NCAM CONTRIBUTION TO ATTAINING SELF-SUFICIENCY IN RICE PRODUCTION NIGERIA

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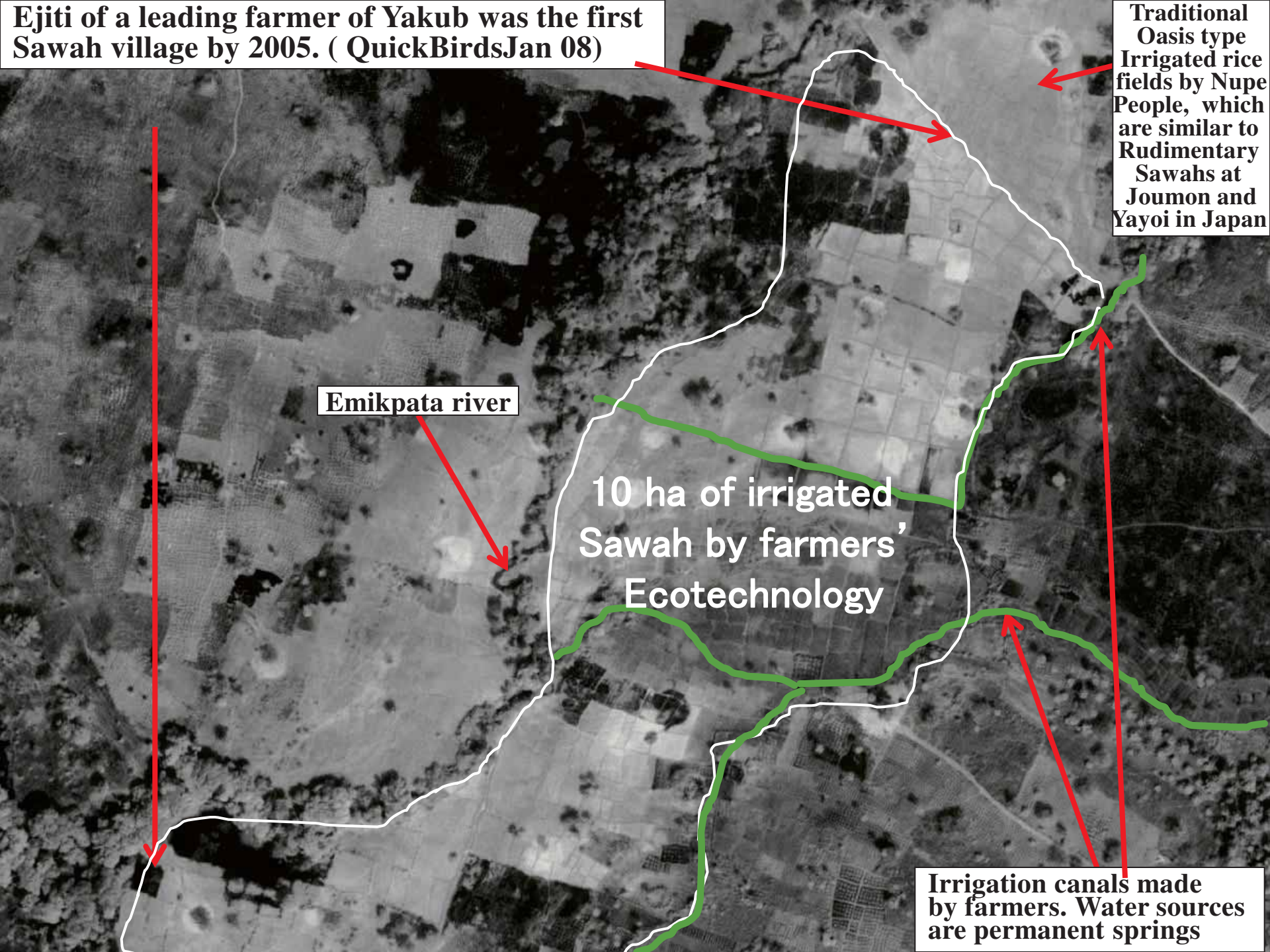
SAWAH REQUIREMENT

SITE SELECTION: THE TYPE OF LAND REQUIRED FOR SAWAH IS LOWLAND, FLOODPLAINS, INLAND BASINS, INLAND VALLEYS AND COASTAL SWAMPS.


