FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

ILSSI Project

Research Results and Outcomes

Presented by Dr. W. Mbungu

ILSSI Stakeholder Consultation – Dar es Salaam - 17th May 2018

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THE BORLAUG INSTITUTE for International Agriculture
TEXAS A&M AGRILIFE RESEARCH
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IFPRI INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE sustainable solutions for ending hunger and poverty Supported by the CGIAR
IWMI International Water Management Institute
ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE
NORTH CAROLINA A&T STATE UNIVERSITY

RESEARCH AIMS

- Increase food production,
- Improve nutrition,
- Protect the environment and
- Accelerate economic development
- Institutional capacity building

METHODOLOGY

These have been conducted through:

1. Identification of Promising Small-Scale Irrigation Technologies to Increase food production, Improve nutrition in sustainable manner
2. Assessing the impact of water abstraction for irrigation on water resources
3. Data Collection and Field Testing for Promising Small-Scale Irrigation Technologies

METHODOLOGY

1. Identification of Promising Small-Scale Irrigation Technologies

- Two sites were identified as potential areas (Rudewa and Mkindo)
- Stakeholders were identified through village government and extension officers
- Vegetable production irrigation were found to have higher economic return
- Irrigation technologies: Motor pump irrigation (economic) and pocket garden (household nutrition)

METHODOLOGY

2. Data Collection and Field Testing:

- The study was divided in 3 work packages (WPs)

WP1: Assessing the feasibility of small motorized pumps for dry season irrigation of vegetables and improving irrigation water productivity of the irrigated vegetables

WP2: Assess the feasibility of pocket garden on improving water use efficiency and household nutrition

WP3: Water resources assessment and assessing the impact of the various small scale irrigation interventions on hydrological processes in the two watersheds, Mkindo and Rudewa-mbuyuni

Capacity development (under graduates, Master and PhD students)

METHODOLOGY

WP1: Assessing the feasibility of small motorized pumps for dry season irrigation of vegetables and improving irrigation water productivity of the irrigated vegetables

- Experiments included research plots and farmers pump sharing groups
- Research plot with the aim for experimenting the productivity of irrigation water

METHODOLOGY

WP2: Assess the feasibility of pocket garden on improving water use efficiency and household nutrition

- A group of 10 women tested the technology
- Control plots were check basin (common practice)
- Amount of water, irrigation time and other agronomic practices were recorded
- Harvested vegetables were also quantified
- Nutrition were measured based on consumption

METHODOLOGY

WP3: Water resources assessment and assessing the impact of the various small scale irrigation interventions on hydrological processes in the two watersheds, Mkindo and Rudewa-mbuyuni

- Stream water level gauges were installed on both sites (downstream and upstream)
- Automatic level sensors were installed
- Weather stations were installed
- Daily data collection was conducted

METHODOLOGY

Capacity development (farmers, under graduates, Master and PhD students)

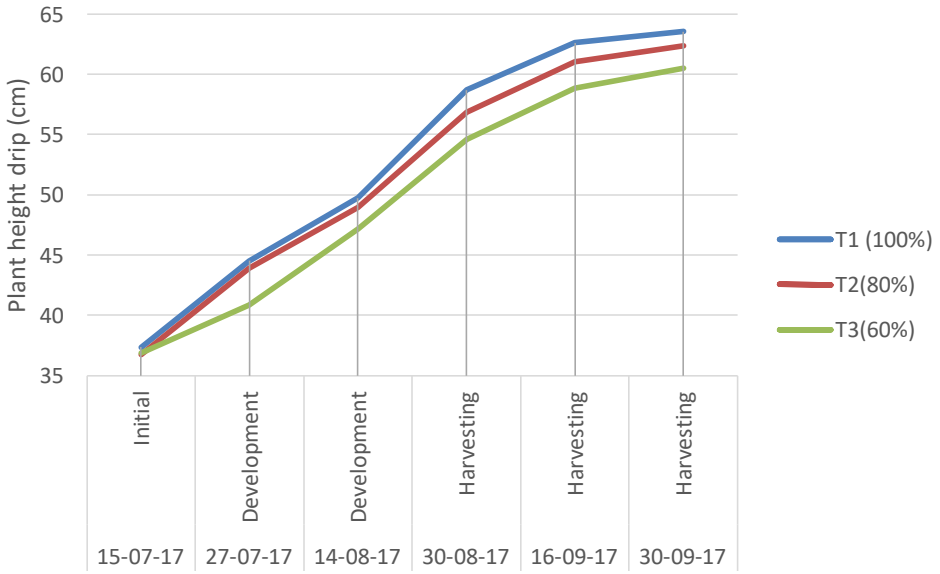
- Farmer groups were trained on motor pump irrigation and pocket garden management
- 14 undergraduate students for field activities i.e.
  - *4 - Dynamics of pump sharing among farmers*
  - *2 - Pocket garden and improved nutrition and income among female farmers*
  - *4 - Irrigation productivity and efficiency*
  - *4 - water abstraction and uses at watershed scale*
  - One Master student is working with social economic aspects
  - One PhD student is conducting his study on precision agriculture (application of Remote sensing in irrigation and nitrogen management)

