A Short Guide to the Demonstration in NARO

<9:50-10:00 Welcome speech>
(1) Kazuo Terashima, Ph.D (Director General, NARC, NARO)
(2) Koji Amemiya (Director General, Agriculture forestry and fisheries research council, MAFF)

<10:00 – 11:00 Demonstration of commercialized machines>

#1 Sprayer control with AG-PORT
Hiroshi Sato (Yamabiko Corporation)
EG97 tractor (Yanmar) + BSM1505 sprayer (Yamabiko)
Spray pressure is controlled using the speed information provided via the “AG-PORT” of the tractor. With the other option, the tractor traveling speed can be controlled by the implement ECU depending on the preferable application rate while the spray pressure remains same. Bi-directional communication is achieved, and this could be the most advanced use case of the “AG-PORT”.

#2 Spreader control with AG-PORT
Motohiro Mori (IHI Star machinery Corporation)
GA30 tractor (Mitsubishi) + MBC200 spreader (IHI Star)
Shutter opening of this spreader is controlled using the speed information provided from the “AG-PORT” on the tractor. Though this 30PS tractor originally is not equipped with “AG-PORT”, a simple retro-fit kit of “AG-PORT”, presently prototype, is added to measure wheel based speed and PTO speed and to transmit those information in forms of ISO 11783 standardized messages.

#3 Seeder control with single pin connector
Kanta Takechi (Kubota Corporation) / Yoshiyuki Shirai (Matsuyama Plow MFG.)
SMZ875 tractor (Kubota) + SRA241 slip-roller-seeder (Matsuyama)
Though this combination does not use the “AG-PORT”, This tractor has more sophisticated single pole connector which can transmit speed information and some other information at the same time. Many kind of implements from different manufacturers have already realized combination control with tractor traveling speed. This technology has been achieved by Kubota Corporation.

#4 Paddling operation with paddy harrow
Toru Abe (Kobashi Kogyo Co. Ltd.)
NTA55 tractor (Iseki) + TX382 cyber harrow (Kobashi Kogyo)
Paddling is a very important farm work in traditional rice production to prepare soil condition before transplanting. While this demonstration shows a typical farm work in spring, two technical aspects will be introduced. One is a rear hitch level control with a special hydraulic cylinder built in a lift rod, and the other is wireless remote control of the wing action to fold both side of the implement.

<11:00 – 12:00 Demonstration of prototype machines>

#5 Robot tractor
Katsuhiko Tamaki, Ph.D (NARC)
A robot tractor which was modified to be controlled steering by stepping motor. Steering, direction of travelling (forward, neutral, backward), engine speed, travelling speed, rear hitch position and PTO speed can be controlled via can-bus. Base unit is 47.8 kW four-wheel-drive tractor, YANMAR EG65.

#6 Rice transplanting robot
Yoshisada Nagasaka, Ph.D (NARC)
Two types rice transplanter robots have developed. Base units are KUBOTA SPU650 (7.7 kW) and ISEKI PZ60 (8.3 kW). Their actuators and controllers for the steering, HST and hitch-control-switch
can be controlled by the computer through can-bus system. To make unmanned rice transplanting operation in one field, it needs to carry enough seedlings. We also modify the rice transplanting attachment to use long-mat-type hydroponic seedlings. It is ten times longer than conventional rice seedling mat and one seedling mat covers 0.05ha field. Japanese standard size of rice field is 0.3 ha, so six-row rice transplanter can make non-stop operation in one standard size field.

#7 Combine harvester robot ...................................................... Masahiro Saito, Ph.D (NARO)
A robot combine harvester for beans was developed using CAN Bus network. Two sensors are connected to the CAN Bus; a RTK-GPS to locate the position, and a GPS Compass to detect the heading direction. This robot is programmed to perform autonomous operation such as moving forward, backward, and turning in right angle.

#8 Tele-operated Tractor System .......................................... Takashi Yamashita, Ph.D (BRAIN)
A commercialized agricultural is modified to a robot tractor by equipping with a camera for driving, security confirmation, a navigation sensor (RTK-GPS, IMU), a steerage, radio communication equipment. Other than remote control of basic tractor operation, autonomous operation based on a work course plan can be done

<12:00-13:15 Lunch break>
Most of the demonstrated machines will be displayed during the lunch break.

<13:15 Departure from NARO>

NARC = National Agricultural Research Center of NARO (http://www.naro.affrc.go.jp/narc/index.html)
NARO = National Agriculture and Food Research Organization
MAFF = Ministry of agriculture, forestry and fishries, JAPAN