Ejiti of a leading farmer of Yakub was the first Sawah village by 2005. (QuickBirdsJan 08)
Traditional Oasis type Irrigated rice fields by Nupe People, which are similar to Rudimentary Sawahs at Joumon and Yayoi in Japan
Emikpata river
10 ha of irrigated Sawah by farmers' Ecotechnology
Irrigation canals made by farmers. Water sources are permanent springs


19Jan2013SouthLakeChadIntakePoint
Kumbulewari
Fage
Jegara
The biggest irrigation scheme of south lake Chad irrigation
1Oct2013SouthLakeChadIrrigationProej
Marte
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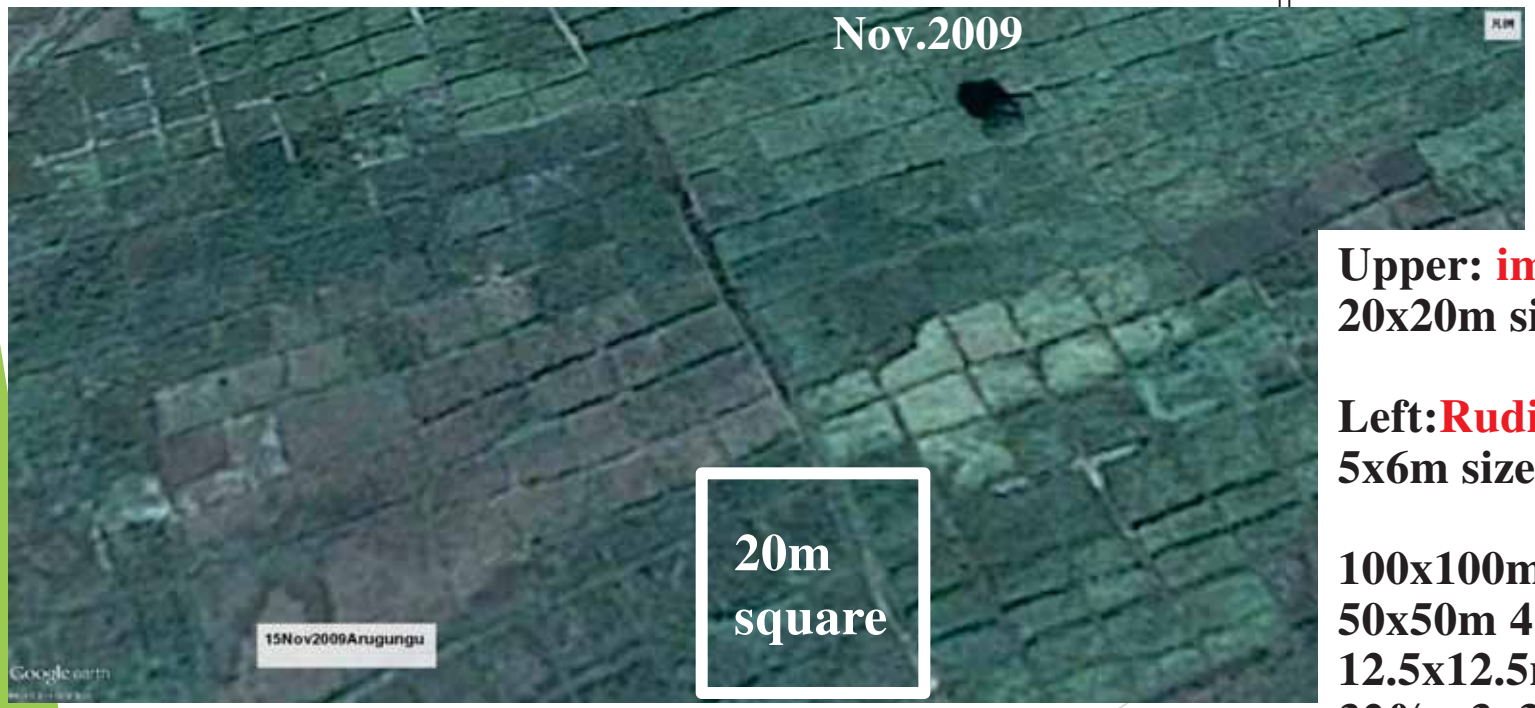


20m
square

Upper: improved Sawah, 20x20m size, 5-7 t /ha

Left:Rudimentary Sawah 5x6m size, 2-3t/ha in 2009

100x100m: bund area2% 50x50m 4%, 25x25m 8%, 12.5x12.5m16%,6.3x6.3m 32%, 3x3m 64%

Asian Sawah systems had developed by farmers using historical years of hundreds- thousands years before scientific technologies applied. Sub Sahara Africa must accelerate the development within 40-50 years, before 2050. Research, development, and innovations are necessary.

