	Specification for Ridger, Animal-drawn
IS 3372 : 1965	Specification for Bund Former
IS 6288 : 1971	Test Code for Mouldboard Ploughs
IS 6690 : 1981	Specification for Blades for Rotavator for Power Tillers
IS 7353 : 1974	Specification for Blade for Tractor-Operated Terracer
IS 9813 : 2002	Tractor-Operated Blade Terracers - Specification
IS 10233 : 1982	Specification for Tractor-operated Disc Ploughs
IS 10239 : 1982	Specification for Blade for Tractor-operated Scraper
IS 10254 : 1982	Specification for Share for Animal-drawn Ridger
IS 10691 : 1983	Specification for Share for Tractor-operated Mouldboard Ploughs
IS 11905 : 1986	Specification for Shaft Assembly for Rotavator for Power Tiller
IS 12334 : 1988	Specification for Tractor Mounted Bund Former
B. SECONDARY TILLAGE EQUIPMENT	
IS 3342 : 1998	Soil working equipment - cultivators, Animal drawn - Specification
IS 3369 : 1965	Specification for Puddler, Animal Drawn
IS 3606 : 1998	Soil working equipment, Disc harrow, Animal drawn - Specifications
IS 4366 : Part 1 : 1985	Specification for Agricultural Tillage Discs Part 1 Concave Type
IS 4366 : Part 2 : 1985	Specification for Agricultural Tillage Discs Part 2 Flat Type
IS 6635 : 1972	Specification for Tractor Operated Disc Harrows
IS 6638 : 1972	Specification for Tractor-Mounted Spring-Loaded Cultivators
IS 7230 : 1974	Specification for Plain Spool For Tractor Operated Disc Harrows
IS 7565 : Part I : 1975	Specification for Tines for Tractor-operated Cultivators - Part I : Rigid Tines
IS 7565 : Part 2 : 1988	Specification for Tines for Tractor Operated Cultivators - Part 2 : S-type Tines
IS 7640 : 1975	Test code for disc harrows
IS 9217 : 1979	Test code for agricultural discs
IS 9442 : 1980	Hot rolled steel plates, sheets and strips for manufacture of agricultural tillage discs
IS 10225 : 1982	Specification for Bearing Spools for Tractor-operated Disc Harrows
IS 10282 : 1982	Specification for Cage Wheel for Power Tillers
IS 11081 : 1993	Agricultural Tractors - Half Cage Wheel - Specification
IS 11531 : 1985	Test code for puddler
C. SOWING AND PLANTING EQUIPMENT	
IS 6316 : 1993	Sowing Equipment - Seed-cum-fertilizer Drill - Test Code
IS 6813 : 2000	Sowing Equipment - Seed-cum-fertilizer Drill - Specification
IS 9855 : 1981	Glossary of terms relating to sowing, planting, fertilizers and manure application equipment

IS 9856 : 1981	Test code for potato planters
IS 11271 : 1985	Specification for Groundnut Planter
IS 11893 : 1986	Specification for Potato Planter, Semi-automatic
IS 11976 : 1986	Specification for Sugarcane Planter, Semi-automatic
D. INTERCULTURE AND WEEDING EQUIPMENT	
IS 1976 : 1976	Specification for Rotary Paddy Weeder, Manually-Operated
IS 7927 : 1975	Method of field testing for manually operated paddy weeder
IS 9818 : Part 1 : 1981	Glossary of terms relating to tillage and intercultivation equipment: Part 1 General terms
IS 9818 : Part 2 : 1981	Glossary of terms relating to tillage and intercultivation equipment: Part 2 Terms relating to equipment
IS 14540 : 1998	Intercultivation Equipment - Hand hoes - Specification
E. HARVESTING EQUIPMENT	
IS 4358 : 1996	Specification for Sickles
IS 6024 : 1983	Specification for Guards for Harvesting Machines
IS 6025 : 1982	Specification for Knife Sections for Harvesting Machines
IS 7825 : 2004	Cylinder Type Hand Lawn Mower - Specification
IS 8122 : Part 1 : 1994	Test Code for Combine Harvester-thresher - Part 1 : Terminology
IS 8122 : Part 2 : 2000	Combine-Harvester-Thresher - Test Code - Part 2 : Performance Test
IS 9575 : 1980	Power lawn mower, pedestrian-controlled cylinder (reel) type
IS 9581 : 1980	Safety and operational requirements for pedestrian-controlled cylinder (reel) power lawn mowers
IS 9826 : 1981	Glossary of terms relating to harvesting and threshing equipment
IS 9877 : 1981	Code of practice for installation, operation and preventive maintenance of grain combine
IS 10378 : 1982	Specification for Knife Back for Harvesting Machines
IS 11033 : 1984	Specification for Animal Drawn Potato Digger, Ridger Type
IS 11204 : 1985	Specification for Sugarcane Harvesting
IS 11235 : 1985	Test code for groundnut digger, animal drawn
IS 11467 : 1985	Test code for cereal harvesting machines
IS 13818 : 1993	Harvesting equipment - Tractor operated potato digger shakers - Test code
F. THRESHING EQUIPMENT	
IS 1511 : 1979	Specification for Blades for Manually-operated Chaff Cutter
IS 1973 : 1999	Sugarcane Crushers - Specification
IS 3327 : 1982	Specification for Pedal-operated Paddy Threshers
IS 6284 : 1985	Test Code for Power Thresher for Cereals
IS 6320 : 1985	Specification for Power Thresher, Hammer-mill Type
IS 7897 : 1975	Test code for chaff cutter
IS 7898 : 2001	Manually-Operated Chaff Cutter - Specification
IS 9019 : 1979	Code of practice for installation, operation and preventive maintenance of power threshers
IS 9020 : 2002	Power Threshers - Safety Requirements
IS 11234 : 1985	Test code for power thresher for groundnut

