

# THE SAWAH TECHNOLOGY: A RICE PRODUCTION SYSTEM FOR EFFECTIVE WEED MANAGEMENT AND CROP PRODUCTIVITY

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## Abstract

Good soil and water management in the inland valley rice production system (Sawah Technology) improves weed management to increase productivity and profitability. Data were collected from rice farmers fields under traditional farming and Sawah systems in the inland valleys at Sokwai in the Ashanti region of Ghana and analysed. Treatments included 4 traditional farmers fields; (1), dibbling and weeding 2x; (2), dibbling and weeding 3x; (3) dibbling and weeding 1x; and 3 water management regimes under transplanted and once-weeded sawah system viz; (5), No standing water (soil at field saturation); (6) Low water level (up to 7cm); and (7) High water level (up to 24cm). Weed diversity, density, and biomass were higher in direct seeded (traditional farming) than transplanted rice (Sawah system). Weed densities and biomass were similar for treatments in both the sawah system and weeding two or three times in the traditional system but significantly different from weeding once in traditional farming. Plant height and panicle length were not influenced by cropping practices. There was no significant yield difference among treatments in the sawah system. These, however differed significantly from the traditional treatments. In the traditional system, weeding 2 or 3x gave similar yields but significantly better than weeding once. With very high Marginal Rate of Return (111.5%) and Value: Cost Ratio (26.56) the Sawah Technology was much more profitable.

## Introduction

Around 75% of Ghana's rice is produced by 78% of small to medium-scale farmers in rain-fed lowland/inland valley systems<sup>(1)</sup> which is characterized by alternate wetting and drying to exacerbate weed infestation. The average rice yield in this ecology is 2.0 t ha<sup>-1</sup>(<sup>19</sup>) but the achievable yield is 8.5 t ha<sup>-1</sup>(<sup>19</sup>). Weeds is the most serious biotic constraint limiting yield.<sup>(2)</sup> According to Johnson and Adesina about 40% of total labour (50-150 persons-day ha<sup>-1</sup>) is used for the crop.<sup>(3)</sup> Good soil and water management in the inland valley rice production system (Sawah Technology) improves weed management to increase productivity and profitability.

## Materials and methods

### Note!

- 1 Traditional farmers dibble randomly at a spacing of about 25cm to 35 cm and weed once, twice or three times.
- 2Sawah farmers transplant and weed once with differences in water management regimes (from field saturation to about 30 cm high water level)

### Treatments:

- 4 traditional farmers fields; (1), weeding 2x; (2), weeding 3x; (3) weeding 3x; (4) weeding 1x; and 3 water management regimes under once-weeded sawah system viz; (5), No standing water (soil at field saturation); (6) Low water level (up to 7cm); and (7) High water level (up to 24cm).

### Data collection:

- Sampling unit = 1m x 1m  
Sample size/Replicate = 3 times the sampling unit  
Sample size/treatment =9 times the sampling unit

## Traditional farming vrs Sawah Technology

Poor drainage in Traditional farming system



Bunded and levelled field with inlet and outlet for irrigation and drainage (Sawah technology)

Weedy rice field (traditional farming)



A weed-free rice field (Sawah)



Rice field is very weedy at maturity in the traditional system when weeded once



Sawah field stays clean 4 days after harvest of rice

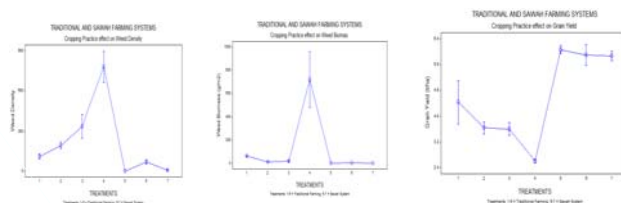


Sawah rice production gives higher yields and profitability



## Results

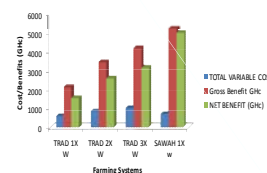
Weed diversity, density, and biomass were higher in direct seeded (traditional farming) than transplanted rice (Sawah system). Weed densities and biomass were not significantly different between sawah and the traditional farming of weeding twice or three times but were all significantly different from weeding once in traditional farming. Plant height and panicle length were not influenced by cropping practice. There was no significant yield difference among treatments in the Sawah system. These, however differed significantly from the traditional treatments.



In the traditional system, weeding 2 or 3x gave similar yields but significantly better than weeding once. With very high Marginal Rate of Return (111.5%) and Value: Cost Ratio (26.56) the Sawah Technology was much more profitable.

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### Marginal Analysis for Traditional Farming and Sawah system



TREATMENT	TOTAL VARIABLE COST (GH¢)	NET BENEFIT (GH¢)	DOMINANCE
TRAD 1X W	594	1566	D
SAWAH 1X W	701	5001.4	*
TRAD 2X W	864	2601.6	D
TRAD 3X W	1044	3180	D

## MARGINAL RATE OF RETURNS

This is the % change in benefit over change in total variable cost in moving from a lower cost treatment to a higher one

- MRR for moving from Trad 1x w to Trad 2x w = 79.3%
- MRR for moving from Trad 1x w to Trad 3x w = 78.2%
- MRR for moving from Trad 1x w to Sawah 1x w = 111.5%

## Value: Cost Ratio

This is the value of yield increase due to input, divided by cost of additional input to achieve this (defines the profitability of treatments)

- Trad 2x w = 4.84
- Trad 3x w = 4.59
- Sawah 1x w = 26.56

## Conclusions

### Advantages of the SAWAH Technology

- High cropping intensity (3x a year)
- High productivity (controlled irrigation and drainage allows for introduction of other crops into the cropping system)
- Reduces weed incidence to enhance rice/weed competition, crop performance and grain yield
- Cuts down costs by weeding only once
- Very high productivity and profitability