

# **Certification System of Agri. Machinery in Korea**

**Goobum KWON**

**Foundation of Agri. Tech. Commercialization & Transfer**

4th Training of Trainers of the Asian and Pacific Network for Testing of  
Agricultural Machinery

October 22-27, 2018 Beijing and Wuhan, China

# **Table of contents**

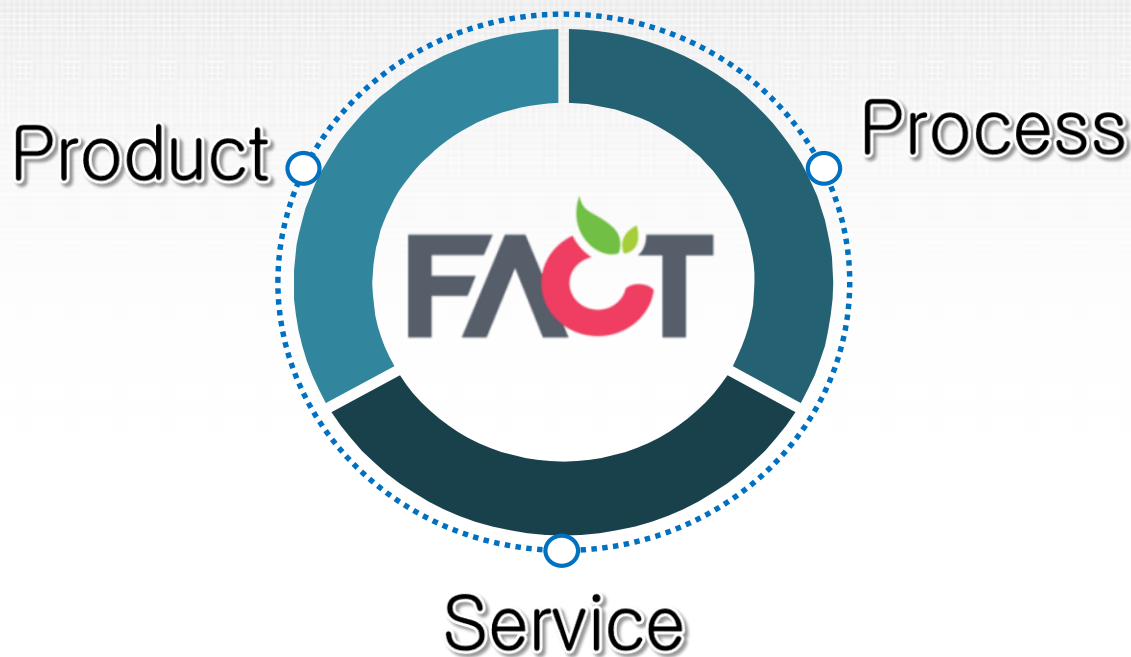
- **General Certification and Accreditation**
- **Traceability and Management of equipment**
- **Certification System of Agri. Machinery in Korea**
- **Testing of Agricultural Tractor in Korea**
- **Test Equipment in FACT**



# **General Certification and Accreditation**

# Certification ?

**Procedure which a third party assures documentarily that a **product, process** or **service** meets the prescribed requirements.**