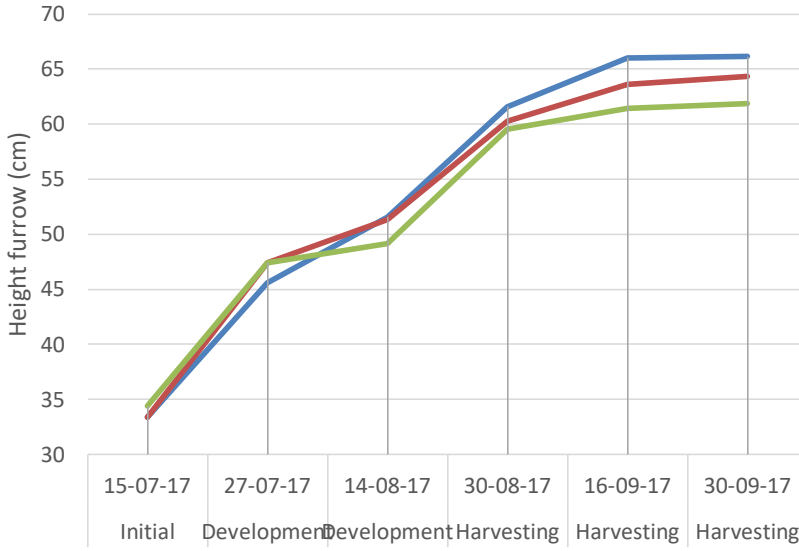
KEY RESEARCH FINDINGS

- Rudewa site had 3 farmer groups while Mkindo site had 2 groups
- Farmers worked in groups of 8 people per group
- Each group was given 1 pump on credit
- Challenges of managing groups
  - Unfaithfulness on financial management
  - Market instability
  - Dropouts
  - Crop deseases (eg. Fusarium wilt)
  - Water scarcity in some areas
  - Land ownership
  - Poor group management
  - Group composition

KEY RESEARCH FINDINGS

Seasonal African eggplant height (drip/furrow)





