LE UNIVERSITÀ PER EXPO 2015
COMITATO SCIENTIFICO DEL COMUNE DI MILANO
Joint ICC/AISTEC Conference at the World Expo Milan 2015
"Grains for feeding the world"
1-3 July 2015, Milan, Italy

Enhancing the Productivity of Maize by Resource-Poor Farmers in Ghana Using Effective Technology Dissemination System

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Abstract
Effective dissemination of proven and appropriate technologies (ATs) is key to the sustainable food production systems in Africa including Uganda, Ghana and Ethiopia. This paper discusses the capacity building among farmers and Agricultural Extension Officers (AEOs) in Ghana using Farmer Field School (FFS) as a tool for dissemination of the proven ATs. Farmer field school was organized for 26 maize farmers from different Farmer Associations in Ghana to train them on modern trends in maize farming. The yield from the model farm was higher (24% and 14%) for *Omankwa* and *Abrohoma* maize varieties, respectively) than that from farms where traditional farming practices were employed.
Key words: Farmer Field School, Dissemination, Maize, Approved Technologies.

Introduction
Substantial research aimed at improving agricultural output has been carried out in Ghana. However, the desired impact has not been maximally realized due to poor dissemination of research findings to the major stakeholders in the supply chain of various food crops. The project "*Strengthening Innovations and Technology Dissemination for Sustainable Development in Cereals, Cocoa and Coffee Value Chains in Western and Eastern Africa*" (SATTIFS), aims at building capacity in science, technology, and innovation in the production of maize, rice, coffee and cocoa within the study regions and to boost food security and socio-economic development. This is done through dissemination of proven and appropriate technologies (ATs) in food production systems in Uganda, Ghana and Ethiopia. The overall goal of the project is to contribute to build and strengthen Science, Technology and Innovation (STI) capacities in the agricultural sector of Western and Eastern African countries to enhance food security and socio-economic development. This paper discusses the capacity

building efforts being carried out among farmers and Agricultural Extension Officers (AEOs) in Ghana. Farmer Field School (FFS) has been utilized as a tool for disseminating proven ATs. The initial findings of the FFS in maize production in the Brong Ahafo Region of Ghana are presented.

Materials and Methods

Having successfully conducted a baseline survey of potentially exploitable knowledge and technologies in maize and cocoa production, 26 farmers from five Farmer Associations were selected to participate in the FFS. Toward this goal, training was organised for the farmers and AEOs, who were then resourced to grow maize on a model farm. The farmers were encouraged to replicate farm practices learned at the FFS on their individual farms and also train their colleagues on the ATs. The yields from the FFS were then compared with those who did not use all the methods prescribed. The farmers and AEOs undertook an initial training on the organisation of FFS where the proven knowledge and ATs were discussed in detail. These included selection of site, selection of high yield, drought and disease resistant seeds, proper land preparation, correct timing of planting, weed control, fertilizer application, disease and pest control as well as harvesting. A production protocol (see table 1) describing all the activities to be undertaken with specific time frames was drawn up. Three different varieties of maize namely *Obaatanpa*, *Abrohoma* and Yellow Maize were planted on the model farm.

Tab. 1: Production protocol of maize at Tanoso and Nkoranza Demonstration Farm

Date	**Activity**
18th August, 2014	Land clearing
19th August, 2014	Application of organic manure (fowl droppings)
20th and 21st August, 2014	Gathering of weeds and field layout demarcation
23rd August, 2014	Ploughing
23rd August, 2014	Field inspection and interaction with 10 farmers
25th August, 2014	Planting
4th and 5th September, 2014	1st weeding
8th September, 2014	1st fertilizer application
24th– 26th September, 2014	2nd weeding
29th September, 2014	2nd fertilizer application
30th and 31st October, 2014	3rd weeding (earthing-up)
23rd December, 2014	Harvesting
3rd January, 2015	Threshing and bagging