# Types of Certification

**Subject**

**Product, Management system**

**Forcibleness**

**Compulsory, Optional**

**Regional**

**National, Foreign, International**

**Body**

**Third party, Self certification**

**Law Base**

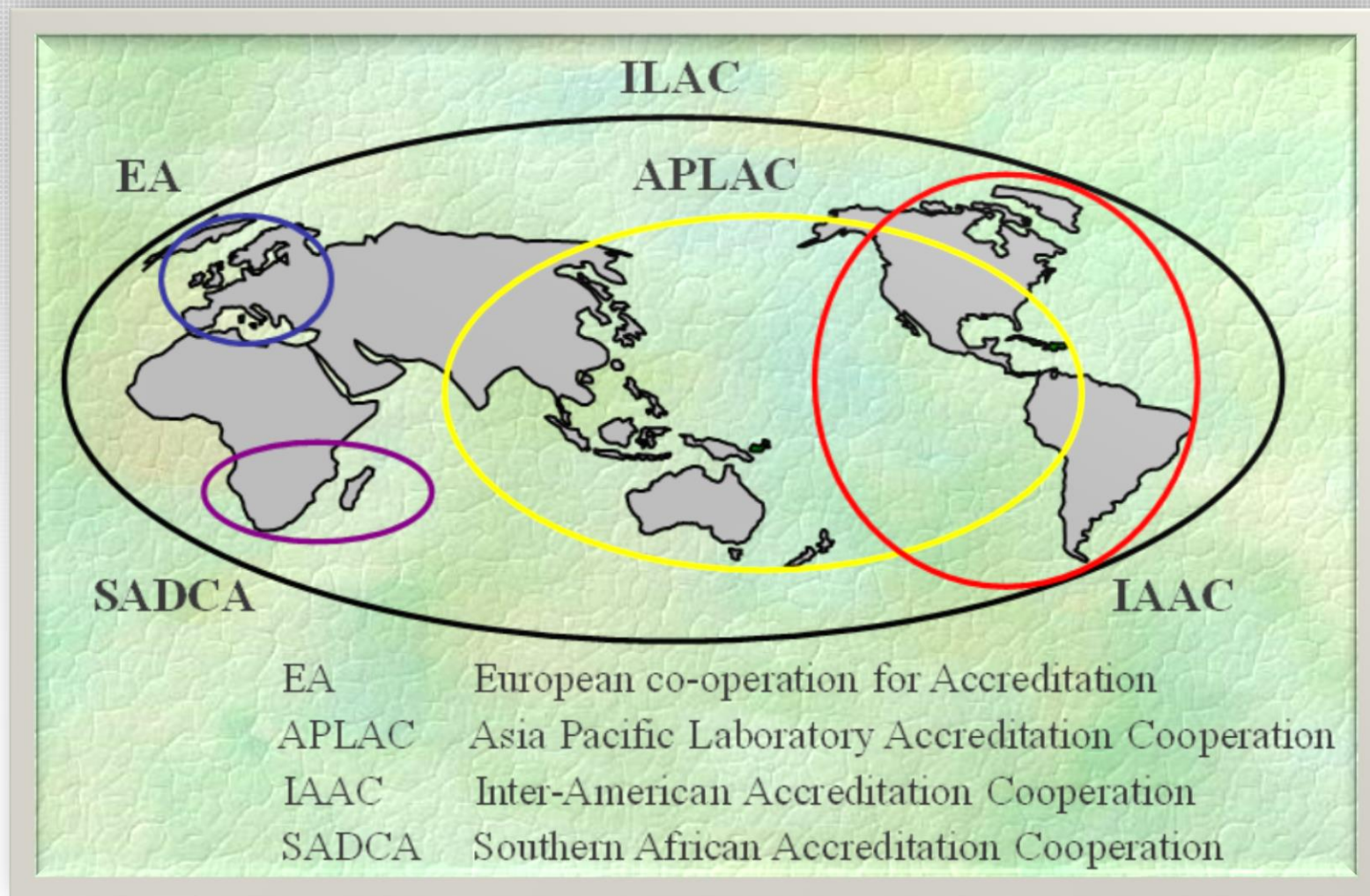
**Legal, Private Certification**

# Accreditation ?

The process in which certification of **competency**, **authority**, or **credibility** is presented



# International picture for accreditation



# What is KOLAS ?



## Korea Laboratory Accreditation Scheme

- **A governmental accreditation body**
- **Corporation with the Asia-Pacific Laboratory Cooperation(APLAC) and the International Laboratory Accreditation Cooperation(ILAC)**

### ○ Mission

- **Provide accreditation for competent laboratories and inspection bodies**
- **Promote mutual recognition with other accreditation bodies**
- **Promote international acceptance of test results and inspection reports produced by accredited organizations in order to facilitate trade**
- **Cooperate and collaborate with other accreditation bodies**



# Accreditation Scheme for Testing

## ○ Accreditation Criteria

Laboratories are accredited by KOLAS in accordance with the National Standards Act, ISO/IEC 17025-General requirements for the competence of testing and calibration laboratories and ILAC

## ○ Accreditation Fields

### • Testing Fields

- ✓ Mechanical, Chemical, Electrical,
- ✓ Heat and Temperature measurement etc.

### • Calibration Fields

- ✓ Length and related quantities, Time & frequency,
- ✓ Mass and related quantities, Temperature & humidity etc.

Equipment for testing





# Accreditation in FACT

## ○ Accreditation Fields

- Mechanical testing
  - ✓ Tractor test
  - ✓ ROPS test
  - ✓ Non-destructive test
    - Sugar content, Acidity
- Chemical testing
  - ✓ Petroleum product test
    - Calorific value

## ○ Members for KOLAS

- Quality manager : 2
- Technical manager : 1 for each test  
(total 4)

*Korea Laboratory Accreditation Scheme*

**CERTIFICATE OF ACCREDITATION**

Foundation of Agri. Tech.  
Commercialization & Transfer

Accreditation No. : KT384  
Corporation Registration No. : 135871-0007158  
Address of Laboratory : 126 Suin-ro Gwonseon-gu Suwon-si Gyeonggi-do  
date of Initial Accreditation : December 1, 2014  
Duration : October 12, 2017 ~ October 11, 2021  
Scope of Accreditation : Attached Annex  
Date of issue : October 12, 2017

This testing laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025 : 2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

    
Administrator  
Korea Laboratory Accreditation Scheme

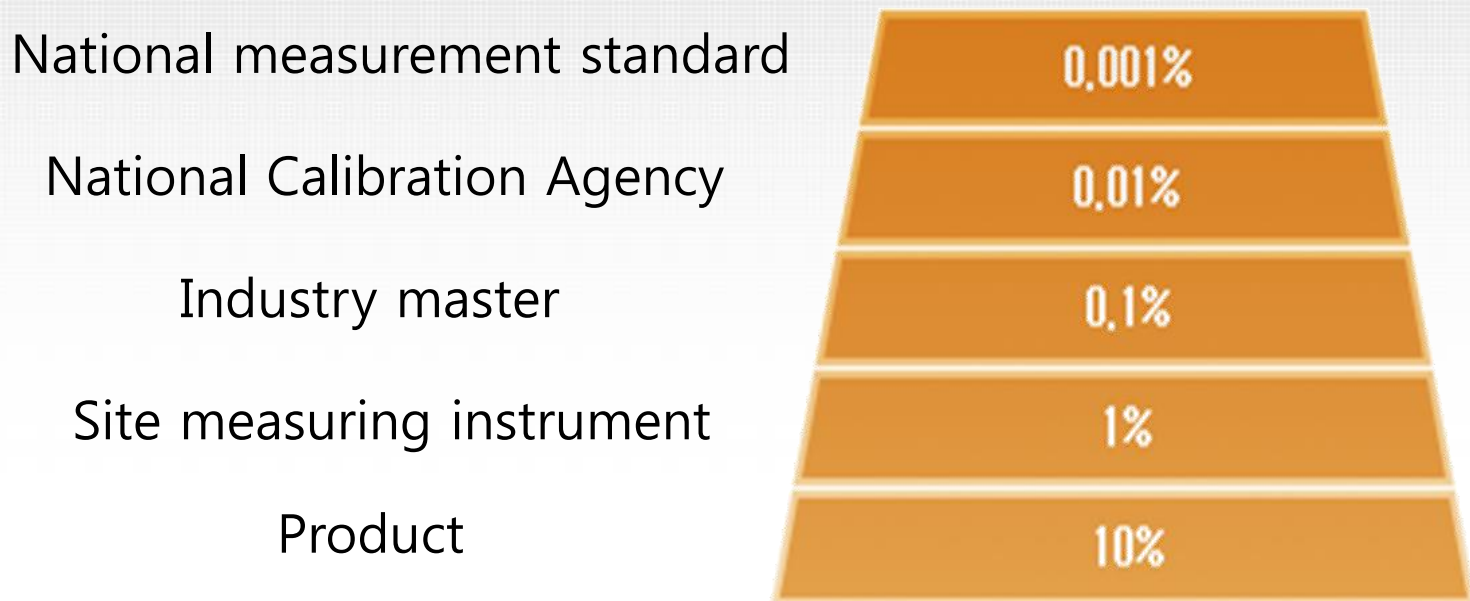
Korea Laboratory Accreditation Scheme(KOLAS) is a signatory of the ILAC mutual recognition arrangement