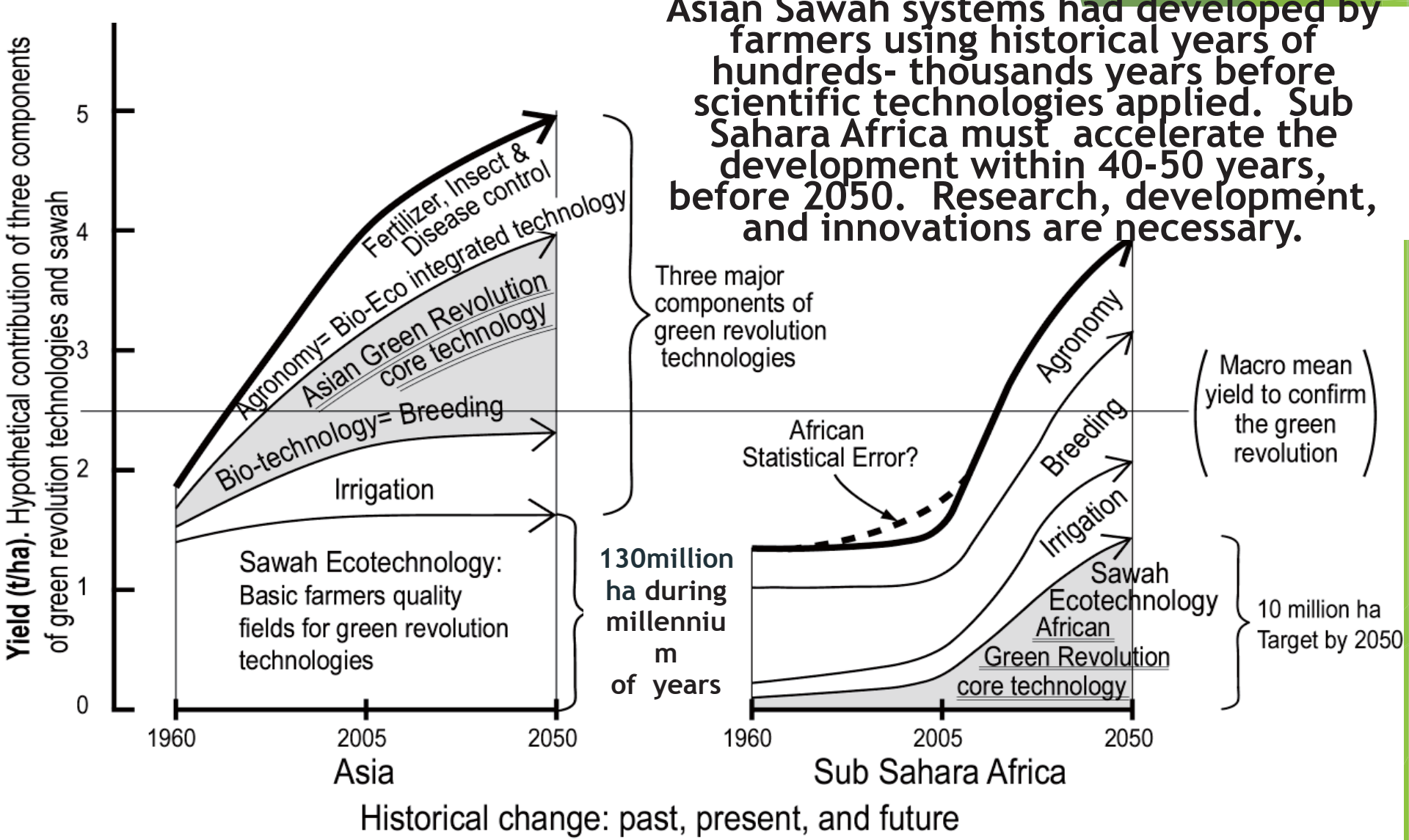


Fig. 4 : Sawah hypothesis (1) for Africa Green Revolution:

hypothetical contribution of three green revolution technologies & sawah system development during 1960-2050. Bold lines during 1960-2005 are

Table 1 Distribution of lowlands and potential irrigated and rainfed sawah area in Sub Saharan Africa (SSA) (Hekstra, Andriesse, Windmeijer 1983 & 1993, Potential Sawah area estimate by Wakatsuki 2002,2012)

Classification	Area (million ha)	Area for potential irrigated sawah development
Coastal swamps	17	4-9 millon ha (25-50%)
Inland basins	108	1-5 million ha (1-5%)
Flood plains	30	8-15 million ha(25-50%)
Inland valleys	85	9-20 million ha(10-25%)

Note 1. Although initial priority was the inland valleys because of easier water control, some flood plains in Sudan and Guinea Savanna zones should be given higher priority, such as Kebbi, Sokoto, Jigawa, Yobe and Borno in Nogeria, where personal small pump irrigated sawah is efficient and soil fertility is high.

Note 2. Estimated potential sawah area and paddy production are 0.5-1 million ha and 2-4 million tons of paddy in Ghana, 3-5 million ha and 12-20 million tons in Nigeria, and 22-49 million ha and 88-196 million tons in SSA. Estimations in Table 1 can be supported by following data, i.e. Asia has 123 million ha of sawah area with 9485 km^{-3} of annual available water, whereas Africa has 3617 km^{-3} of water availability, 40% of Asia's (Oki et al 2009, FAOSTAT 2014).