IS 11459 : 1985	Specification for Power-operated Chaff Cutter
IS 11691 : 1986	Specification for Power Thresher, Spike Tooth Type
IS 15542 : 2005	Power-Operated Chaff Cutter - Safety Requirements

www.unapcaem.org

Manufacturer-wise latest production and sales figures and horsepower range of tractors in India showing manufacturers

	PRODUCTION				SALES			
Category	**Current Year**		**Previous Year**		**Current Year**		**Previous Year**	
Manufacturer	**Feb-12**	**YTD (Financial)**	**Feb-11**	**YTD (Financial)**	**Feb-12**	**YTD (Financial)**	**Feb-11**	**YTD (Financial)**
< 20 HP								
VST	801	6420	500	4071	523	6030	501	4176
M&M GROUP								
TOTAL	**801**	**6420**	**500**	**4071**	**523**	**6030**	**501**	**4176**
21-30 HP								
FORCE MOTORS	65	1043	68	438	79	837	6	330
ESCORTS	671	7880	554	8042	601	7916	648	8155
HMT	45	274	58	494	74	262	68	478
M&M GROUP	4204	42610	3496	33754	2707	38460	3021	34741
TAFE GROUP	2242	21292	1705	18107	2032	20177	1681	18220
SAME DEUTZ-FAHR								
SONALIKA	129	1709	140	1470	167	1449	97	1650
TOTAL	**7356**	**74808**	**6021**	**62305**	**5660**	**69101**	**5521**	**63574**
31-40 HP								
FORCE MOTORS	31	362	24	258	27	344	19	222
ESCORTS	1818	17914	1792	17927	1305	17142	1743	17958
HMT	366	2371	264	2873	223	1847	228	2810
M&M GROUP	8776	98532	9111	93360	6567	94994	8769	91173
TAFE GROUP	7775	87039	5758	63737	7466	82569	5736	64344
JD	556	7985	790	6701	536	7623	679	6914
NHI	509	5249	478	5503	482	5234	450	5281
SAME DEUTZ-FAHR	2	108	16	240	2	90	11	239
SONALIKA	1055	33849	1438	19837	1342	19583	1617	17905
TOTAL	**20888**	**253409**	**19671**	**210436**	**17950**	**229426**	**19252**	**206846**
41-50 HP								
FORCE MOTORS	19	342	18	286	24	334	71	285
ESCORTS	3148	31524	2873	32892	2905	31825	3102	32898
HMT	111	540	15	425	41	349	57	403
M&M GROUP	3138	45024	4503	36446	2862	43978	3897	36810
TAFE GROUP	2531	24322	1987	16956	1974	22764	2049	15484
JD	1846	17768	1242	15236	1124	15283	1336	16139
NHI	2613	27610	2322	24531	2186	26702	2360	23472
SAME DEUTZ-FAHR	75	979	67	1097	74	739	39	609
SONALIKA	1164	13645	1133	10956	819	12728	1174	11751
TOTAL	**14645**	**161754**	**14160**	**138825**	**12009**	**154702**	**14085**	**137851**
> 51 HP								
HMT	100	538	65	493	68	500	51	480