# **Traceability and Management of equipment**

# Measurement Traceability

- **Unbroken chain of comparisons relating an instrument's measurements to a known standard**
- Traceability preserving system



★ Measuring instrument must be calibrated by a upper level standard device

# Calibration system

- To assure accuracy and precision of a measuring instrument by traceability to maintain the error and the uncertainty within the permissible tolerance

## ○ Management of measuring instrument

- Annual calibration by accredited lab(external)
  - ✓ All instruments that are critical to the test
- Intermediate inspection by accredited lab(external)
  - ✓ Some instruments that are critical to the test
- Pre-check before the test(internal)

**교 정 성 적 서**  
CALIBRATION CERTIFICATE

교정기관: (주)표준교정기술원 131번길 43 (의정부)  
Tel: 021-458-3405, Fax: 021-458-0531

발행번호: SC1801-01884-1  
(Certificate No.)

제1회 (Client)  
계명 (Name): 농림수산식품안전관리공단  
주소 (Address): 경기도 수원시 권선구 수인로 135번길 22 (서현동)

제2회 (Calibration Subject)  
계명 (Description): 전자저울  
제적번호 및 형식 (Manufacturer & Type): FINE; 3.000 kg  
계기번호 (Serial Number): 10045(전용부품)  
제3회 (Date of Calibration): 2018. 01. 31.

제4회 (Calibration Environment)  
온도 (Temperature):  $10.4 \pm 0.2$  °C  
습도 (Humidity):  $34 \pm 2$  % RH  
교정장소 (Location): ☒ 고정표준실 (Permanent Cal. Lab.) ☐ 이동교정 (Mobile Lab.) ☒ 현장교정 (On Site Cal.)

제5회 (Calibration Traceability)  
교정방법 및 소급성 시험 (Calibration method and/or brief description):  
상기 계기는 전자저울 제조업체(ISO 9001:2015)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 표준장비를 이용하여 교정되었습니다.  
The above instrument was calibrated by calibration procedure of Electric Scales (SC1-4-201-01) using standard equipment which was manufactured traceability from National Standard.

교정된 사용항목 목록 (List of used standards/specifications)

Description	제적번호 및 형식 (Manufacturer & Model)	계기번호 (Serial Number)	국가교정일자 (The date of next Cal.)	교정기관 (Calibration Lab.)
표준 무게	HANSLUNG (F1) / 1 mg ~ 10 kg	090004	2018. 12. 07	SC11
표준 무게	표준저울 (S1) / 20 kg	S1-1	2018. 02. 24	SC11
표준 무게	표준저울 (S2) / 500 kg	S2-1	2018. 08. 14	HANSLUNG
표준 무게	표준저울 (S2) / 500 kg	S1-10	2018. 08. 14	HANSLUNG

제6회 (Calibration result)  
교정결과 참조 (Refer attached file)

제7회 (Measurement uncertainty)  
교정결과 참조 (Refer attached file)

확인 (Signature)  
측정자 (Measurement performed by): [인]  
확인자 (Confirmed by): [인]  
발행 (Issued): [인]

본 교정서는 국제시험기관인정협력제 (International Laboratory Accreditation Cooperation) 상호인정협정 (Mutual Recognition Arrangement)에 시행된 국제시험기구 (ISO/IEC 17025)에 따라 발급된 교정결과입니다. (The above calibration certificate is the accredited calibration result by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.)

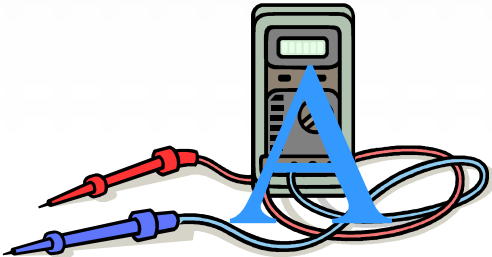
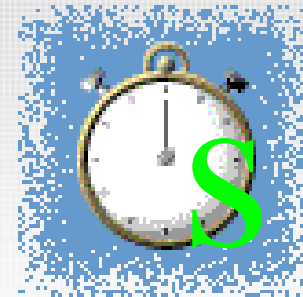
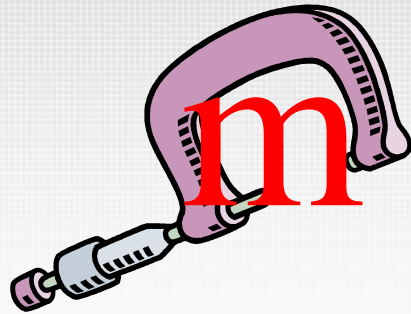
한국인정기구 (KOLAS)에 의해 인증된 교정기관 (Accredited by KOLAS, Republic of Korea)

(주)표준교정기술원 대표이사 (Standard Calibration Technology Institute Co., Ltd. Representative Director)

본 교정서는 측정기준, 측정방법, 측정결과, 측정환경, 측정장비, 측정인력, 측정결과, 측정결과에 영향을 미치는 요소(온도, 습도, 진동, 충격 등)의 공차에 대한 규격에 따라 발급된 교정결과입니다. (NOTES) If any significant instability or other adverse factor (temperature, humidity, vibration, shock, etc.) is likely to affect the validity of the calibration.