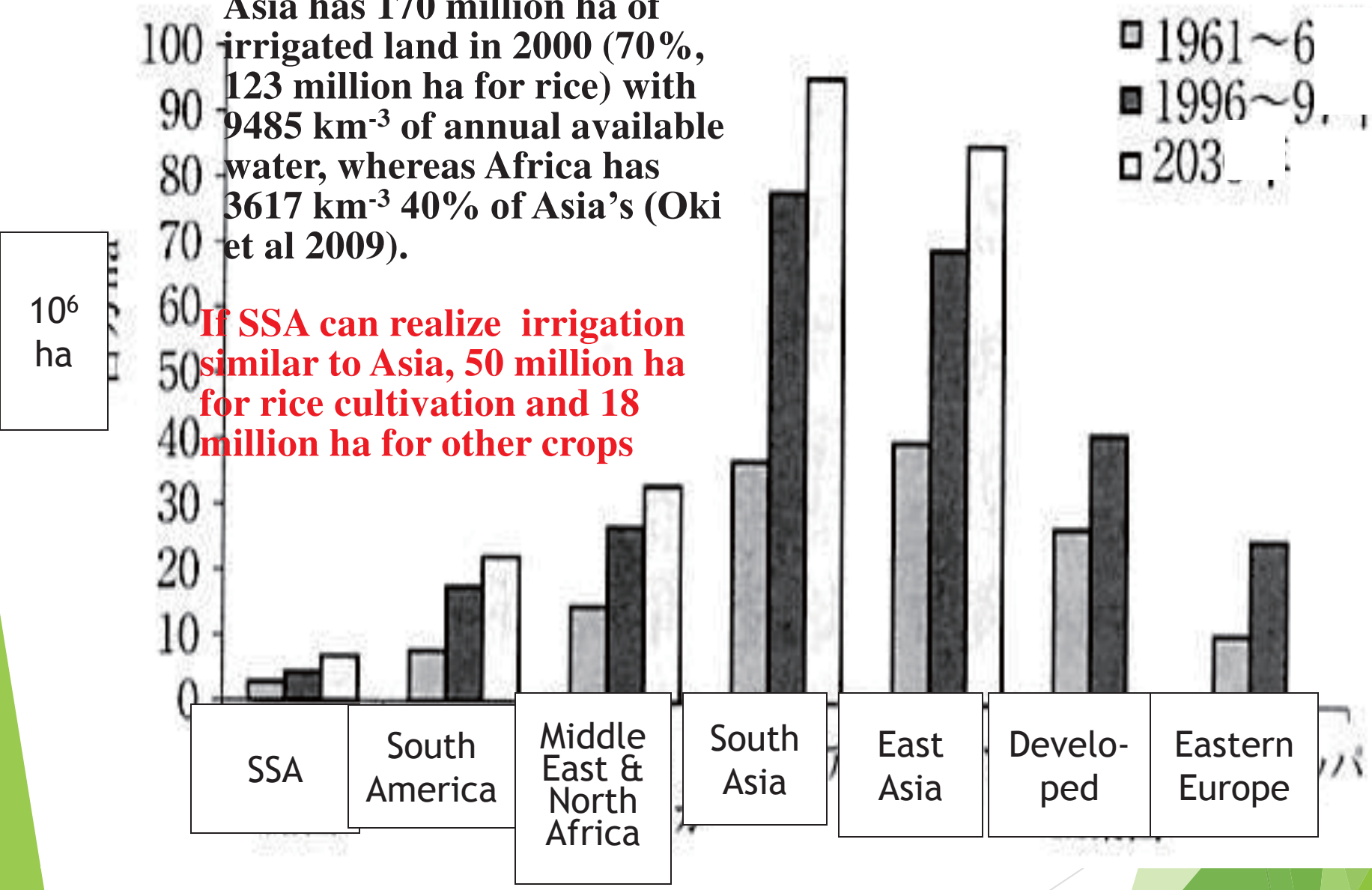
Table 2: Comparison of farmers' site-specific personal irrigated sawah system development and sawah based rice farming(Sawah eco-technology) with large- and small-scale contractor (ODA) style developments, and traditional rice cultivation system in various lowlands of Nigeria and Ghana (2013).

	Large-scale development	Small-scale development	Sawah eco-technology	Traditional system
Development cost ($/ha)	**10000–30000**	**10000–30000**	**1000-3000 (10 yrs ago 3000-7000)**	**30–60**
Gross revenue ($/ha)†	2000–3000	2000–3000	2000–3000	500–1000
Yield (t/ha)	4–6	4–6	4–6	1–2
Running cost, including machinery ($/ha)	1000–1100	1000–1100	1000–1100	400–500
Farmer participation	Low	Medium–High	High	High
Project ownership	Government	Government	Farmer	Farmer
Adaptation of technology	Long,	Medium to short	Medium to short, needs intensive demonstration and on-the-job training (OJT) program	Short
Technology transfer	Difficult	Difficult	Easy	Few technology transfer
Sustainable development	**Low(heavy machinery used by contractors in development)**	**Low to medium**	**High (farmer-based and small power-tiller used in development and management)**	**Medium**
Management	**Difficult**	**Difficult**	**Easy**	**Easy**
Adverse environmental effect	High	Medium	Low	Medium

† Assuming 1 ton paddy is worth US$ 500; one power-tiller costs US $ 3000-5000 in West Africa depending on the brand quality and accessories (2012 values). Selling prices are $1500-$3000 for farmers in Asian countries.

Asia has 170 million ha of irrigated land in 2000 (70%, 123 million ha for rice) with 9485 km^{-3} of annual available water, whereas Africa has 3617 km^{-3} 40% of Asia's (Oki et al 2009).