www.unapcaem.org

M&M GROUP	4584	45642	3540	32862	3401	43231	3557	33219
TAFE GROUP	879	6075	437	3818	926	6267	701	6058
JD	1486	30498	2748	26854	1917	29208	2949	25496
SAME DEUTZ-FAHR	433	5328	322	4026	379	5528	274	4350
SONALIKA	746	10196	625	9471	1068	12225	941	9503
TOTAL	**8228**	**98277**	**7737**	**77524**	**7759**	**96959**	**8473**	**79106**
ALL MANUFACTURERS								
FORCE MOTORS	115	1747	110	982	130	1515	96	837
ESCORTS	5637	57318	5219	58861	4811	56883	5493	59011
HMT	622	3723	402	4285	406	2958	404	4171
M&M GROUP	20702	231808	20650	196422	15537	220663	19244	195943
TAFE GROUP	13427	138728	9887	102618	12398	131777	10167	104106
VST	801	6420	500	4071	523	6030	501	4176
JD	3888	56251	4780	48791	3577	52114	4964	48549
NHI	3122	32859	2800	30034	2668	31936	2810	28753
SAME DEUTZ-FAHR	510	6415	405	5363	455	6357	324	5198
SONALIKA	3094	59399	3336	41734	3396	45985	3829	40809
TOTAL INDUSTRY	**51918**	**594668**	**48089**	**493161**	**43901**	**556218**	**47832**	**491553**

www.unapcaem.org

Testing of Agricultural Equipment

Testing helps in assessing the functional suitability, durability and performance characteristics under different conditions. The results of the test serve as a basis to decide the machine best suited for different agro-climatic conditions in the country, help financing institutions and users in determining the comparative performance of the machines available in the market, form the basis for standard specifications to be used by manufacturers and distributors, facilitate to maintain check over quality and helps to promote export. In India centralized and highly sophisticated test facility for agricultural tractors is available at Central Farm Machinery Training and Testing Institute (CFMTTI), Budni (Madhya Predesh); and for agricultural implements at three testing institutes (FMTTI) located at Hissar (Haryana), Anantapur (Andhra Pradesh) and Guwahati (Assam). In addition, there are 22 testing centres identified in different locations throughout the country for the regional requirement of testing farm implements.

Testing of Agricultural tractors

There are mainly two types of testing done based on purpose:

a) **Confidential Test**: The tests conducted for providing confidential information on the performance of tractors whether ready for commercial production or not, or to provide any special data that may be required by the manufacturer/applicant.

b) **Commercial Test**: The tests conducted for establishing performance characteristics of tractors that are ready for commercial production or already in production.

Selection

The tractor, if under production, should be selected at random (see IS 4905) using simple random sampling from any of the production line complete with its standard accessories and in a condition as generally offered for sale. The selection is to be done by representative of testing institute. The tractor shall be new and should not be given any special treatment or preparation for test. After servicing and preliminary setting, using fuel, lubricants and operating in accordance to published instructions by manufacturer in operator's manual following tests are conducted on agricultural tractors as per BIS standards (IS 5994).

Lab tests:

Lab tests should be performed in normal (27 ± 7°C) and high (45 ± 2°C) ambient conditions at atmospheric pressures not less than 96.6 kPa.

a) Checking of the specification

b) **Power test:**

i) PTO performance test (IS 12036)

- varying speed test (to generate torque/power/SFC vs. engine speed curves)

- varying load test (to check governor functioning)
- 2 h maximum power test

ii) Belt-pulley performance (IS 12036)

- To be conducted if desired by the manufacturer PTO test has not been conducted

iii) Drawbar performance (IS 12226)

- 5 h maximum pull test ((At 15% wheel slip and)
- 5 h -75% of maximum pull (20% weight on front wheels)

iv) Test for hydraulic power and lifting capacity (IS 12224)

- to test hydraulic pump and relief valve performance and ability to hold in lifted position without hydraulic power

c) **Safety test** :

i) Turning ability test (IS 11859)

ii) Centre of gravity (IS 10743)

iii) Brake test (IS 12061)

- cold braking distance – 7.6 m
- hot braking distance – 9.5 m

d) **Ergonomical testing** :

i) Operator's field of vision (IS 11442)

- at eye level of 760 mm from SRP, furrow should be visible within 100 mm shifting from normal sitting position

ii) Smoke measurement (IS 12062)

- Measured at 80% of maximum power
- light absorption coefficient should be less than 3.1 /m

iii) Noise measurement--should be not greater than 90 dB

- At operator's position (3 of IS 12180)
- At bystander position (4 of IS 12180)

iv) Vibration measurement

- average amplitude of vibration of un-ballasted tractor

v) Safety (8 of IS 12239 (PartI))

e) **Miscellaneous tests:**

i) Test for air cleaner

- Air cleaner oil pull over test (oil pull over should not be greater than 0.25% for tractor tilted to 15° on either side with addition 5% oil.)