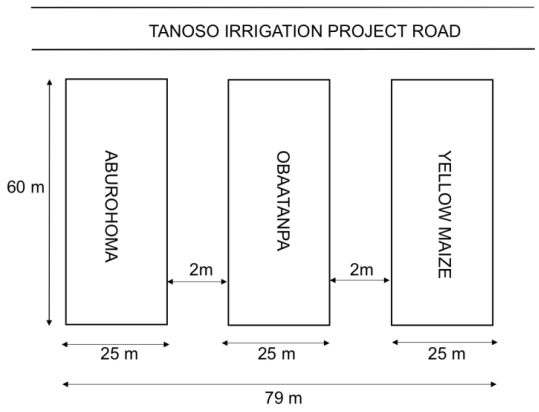
Site and Seed Selection

Maize is a versatile crop that does well in all the ecological zones in Ghana. A well drained loamy soil was selected for cultivation at Tanoso and Nkoranza. For good yield, quality seeds must be obtained from certified sources. The seeds of three maize varieties (*Omankwa, Obaatanpa and Aburohoma*) were obtained from the Ministry of Food and Agriculture (MoFA).

Planting Patterns

The trial field was divided into three plots of 25 m x 60 m each with 2 m between plots as shown in figure 1. Maize was planted in rows at the onset of the rains to ensure good germination, easy weed and pest control. The seeds were planted in 5-7 cm deep holes and covered well with soil followed by stepping to prevent seed removal by birds and rodents. The recommended spacing of 90 cm between rows, and 40 cm between crops was used. This allows for about 56,000 crops (20 kg of seed) per hectare (Morris *et al.,* 1999)

Fig. 1. *Field layout of maize plot at Tanoso in the Techiman South District, Ghana.*



Fertilizer Application

Organic fertilizer was applied after clearing the land followed by the inorganic fertilizer, NPK, at planting. About 100 kg of NPK and 50 kg of Sulphate of Ammonia per acre, and 150 kg of NPK and 100 kg of sulphate of Ammonia per acre at 4 weeks were applied (Kluste *et al.,* 2013).

Weed Control

Currently farmers in Ghana rely heavily on herbicides to control weeds on their farms (Katinila *et al.,* 1998; Morris *et al.,* 1999; MoFA, 2012). The SATTIFs project team intentionally agreed on manual weed control as opposed to chemical herbicide application in order to discourage the rural farmers from the indiscriminate use of agro chemicals.

Pests and Diseases

The most serious diseases affecting maize in Ghana are the maize streak, maize rust, maize smut, leaf blight, and downy mildew (Morris *et al.*, 1999; Kluste *et al.*, 2013). The major pests of maize are maize stem borers, army worms, the larger grain borers and grain weevils. There was no application of pesticides for pest and disease control. Good husbandry practices and regular monitoring were used for prevention of pest and disease attack.

Results and Discussion

Scientifically approved farming technologies have been demonstrated to farmers through FFS approach where farmers actively participated in joint learning. No pests or diseases were observed on the farm. The yields from the model farm was higher than that from farms that did not use the approved methods (table 2) though they were a little below the theoretical yield expected due to erratic of rains.

Tab. 2: Yield Analysis Results from Nkoranza FFS during minor season

Name of Farmer	**Maize Variety (grain weight) kg± standard deviation**		
	Omankwa	***Obataanpa***	***Abrohoma***
FFS Farm	14.6± 1.3	12.2± 1.4	10.6± 1.2
Traditional farms (n = 5)	9.6 ± 1.7	8.2±1,2	7.4 ± 1.9

Over the past two planting seasons, the SATTIFs team has experienced the impacts of climate change on maize cultivation in Ghana. Most of the farmers had very poor harvests in the major planting season due to poor rainfall pattern. It has been observed that the effects of decreasing rainfall hamper maize production (Kluste *et al.*, 2013) and differences were observed in as little as 1 week between planting times. Consequently, adaptation practices are high on our list of knowledge and ATs to be disseminated to farmers now and beyond the project cycle.

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