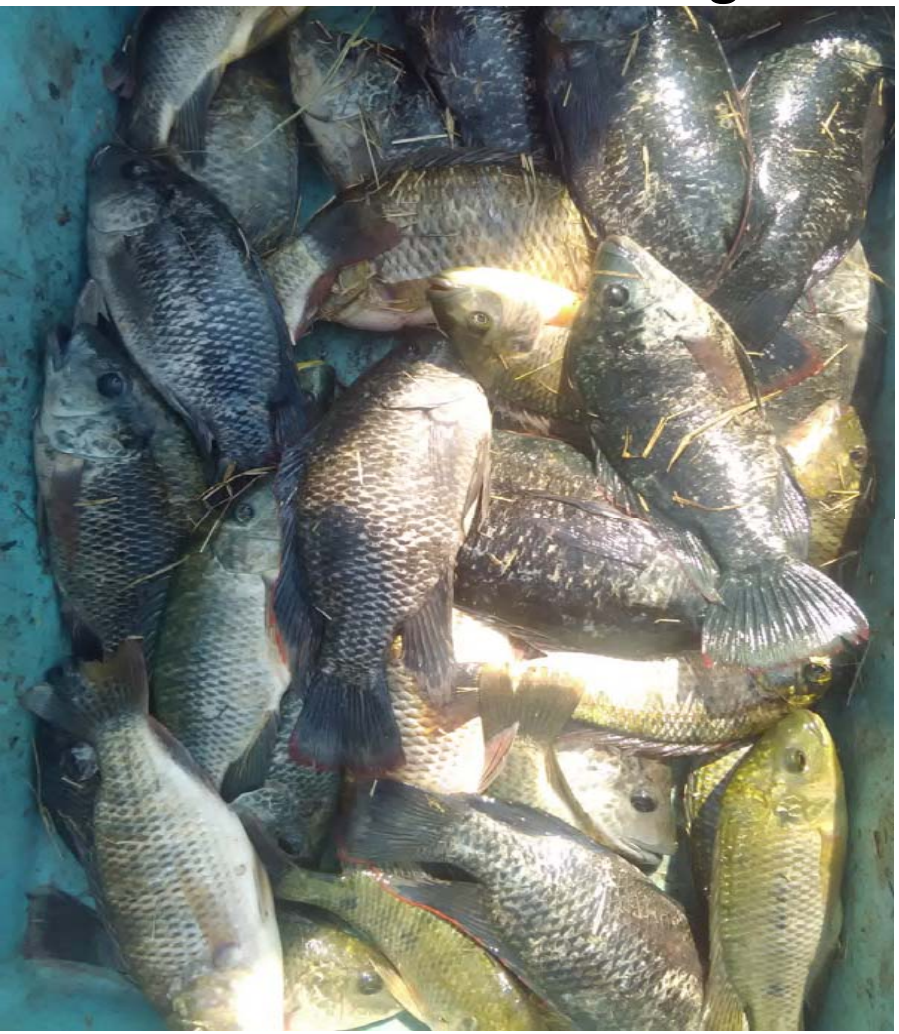
# Assessing economic efficiency of fish-cum-vegetable integrated agriculture aquaculture system.