# International system of unit (SI)

- Establish a correct unit system for all fields to secure reliability and avoid misunderstanding in testing







# **Certification System of Agri. Machinery in Korea**

# Agri. Machinery Certification Systems in Korea

## 1. Improvement progress of agri. mech. in Korea



1970's  
(Crawling)

1980's  
(Walking)

1990's  
(Riding)

2000's

2010's

**Rice**

**Protected Agri.**

**Smart Farming**

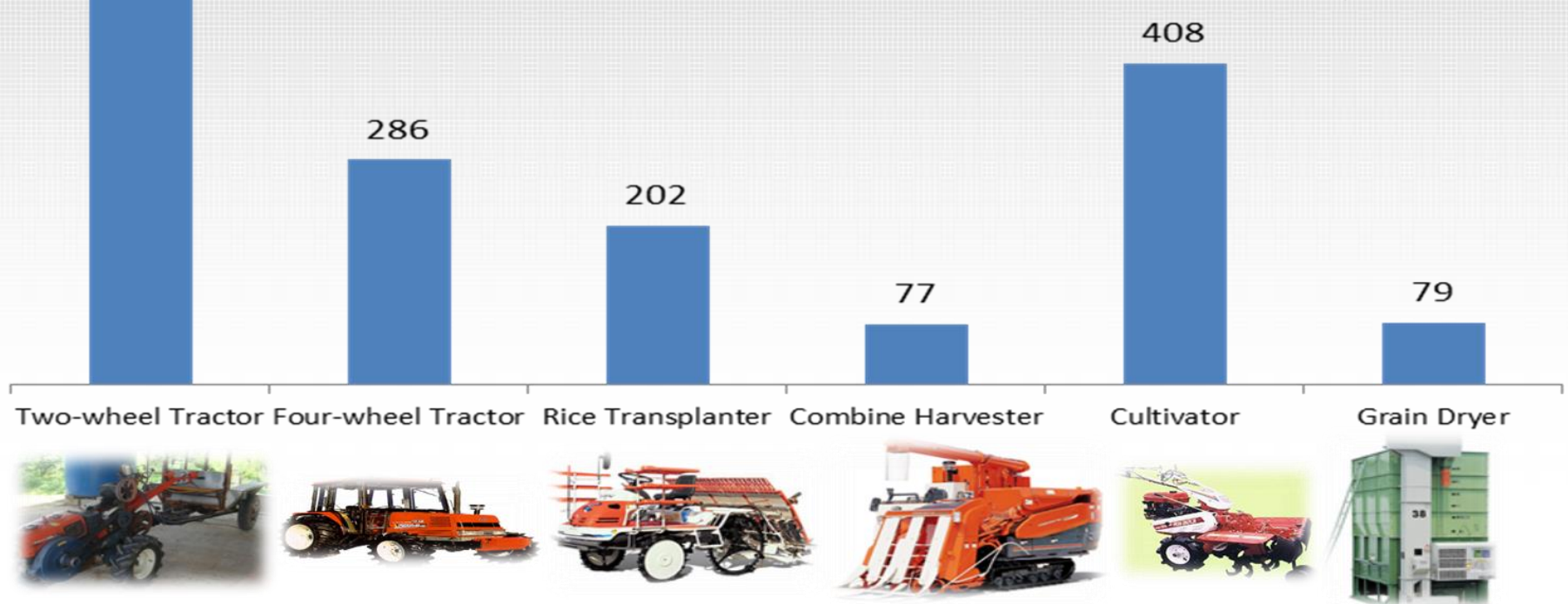
Source: CSAM – Regional Workshop on the Role of Mechanization in Strengthening Smallholders' Resilience through Conservation Agriculture in Asia and the Pacific (RDA, Byounggap Kim)

## 2. Number of agri. machineries in Korea(2016)

Agri. Mechanical rate for rice : **98 %**

Agri. Mechanical rate for field crop : **58 %**

Unit: Thousand



Source: CSAM – Regional Workshop on the Role of Mechanization in Strengthening Smallholders' Resilience through Conservation Agriculture in Asia and the Pacific (RDA, Byounggap Kim)