If SSA can realize irrigation similar to Asia, 50 million ha for rice cultivation and 18 million ha for other crops



World Irrigated Area in million ha(Yoshinaga et al, FAO 2003)

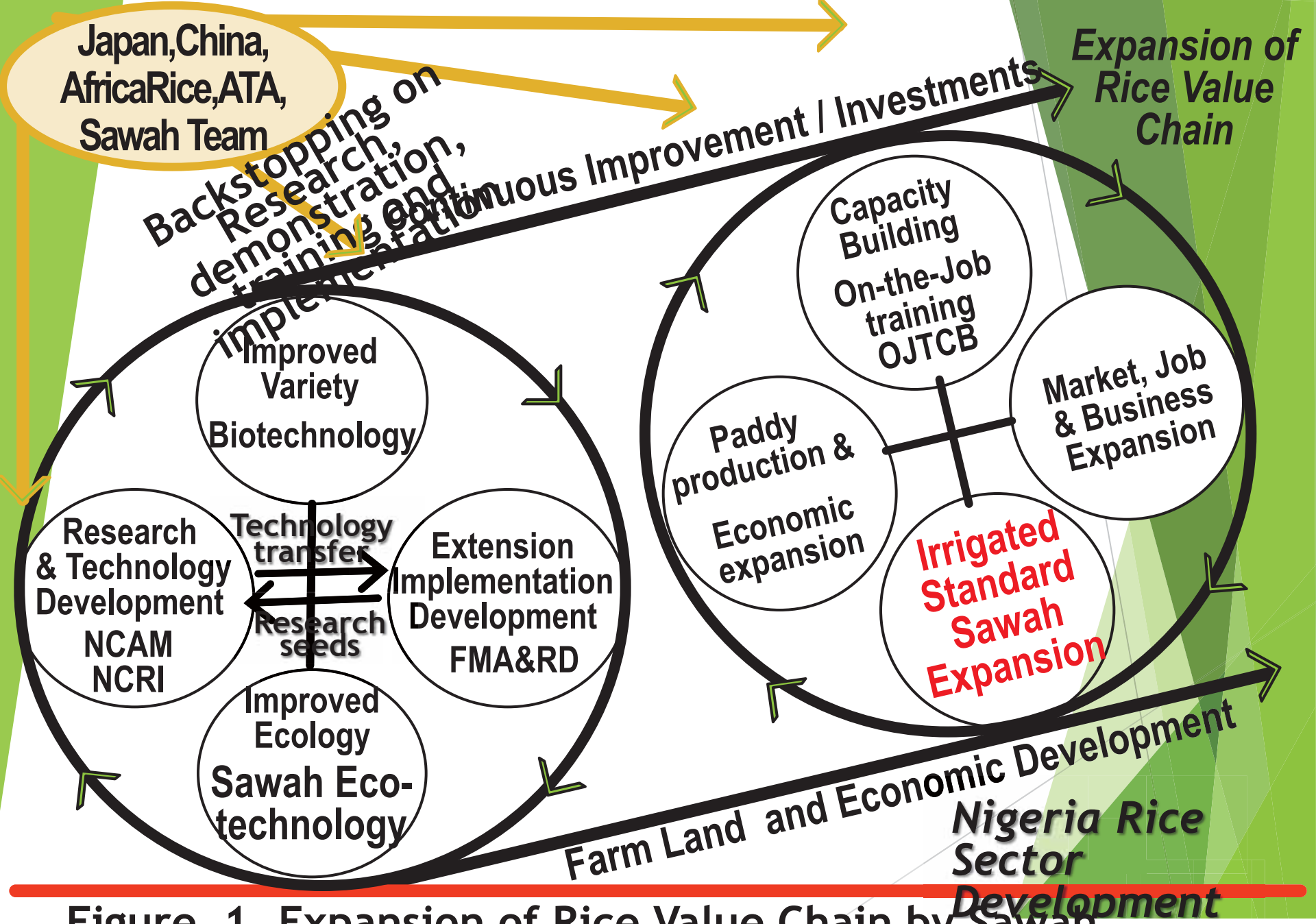
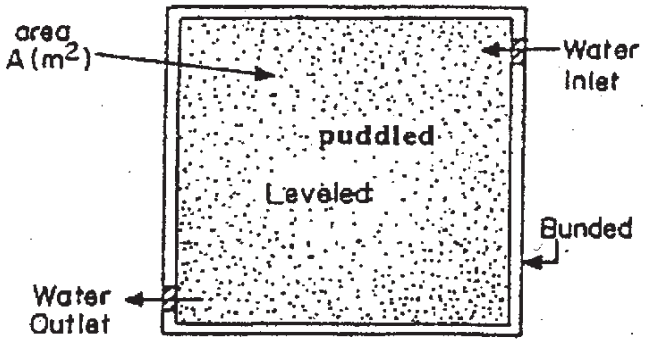
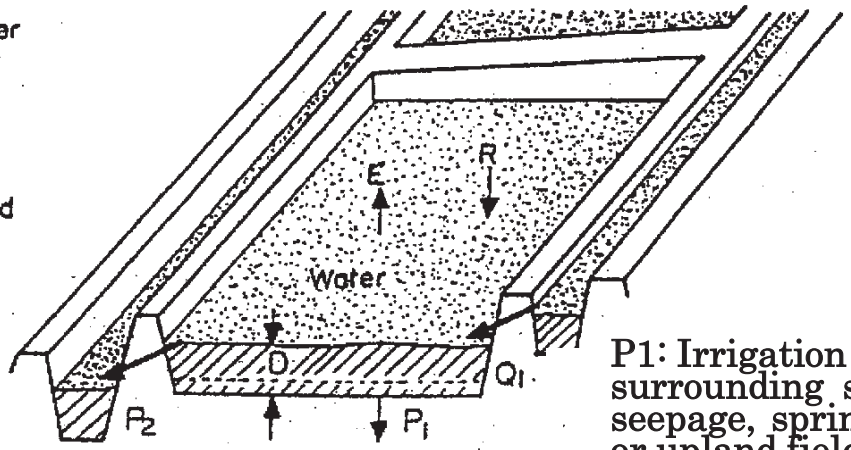