Project report

By

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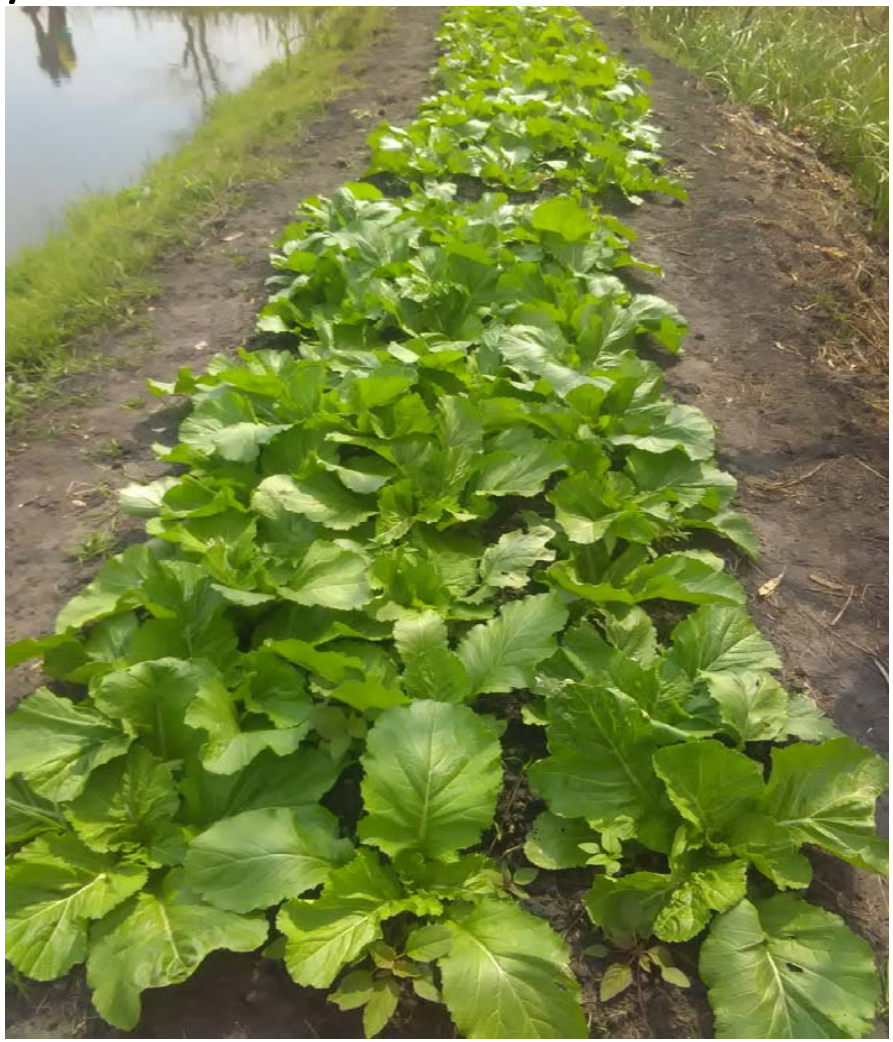


# Introduction

- In Malawi farmers grow a diverse number of crops ranging from cereals and legumes to vegetables.
- These resources are not optimally combined to produce high yields. As a result, farm productivity, economic efficiency and sustainability are low.
- IAA optimizes the use of resources in production unit resulting in low production cost, increase of profit in production unit and also it leads to greater efficiency of output (Nnaji *et al*., 2003).
- There has been uncertainty as to whether small-scale IAA fish farmers operating in Malawi are efficient in the production of fish and vegetables.

# Specific objectives

Specifically the study intends to:

- Assess Return on Investment of fish-cum-vegetable integrated agriculture aquaculture systems as compared to stand alone system.

- Assess Technical, Allocative and Economic efficiency of fish-cum-vegetable integrated agriculture aquaculture system as compared to stand alone system.

# Efficiency measures

- **Return on investment** (ROI) is a financial measure used to monitor performance.
- It is a simple calculation in which the benefit (return) of an investment is divided by the cost of the investment and the result is expressed as a percentage or a ratio. (Preuss 2016).

- **Technical Efficiency** (TE) measures the ability of a DMU to produce the maximum feasible output from a given bundle of inputs.

- **Allocative efficiency** (AE) measures the ability of a technically efficient DMU to use inputs in proportions that minimize production costs given input prices.

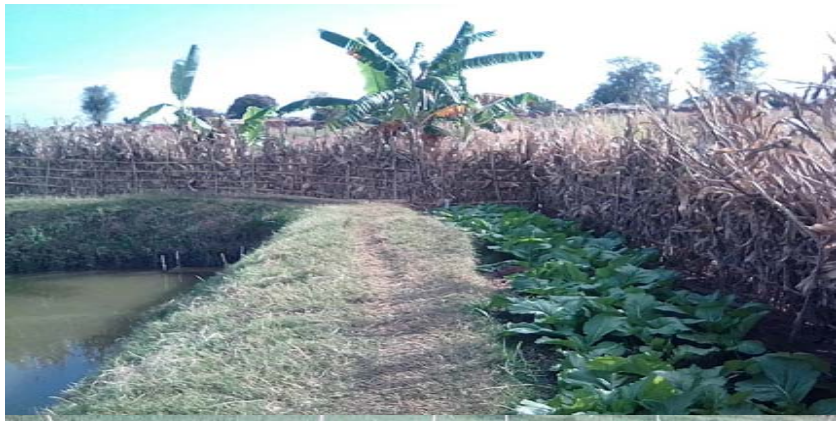
- **Economic efficiency** (EE)/(CE), is the product of both Technical Efficiency and Allocative Efficiency (Farrell, 1957). a Decision-Making Unit is economically efficient if it is both technically and allocatively efficient.