ii) Component/assembly inspection

iii) Special characteristic

- If required by the manufacturer and with the mutual agreement of manufacturer

Field test:

i) Field test (2 of IS 9253)

- field evaluation with specific implements
  - commercial test - 50 h
  - batch test - 40 h

ii) Haulage test (3 of IS 92.53)

Measuring Tolerances

The measuring apparatus shall be such that the following items shall have the tolerances within the limits shown against each:

a) Rotational speeds, rev/min ± 0.5 %
b) Time, s ± 0.2 s
c) Distance, m or mm ± 0.5 %
d) Force, N and torque, N.m ± 1 %
e) Mass, kg ± 0.5 %
f) Atmospheric pressure, kPa ± 0.2 kPa
g) Tyre pressure, kPa ± 5 %

www.unapcaem.org

Testing of Power tiller

Power Tiller is a prime mover having single axle in which the direction of travel and its control for field operation is performed by the operator walking behind it. It is also known as hand or walking type tractor. Some of these may have riding arrangement. Depending on purpose these are classified as

- General Purpose Type: the power tillers which can be used for a number of farm operations, including the types defined under pull type and tilling type.
- Pull Type: The power tiller which pulls various kinds of implements.
- Tilling Type: The power tiller which uses an engine power driven tilling device, such as rotary and crank or screw blades.

There are two types of testing done based on purpose:

1) **Commercial Test**: The tests conducted for establishing performance characteristics of power tillers that are ready for commercial production or already in production.
    a) Initial Commercial Test: The tests conducted on indigenous or imported prototype of power tiller ready for commercial production.
    b) Batch Test: The tests conducted on power tillers which have already undergone initial commercial test and/or being manufactured commercially in the country.
2) **Confidential Test**: The tests conducted for providing confidential information on the performance of power tillers whether ready for commercial production or not, or to provide any special data that may be required by the manufacturer/applicant.

Selection

The power tiller, under production, should be selected at random (see IS 4905) using simple random sampling from the production line complete with its standard accessories and in a condition as generally offered for sale. The selection is to be done by representative of testing institute. The power tiller shall be new and should not be given any special treatment or preparation for test. After servicing and preliminary setting, using fuel, lubricants and operating in accordance to published instructions by manufacturer in operator's manual following tests are conducted on power tillers as per BIS standards (IS 9935).

Lab tests:

Power tests should be performed in normal (27±7°C) and high (45±2°C) ambient conditions at atmospheric pressures not less than 96.6 kPa.

a) Checking of the specification
b) **Power test:**

i) Engine performance

ii) Rotary shaft test--done at natural and high ambient temperatures (Natural Ambient Test: (27±7°C)

1) Maximum power test (6.1.2of IS 12036)

2) Varying speed test at full load (6.1.3 of IS 12036)
3) Varying loads test (61.4 of IS 12036)
4) Five hour engine rating test

- done when rotary attachment is not provided. The engine is run at 90 % of load at maximum power continuously for 4 h and during the 5th hour, at full load corresponding to maximum power.

5) Five hour test at rated power of rotary shaft

- done when rotary attachment is provided and in accordance with five hour engine rating test.

High Ambient Test: (43 ± 2°C)
1) Varying speed test (6.1.3 of IS 12036)
2) Maximum power test (6.1.2 of IS 12036)
3) Rotary shaft test

- conducted at the lowest rotary shaft speed if more than one rotary shaft speed.

iii) Drawbar performance
1) Test for maximum power and pull
2) Ten hour test

- 10 h testing in the gear designated by the manufacturer for field work at 75% drawbar load of the pull at maximum power in the gear being used

c) **Safety test** :
i) Turning ability > conducted at minimum achievable speed
ii) Parking brake test

d) **Ergonomical testing**:
i) Smoke measurement (IS 12062)
ii) Noise measurement (IS 12180)
1) At operator's year level
2) At bystander position
iii) Vibration measurement

- maximum horizontal displacement (HD) and vertical displacement (VD) in microns is measured

iv) Safety (IS 12239 (Part3))

e) **Miscellaneous tests:**
i) Air cleaner oil pull-over test
ii) Component/assembly inspection
iii) Special characteristics

- if required by the manufacturer and with the mutual agreement of manufacturer and testing authority