Figure 1. Expansion of Rice Value Chain by Sawah Technology

Quality of Sawah determines the quality of water control, then quality of soil management and performance of various agronomic practices for rice production





P1: Irrigation canal, surrounding sawahs, seepage, spring, and/ or upland fields

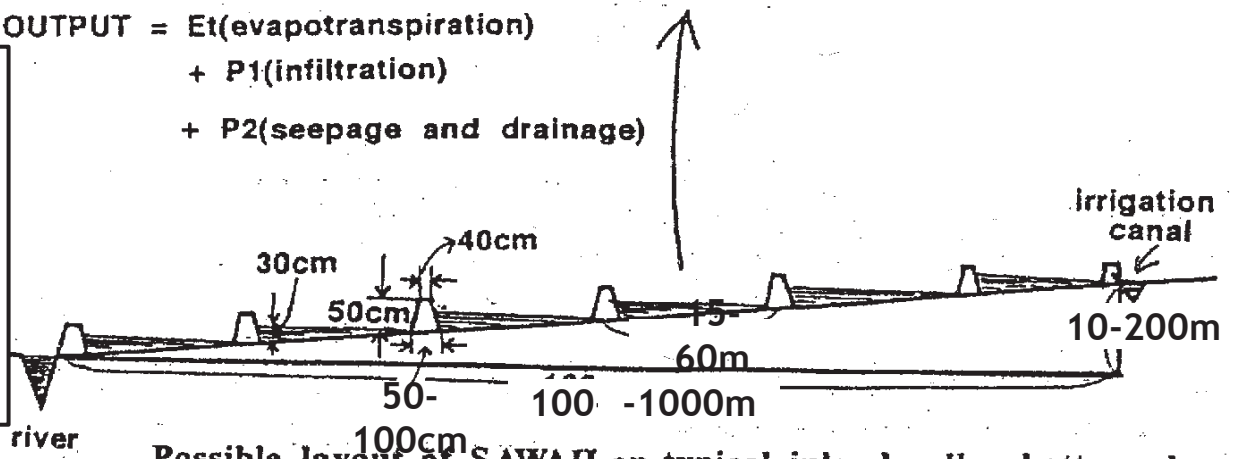
INPUT = R (rainfall)
+ Q1(seepage and irrigation)

Drainage canal, or surrounding sawahs

D = Depth of water

OUTPUT = Et(evapotranspiration)
+ P1(infiltration)
+ P2(seepage and drainage)

Quality of a Sawah was determined by the quality of leveling, bunding, puddling, and inlet/ outlet of water including ground water control functions, even if the same farmer, soil, and climate



Possible layout of SAWAH on typical inland valley bottom slope in West Africa

Figure . Sawah: A leveled, bunded, and puddled rice field with inlet of irrigation and outlet to drainage, thus control water and weeds as well as manage nutrients

New Sawah development in Biemso No.1 by Farmer to farmer with SRI backstopping

WHAT IS POWER TILLER?

The power tiller is a multipurpose hand tractor designed primarily for rotary tilling and other operations on small farms. (Fashola and Ademiluyi, 2007)

Power tiller is the only power driven tool that is effectively being used for “Sawah” activities currently in Nigeria and Ghana.