## 3. History of Agricultural Machinery Testing Station

Agricultural Machinery Test Building



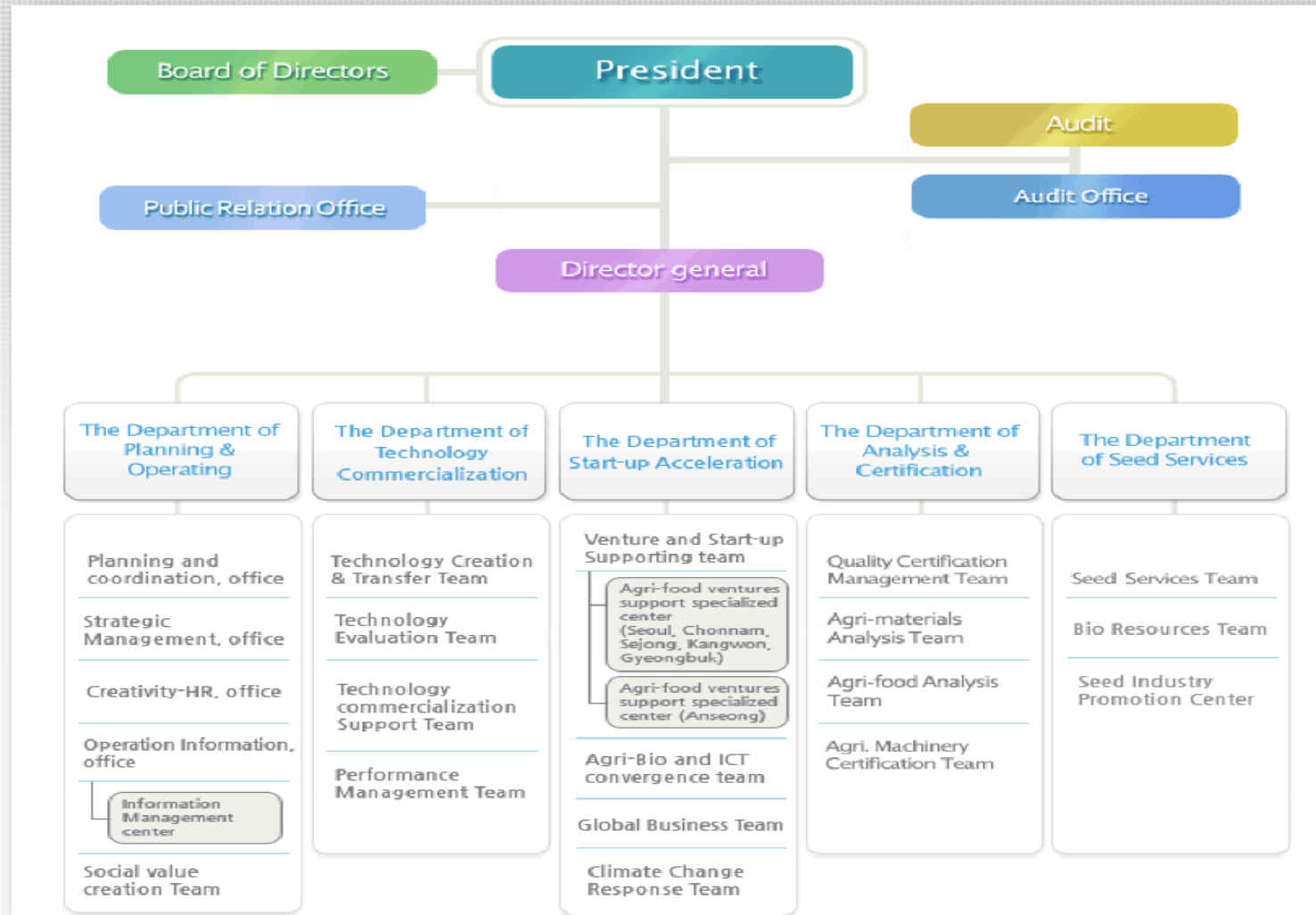
Agricultural Machinery Field Test Track



- 1966. 3. : National Agricultural Materials Inspection Office, Ministry for Agriculture, Forestry and Fisheries
- 1994. 12. : Agricultural Mechanization Research Institute, Rural Development Administration
- 1995. 12. : OECD Agri. tractor standard code designation testing station
- 2008. 12. : KOLAS International official testing station
- 2009. 9. : Foundation of Agri. Tech. Commercialization and Transfer
- 2018. 8. : Relocation to another city (build up new facilities)

## 4. Organization of FACT

○ Agri. Machinery Certification Team employees: 20





## **5. Legal base related to the Certification**

- Agri. Mechanization Promotion Law
- Agri. Machinery Testing & Safety Management Regulation

## **6. Objects of Certification for Agri. Machinery**

- Restriction of market entrance of defective agricultural machines
- Providing information necessary to select the agri. machines
- Support of Research & Development in agricultural machinery industry
- Support of domestic and foreign business activities
- Safety assurance of agricultural machines' users
- Contribution in environmental preservation and energy saving

## 7. Certification standards

- National Codes
  - ✓ Agri. machines general testing methods and criteria
  - ✓ Agri. machines safety criteria
- International standards
  - ✓ OECD Codes, ISO Standards, ASABE Standards, EC Directives etc.

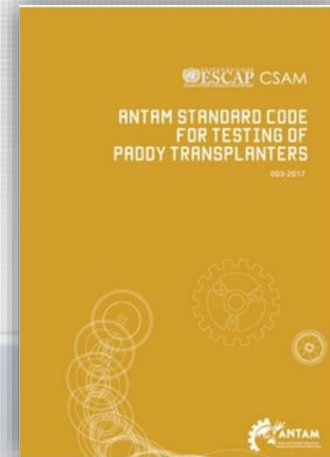
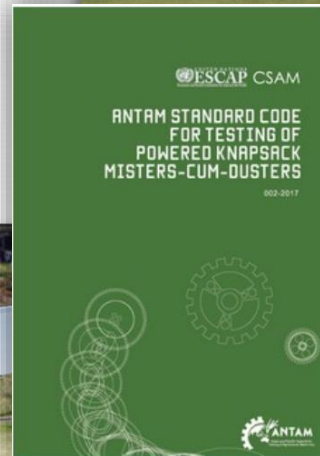
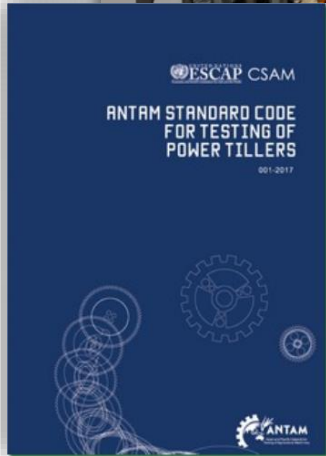
## 8. Types of certification

- National test : Testing the structure, performance, safety and level of difficulty in operating
- Safety test : Checking the safety devices
- Specific performance test : Test for the development of agri. Machines
- International standard test : Test according to OECD, ISO, ASABE etc.
- Modification verifying check : Evaluating the suitability of the modified parts after certification
- Post test : To manage and supervise the machine after tests

## 9. Test machines(compulsory)

Test types	Machines
<b>National test</b> <b>15 items</b>	agricultural tractor, ROPS, combine harvester, riding type rice-transplanter, transplanter, agricultural heater, farm product dryer, low temperature storage, rice milling machine, riding type haulage vehicle, loader, excavator, riding type cultivator, riding type fertilizer sprayer, riding type baler
<b>Safety test</b> <b>29 items</b>	walking type rice-transplanter, walking type haulage vehicle, grain dryer, high place operation vehicle, rice planter, long distance pest applicator, travelling type sprayer, crusher, wood chipper, fertilizer sprayer, farm-product washer, oil use dryer, weeder, mower, lift, trailer, baler, cutter, coating machine, harvester, power tiller, walking type cultivator, speed-sprayer, feed mixer, sowing machine, feeder, skinning machine, threshing machine

## 10. Preparing for testing power tillers, powered knapsack sprayers cum dusters and rice transplanters







# **Testing of Agricultural Tractor in KOREA**



# Testing of Agricultural Tractor

## 1. Definition of Agri. Tractor

### Agricultural tractor



- Self-propelled vehicles, at least two axles, designed to carry out the following operations for agri. purposes
- to pull trailers
- to carry, pull or propel agri. tools or machinery and where necessary, supply power to operate them with the tractor in motion or stationary

# Testing of Agricultural Tractor

## 2. Testing items

### Structures

Dimensions, Mass, Wheelbase, Ground clearance, Transmission, PTO, Linkage, Steering, Axles, Engine

### Performance

PTO test, Drawbar test, lifting force test, Braking test, Noise test, Center of gravity, Water-proofing test

### Safety

15 items including protection of PTO shaft, Instrument systems, Lighting systems etc.