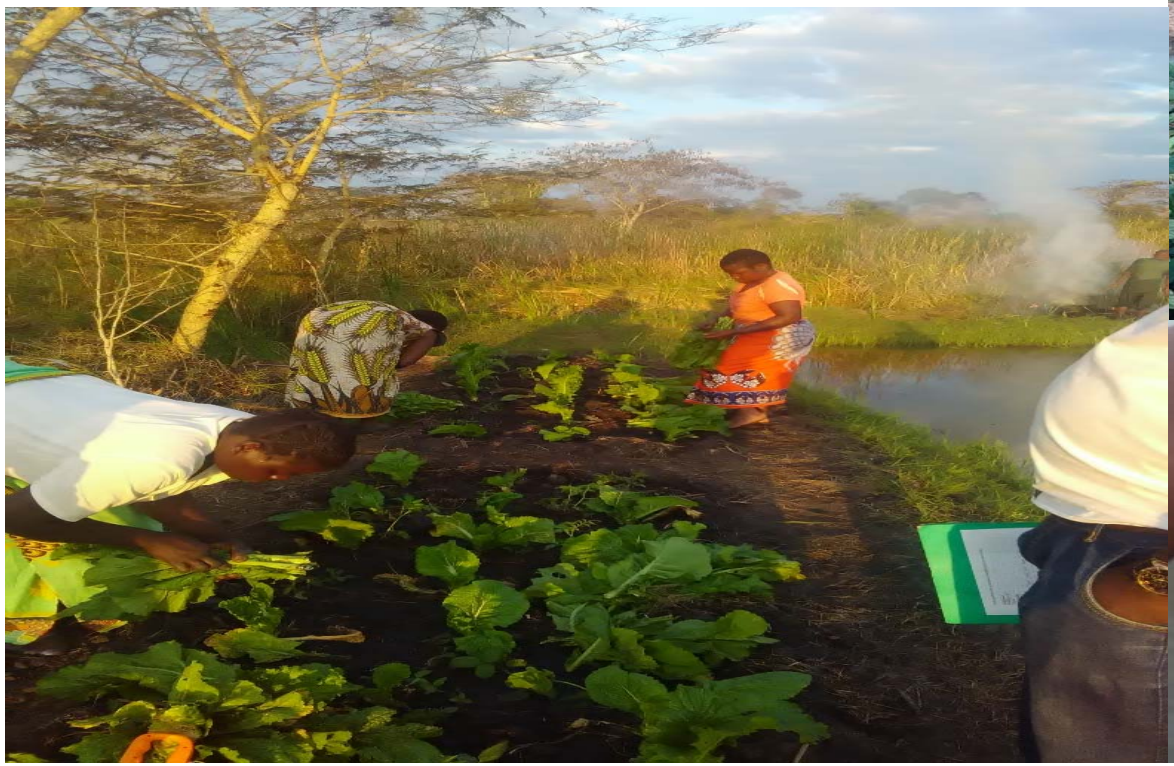
# ranges of technical, allocative and cost efficiency (Laha, 2011)

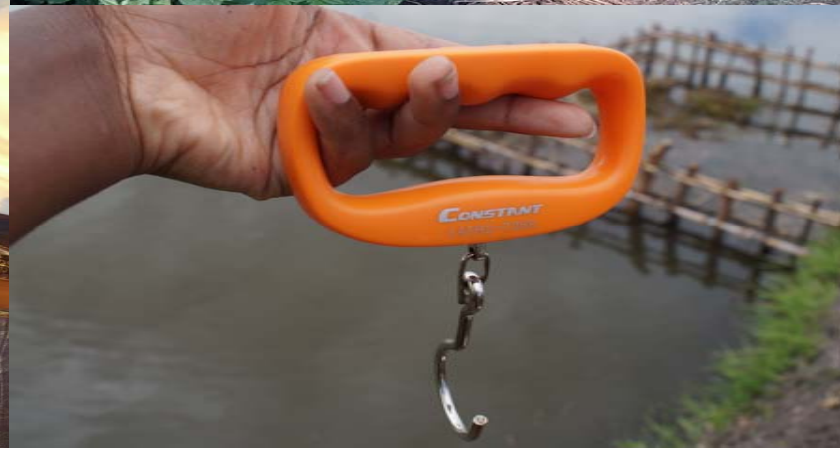
| | | |
|---|---|---|
| Efficient resource use | : | TE, AE, CE = 1 |
| Little inefficiency | : | $0.9 \leq$ TE, AE, CE $< 1$ |
| Moderately efficient | : | $0.7 \leq$ TE, AE, CE $< 0.9$ |
| Inefficiency | : | TE, AE, CE $< 0.7$ |