It can carry out the following operations:

Ploughing, Puddling, Levelling, Bund making, Canal digging and Smoothening. It can also be used for transportation and powering post harvest equipments

Collaborative research in machinery application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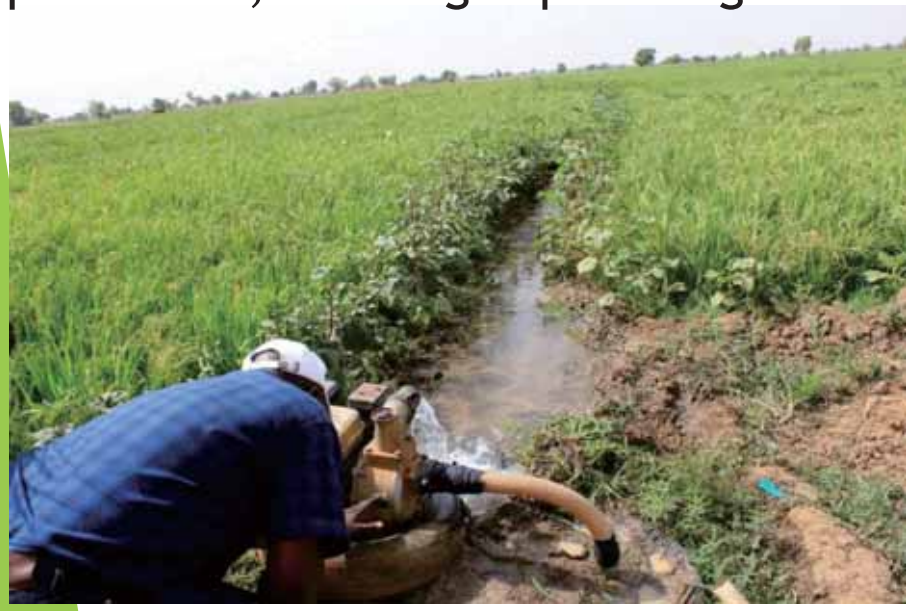
UN – IAS On-the-job training in Bida with Quick Kubota Power tiller on the 7th January, 2016 – 14th February, 2016.

Training Returnees with Sawah Eco-technology for dry season in Tissi – Haraze, Mangagne, Republic of Chad. Massamagne, 18th November, 2015 – till date. Pump irrigated rice fields of **Sawah Eco-technology** with a square bund of 20 – 25m with good bund making, leveling, puddling and water management.

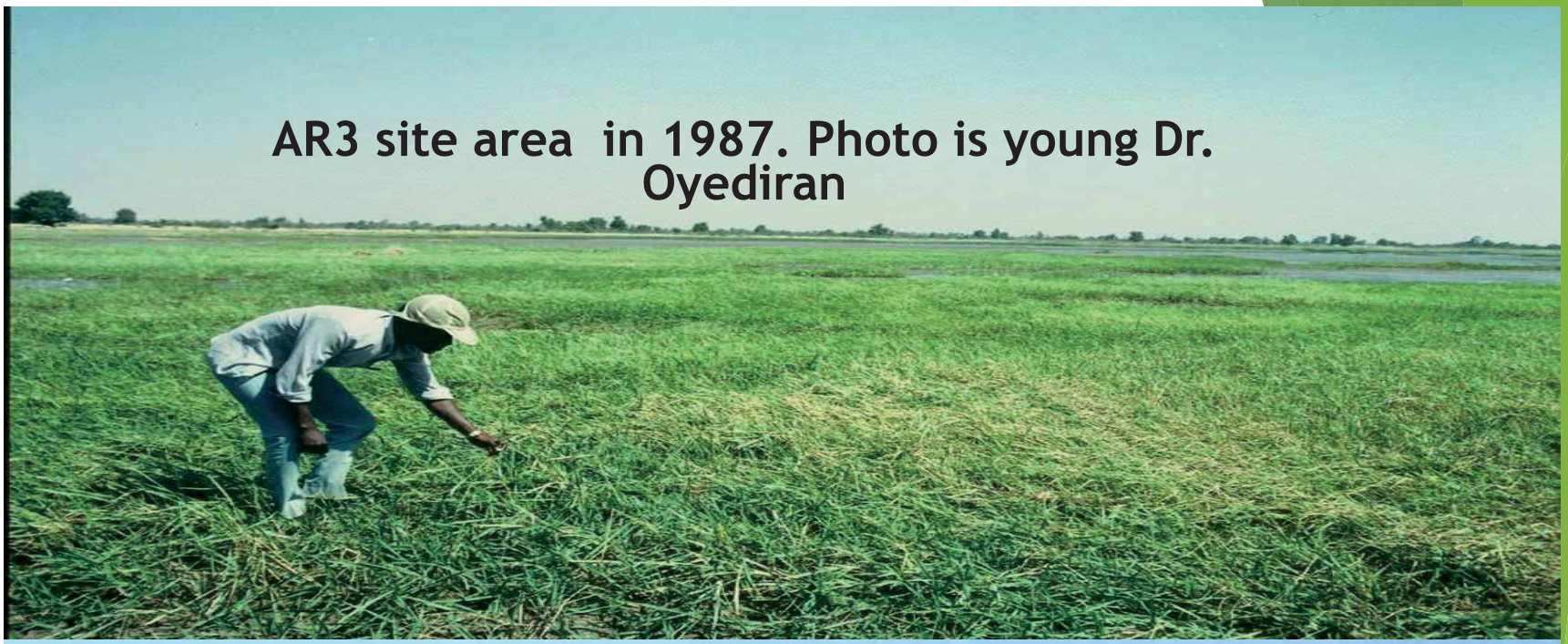
Transplanted Basins in Tissi – Haraze, Mangagne, Republic of Chad.