### Level of operating

Operating devices

# Testing of Agricultural Tractor

## 3. PTO performance test



### Test items

- Max. power test
- Full load test
- Part load test

### Test requirements

- Ambient temp. :  $23 \pm 7$  °C
- Power transfer loss of the torque and power value is not modified.
- The U-joint between PTO shaft and Dynamo. should not have any appreciable angularity.
- The exhaust gas discharge device must not affect the engine power.
- All tests should be carried out continuously.

# Testing of Agricultural Tractor

## 4. Hydraulic power & Lifting force test



### Test items

- Hydraulic power
- Lifting force

### Test requirements

- Hydraulic fluid : recommended by the manufacturer and identified by type and viscosity in accordance with ISO 3448:1992.
- Temp. of tractor hydraulic fluid :  $65 \pm 5^{\circ}\text{C}$
- Adjusting the linkage according to ISO 730:2009
- Angle of mast more than 10 degrees(if possible)
- Checking the oil pressure during the test



# Testing of Agricultural Tractor

## 5. Drawbar test



### Test items

- Max. draw power
- Max. draw pull
- Fuel consumption

### Measuring & checking items

- Draw power
- Draw pull
- Velocity
- Wheel slip
- Fuel consumption
- Engine speed
- Temperatures(Fuel, Coolant, Engine oil, Air)
- Relative humidity
- Atmospheric pressure



# Testing of Agricultural Tractor

## 6. Braking test



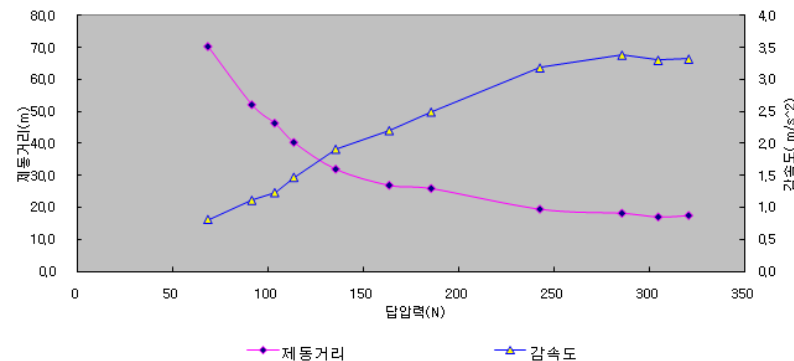
Service braking test



Parking braking test

### Measuring & checking items

- Pedal operating force
- Braking distance
- Velocity
- Deceleration ,  $f = V^2 / 2S$   
( $f$  : Mean deceleration( $m/s^2$ ),  $V$  : Initial speed( $m/s$ ),  
 $S$  : Braking distance( $m$ ))



# Testing of Agricultural Tractor

## 7. Center of gravity test



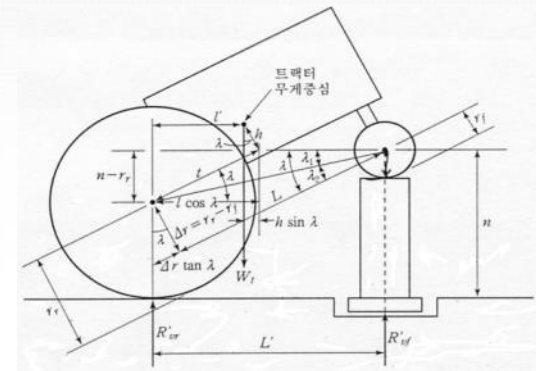
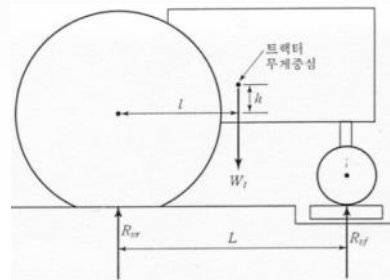
Position of Center of gravity



Overturning angle

### Measuring & checking items

- Height above ground
- Distance from the vertical plane
- Distance from the median longitudinal plane
- Static overturning angle



# Testing of Agricultural Tractor

## 8. Turning area and Turning circle



### Measuring & checking items

- Radius of turning area
- Radius of turning circle
- Driving speed

## 9. Waterproofing test



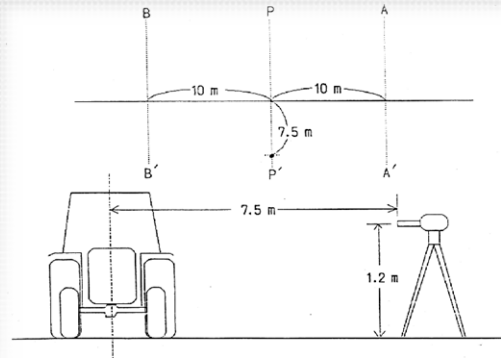
### Checking items

- Axis housing
- Clutch housing
- Gear box

# Testing of Agricultural Tractor

## 10. External noise test

- Max. noise
- Max. speed



## 11. Steering force test

- Steering force
- Operating time





# Testing of Agricultural Tractor

## 12. Safety test

### Protection from the moving parts and safety devices



### Operating systems and Driving position



### Lighting, High temp. guards and Labels etc.





# **Test Equipment in FACT**



## Engine Dynamometer

- Type : AC (Alternating Current)
- Measuring the engine performances such as power, torque, speed, fuel consumption, temperatures(fuel, water, air, oil etc)