Field test:
i) Field performance and haulage test (IS 9980)

www.unapcaem.org

Measuring Tolerances

The measuring apparatus shall be such that the following items shall have the tolerances within the limits shown against each:

a) Rotational speeds, rev/min	± 0.5 %
b) Time, s	± 0.2 s
c) Distance, m or mm	± 0.5 %
d) Force, N and torque, N.m	± 1 %
e) Mass, kg	± 0.5 %
f) Atmospheric pressure, kPa	± 0.2 kPa
g) Tyre pressure, kPa	± 5 %
h) Temperature of fuels etc, °C	± 2
j) Wet and dry bulb thermometers,°C	± 0.5

k) Fuel consumption (overall for the apparatus used);

1) Engine test, kg	± 1.0%
2) Drawbar test, kg	±2.0%

www.unapcaem.org

Testing of Combine Harvester

Selection

The combine shall either be selected at random (see IS 4905) from the production lot by the testing institute for commercial tests or shall be submitted by the applicant to the testing authority for confidential/initial commercial tests as the case may be. The combine selected or submitted for test shall be completed with its usual accessories and in a condition generally offered for sale. The combine shall be new and shall not be given any special treatment or preparation for test. After servicing and preliminary setting, using fuel, lubricants and operating in accordance to published instructions by manufacturer in operator's manual following tests are conducted on agricultural tractors as per BIS standards (IS 8122 Part 2).

Lab tests:

Lab tests should be performed in normal (27±7°C) and high (45±2°C) ambient conditions at atmospheric pressures not less than 96.6 kPa.

a) Checking of the specification

b) Material analysis (IS 6025)

- The hardness and chemical analysis of critical components, such as knife section rasp bar, peg tooth, ledger plate and knife guards are recorded.

c) Visual observations and checking of provision for adjustments

- Particular attention to bearings, drives and other moving parts, correctness of various adjustments, tightness of bolts and nuts, etc.

d) **Power tests** (IS 12036)

i) Maximum power (absolute) test (6.1.2 of IS 12030)

ii) Varying speed test at full load (6.1.3 of IS 12036)

iii) Varying loads test (6.1.4 of IS 12036)

High Ambient Test (43 ± 2°C)

iv) Varying speed test (6.1.3 of IS 12036)

v) Five hour engine rating test

- at 90% of load corresponding to maximum power continuously for 4 hours

e) Hydraulic test

Header Lifting Test

- cycle of lifting and lowering continuously 1000 times

f) Noise level measurement (IS 12180)

g) Vibration test

- maximum horizontal displacement (HD) and vertical displacement (VD) due to vibration is measured

h) Operator's field of vision (IS 11442)

Height of cutter bar above ground level - 150 mm

j) Brake test (IS 12061)

- cold braking distance – 7.6 m
- hot braking distance – 9.5 m

1) Parking Brake Test

- force, necessary to apply at the control of the parking braking device to hold the combine harvester stationary when facing up and down on 12% gradient in a condition recommended for road transport, is measured. The maximum actuating force shall not be more than 400 N for hand operated and 600 N for foot operated parking brake device

k) Air cleaner oil pull-over test (8 of IS 5994)

- Combine parked in horizontal level position,
- Combine tilted 10° to either side, and
- Combine tilted 10° to forward and backward in relation to the direction of travel of the combine

m) Turning ability test (IS 11859)

- height of cutter bar above ground level - 150 mm

n) Position of center of gravity (IS 10743)

p) Components/Assembly inspection.

Field test: (5.2 of IS 8122 (Part 1))

- minimum of 100 hours with minimum of 30 hours test for any crop recommended by the manufacturer.
- pre-harvest losses is determined, at three places randomly selected within the area selected, for test run of at least 15 m

a) Rate of work and combine capacity

b) Quality of work

i) Efficiencies:

1) Threshing

2) Cleaning

ii) Non-collectable losses:

1) Pre-harvest

2) Header

3) Rack and shoe >the straw and chaff afflux is collected separately

c) Output

i) Straw

ii) Grain

d) Fuel consumption

e) Visual observations

www.unapcaem.org

1) Night observations

- for minimum of two hours shall be conducted to assess the intensity and suitability of the lighting equipment for the night work.

2) Ease of operation and handling

- Adequacy of accessibility of controls and visibility of the header and instrumentation shall also be recorded. The note on operator's working condition, the ease of setting adjustment, routine maintenance and other similar features shall also be made.

f) Safety provisions

- The note on safety device, such as slip clutches, shear pin, signal horns, indicator lights, provided for various systems shall be taken.

g) Soundness of construction

www.unapcaem.org