# Experimental design

Trt 1- Fish only system
Trt 2- Fish-*Amaranthus* IAA
Trt 3- Fish- *Brassica Juncea*







# Results
# Return on investments

| | Nkhotakota | | Mchinji | |
|---|---|---|---|---|
| Treatment | Mean (MK) | Std. Dev | Mean (MK) | Std. Dev |
| Non-IAA | -0.55 | 0.11 | -0.04 | 0.45 |
| Fish- *Amaranthus* IAA | 6.02 | 3.48 | 3.80 | 1.02 |
| Fish- *Brassica Juncea* IAA | 7.18 | 2.68 | 7.86 | 3.33 |

# Efficiency etimates in Nkhotakota

| Typeof efficiency | Non-IAA | | Fish-Amaranthus IAA | | Fish-Brassica IAA | |
|---|---|---|---|---|---|---|
| | Average efficiency level | Standard deviation | Average efficiency level | Standard deviation | Average efficiency level | Standard deviation |
| TE | 0.53 | 0.05 | 0.37 | 0.11 | 0.63 | 0.02 |
| AE | 0.45 | 0.05 | 0.90 | 0.07 | 0.76 | 0.20 |
| CE | 0.24 | 0.02 | 0.33 | 0.10 | 0.47 | 0.13 |

# Efficiency estimates in Mchinji

| Typeof efficiency | Non-IAA | | Fish-Amaranthus IAA | | Fish-Brassica IAA | |
|---|---|---|---|---|---|---|
| | Average efficiency level | Standard deviation | Average efficiency level | Standard deviation | Average efficiency level | Standard deviation |
| TE | 0.92 | 0.12 | 0.55 | 0.08 | 0.78 | 0.25 |
| AE | 0.49 | 0.05 | 0.74 | 0.18 | 0.91 | 0.10 |
| CE | 0.46 | 0.09 | 0.40 | 0.09 | 0.71 | 0.26 |

# Comparisons of efficiency levels between Nkhotakota and Mchinji

| Type of efficiency | Nkhotakota | | Mchinji | |
|---|---|---|---|---|
| | Average efficiency level | Standard deviation | Average efficiency level | Standard deviation |
| TE | 0.51 | 0.13 | 0.75 | 0.22 |
| AE | 0.70 | 0.22 | 0.71 | 0.21 |
| CE | 0.35 | 0.13 | 0.52 | 0.21 |

# Fish growth parameters

| Mchinji | | | | Nkhotakota | | |
|---|---|---|---|---|---|---|
| **parameter** | Fish-only | Fish-Amaranthus IAA | Fish- Brassica IAA | Fish-only | Fish-Amaranthus IAA | Fish- Brassica IAA |
| **Initial weight** | 6.371± 0.225[a] | 5.962± 0.215[a] | 6.602± 0.226[a] | 6.429± 0.226[a] | 6.311± 0.210[a] | 5.754± 0.228[a] |
| **Final weight** | 78.130± 3.914[a] | 71.830± 2.623[a] | 81.230± 3.139[a] | 74.73± 2.213[a] | 82.49± 2.964[b] | 69.24± 1.814[a] |
| **Mean weight gain** | 71.780± 3.944[a] | 65.860± 2.628[a] | 65.860± 2.628[a] | 68.30± 2.223[a] | 76.18± 3.002[b] | 63.49± 1.829[a] |
| **Specific Growth Rate** | 0.596± 0.014[a] | 0.601± 0.012[a] | 0.625± 0.013[a] | 0.5919± 0.012[a] | 0.6187± 0.012[a] | 0.6033± 0.010[a] |
| **Survival rate** | 90.500± 3.892[a] | 91.560± 3.772[a] | 87.310± 2.679[a] | 85.42± 3.150[a] | 88.83± 1.787[a] | 85.20± 5.708[a] |

# Conclusion

- Fish-*Brassica Juncea* system had the highest Return on Investment values as compared to the other two systems.
- Fish-*Brassica Juncea* IAA had the highest efficiency scores seconded by the fish-Amaranthus IAA system in both allocative and economic efficiency measurements.
- IAA technology improves the efficiency of the traditional aquaculture system.
- This is an indication that although the study was conducted on farm and managed by small scale farmers, but they have shown to be fairly efficient in the use of their resources.
- Expansion in their present level of production would bring down the cost of production per output to achieve full efficiency.

# Challenges

- commitment
- Management

Thank you