## Tractor PTO Dynamometer

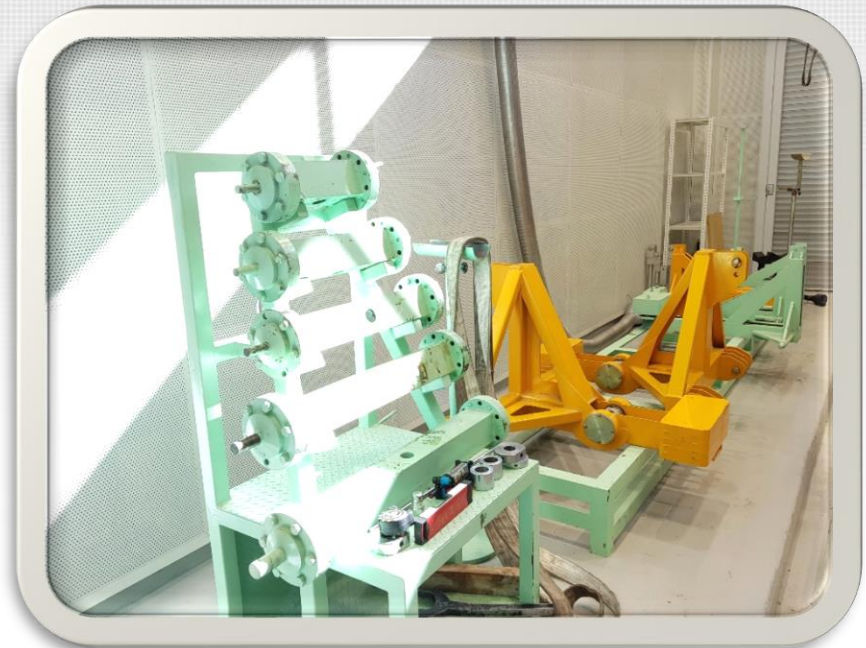
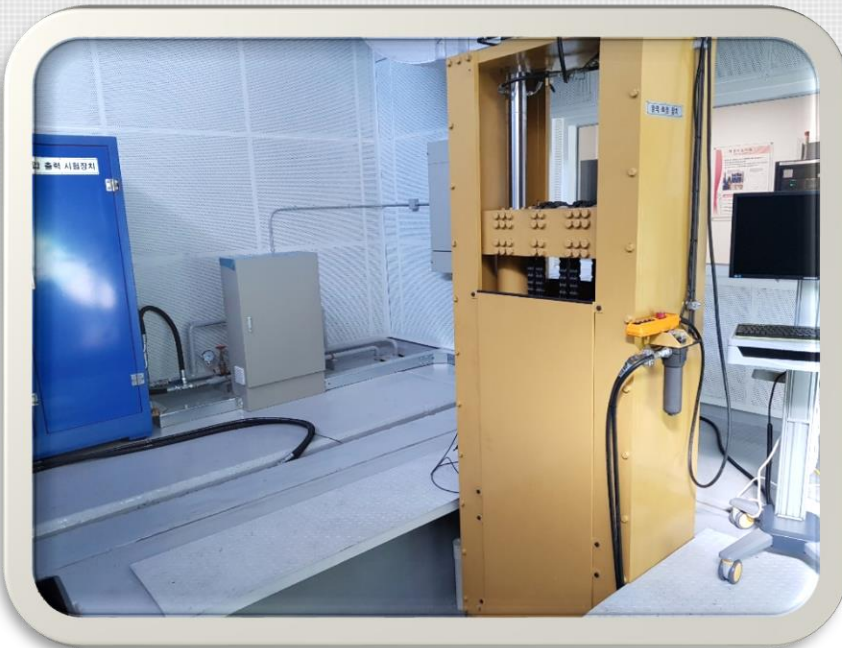
- Type : EC (Eddy Current)
- Measuring the tractor PTO performances such as power, torque, speed, fuel consumption, temperatures(fuel, water, air, oil etc)





## Hydraulic Power & Lifting Force measuring system

- **Specification :** Max. Lifting Force 200,000 N  
Max. Hydraulic Power 100 kW  
Max. flow rate 250 L/min  
Max. Hydraulic Pressure 24,000 kPa
- **Measuring the hydraulic power, lifting force, oil pressure, temperatures etc.**



## ROPS testing system

- Type : Hydraulic
- Specification : max. load 20 t (Horizontal & Crushing Load)
- Measuring the load applied to ROPS and deflection of structure and strength of seat belt anchorage.