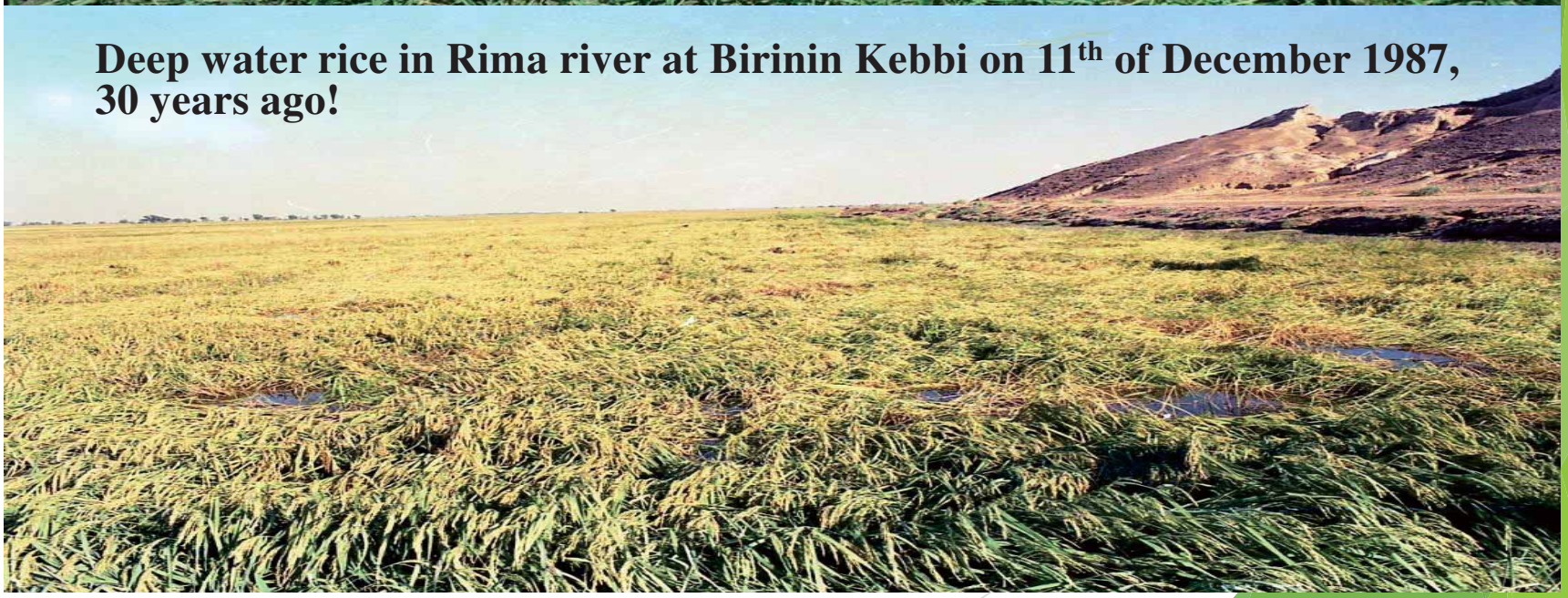
The Sawah system is the basic infrastructure for intensive and sustainable rice production for rice farmers (Kebbi 1st Year, 2011)

Sokoto, Kebbi, Borno, Nigeria, May-Sep, 2011. Pump irrigated rice & vegetable fields of **Rudimentary Sawah** with a square of side 3-8 m. Weedy rice field before Sawah technology, because of poor water use efficiency by poor bund, leveling & puddling



Fig, Sawah technology training and demonstration at Haraze, border town of Central Africa Republic, and Tissi, border of Sudan, during December 2015 to April 2016


AR3 site area in 1987. Photo is young Dr. Oyediran


Deep water rice in Rima river at Birinin Kebbi on 11th of December 1987, 30 years ago!

Visit of Kubota team from Indonesian to NCAM for the testing of G1000 Boxer Power tiller in Nigeria soil.

Sensitization of farmers and demonstration of Indonesian G1000 Boxwer's in Kebbi State for ploughing and puddling. Plough can help bunding (10th Jul 2015).

Using G 1000 boxer power tiller for scooping of an existing canal.

An already transplanted of a well prepared field with G 1000 boxer power tiller.

Indonesian G1000 Boxwer's puddler, leveler and plough. Plough can help bunding (24th Jul 2015), Niger State, Nigeria

Indonesian G1000 Boxer can move soil 25m for leveling(10th Dec 2015)

Kebbi Rice Revolution: ① 2011-12: 20ha Sawah produced 120 tons of paddy, ② 2013/14, 22 sets of powertillers were bought by farmers to develop 326ha sawah and 2100 tons paddy, ③ Kebbi state Governor bought 1000 set of power tillers in 2014 to supply farmers to develop >10,000ha of sawah and produce >100,000 tons of paddy

15 ha of sawah developed by Mr. Abdullahi Maigandu Arugungu

June 2014

35 ha of sawah developed by Alh. Bello Baidu at Bagudo, Niger river floodplain

THANKS FOR LISTENING.