Lateral load



Vertical load



Seat belt anchorage  
testing system



# Test Equipment in FACT

## ○ FOPS testing system

- Confirming the safety of FOPS from the pendulum



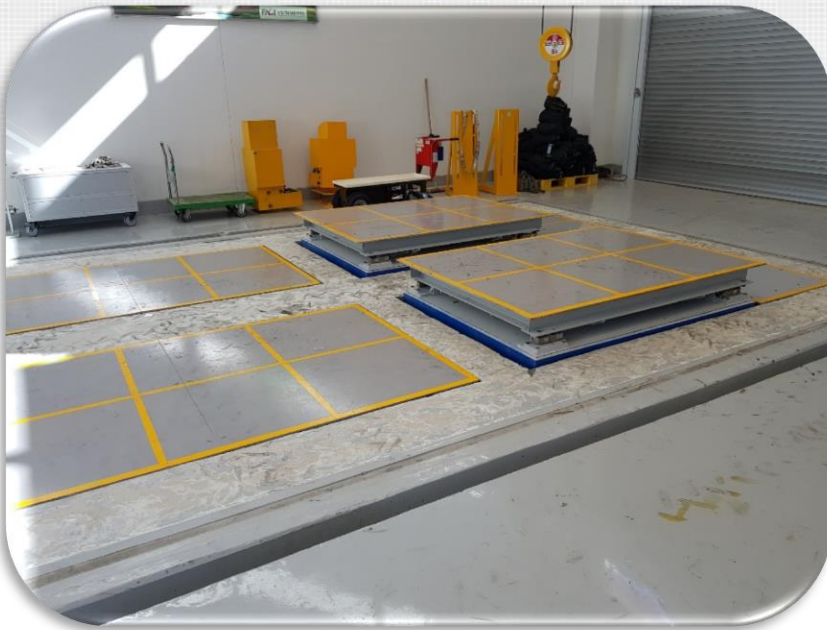
**Level 1 : 45 kg (right)**

**Level 2 : 227 kg (left)**

# Test Equipment in FACT

## Position of center of gravity

- Type : Load Cell
- Measurement Range : 20,000 kg (5,000 kg x 4 ea)
- Measuring the position of COG, theoretical overturning angles etc.



## Overturning angle test

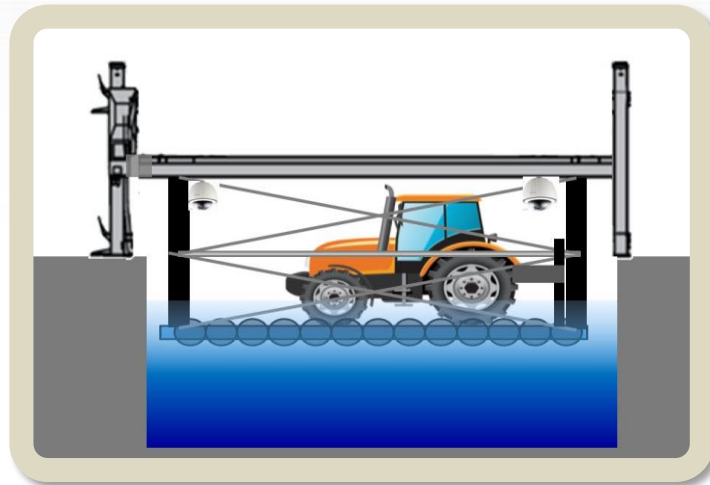
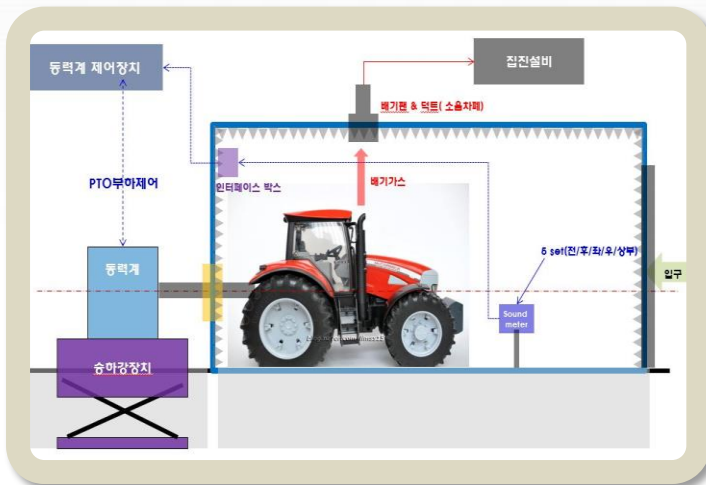
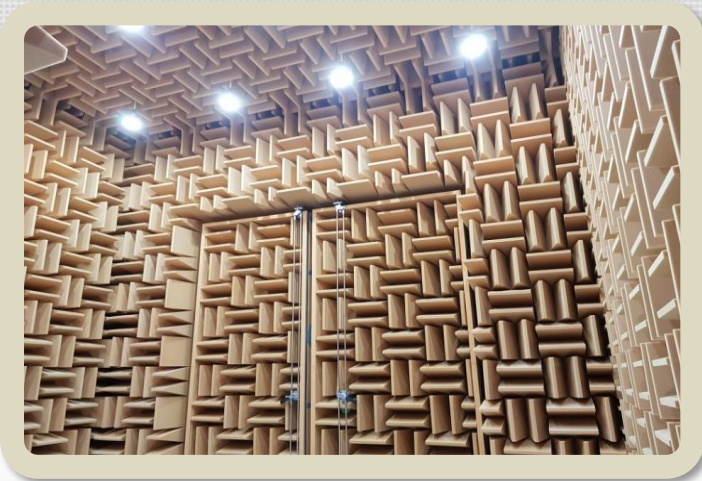
- Type : Hydraulic Cylinder
- Specification : maximum overturning angle 45°
- Measuring overturning angles in static condition of machines





# Test Equipment in FACT

## Noise test chamber and Waterproofing cistern



# Test Equipment in FACT

## Heat-pump and Agri. Heater performance testing



# Test Equipment in FACT

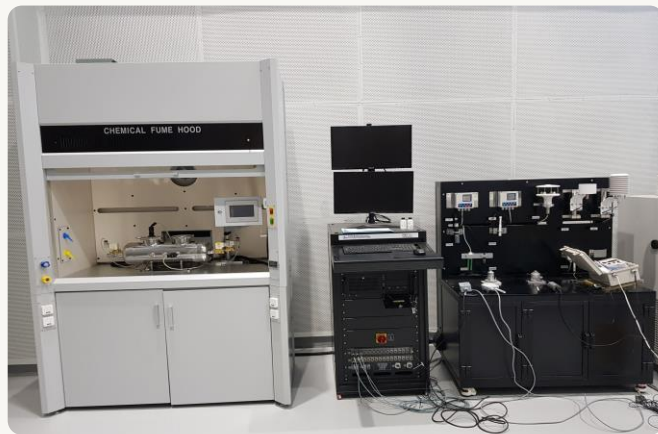
## Agri. Product – Refrigerator and Dryer performance test





# Test Equipment in FACT

## Testing for Drone sprayers and Smart-Farm devices







**Thank you**