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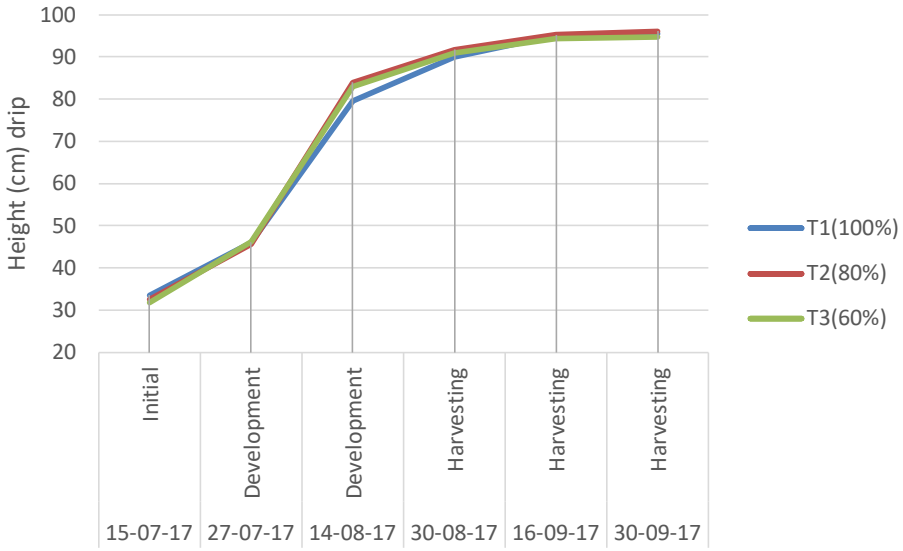
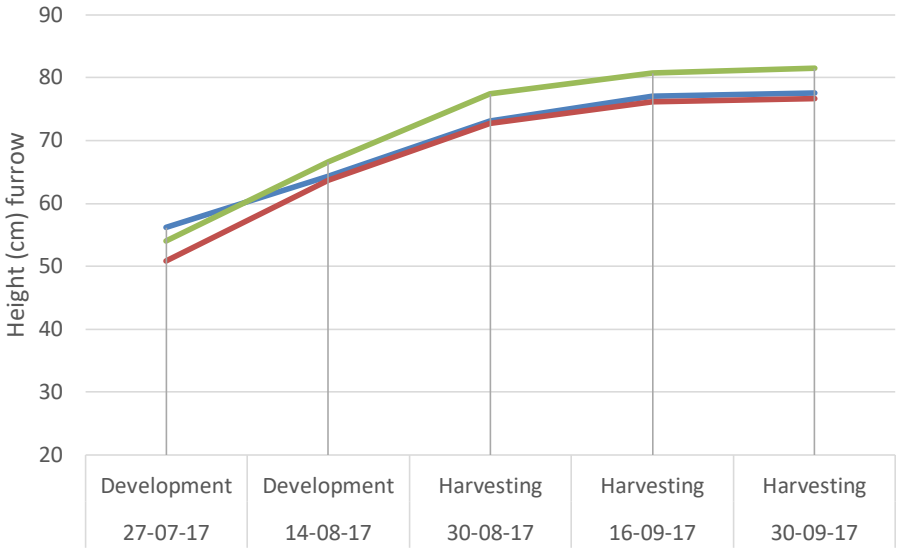
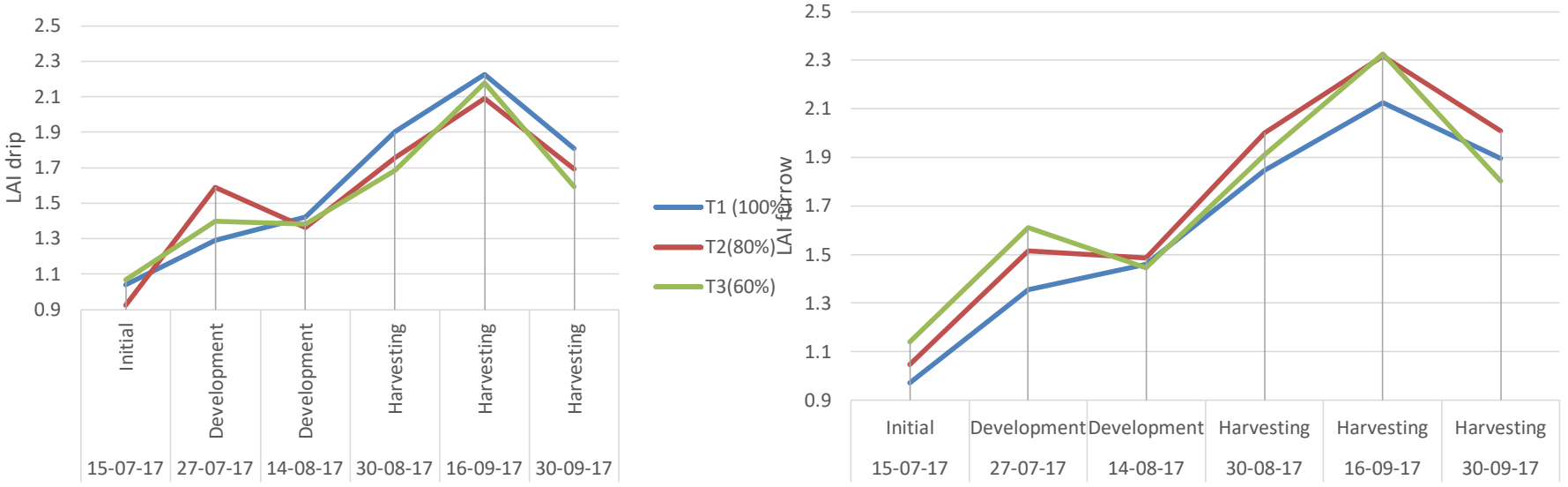
Seasonal tomato height (drip/furrow)





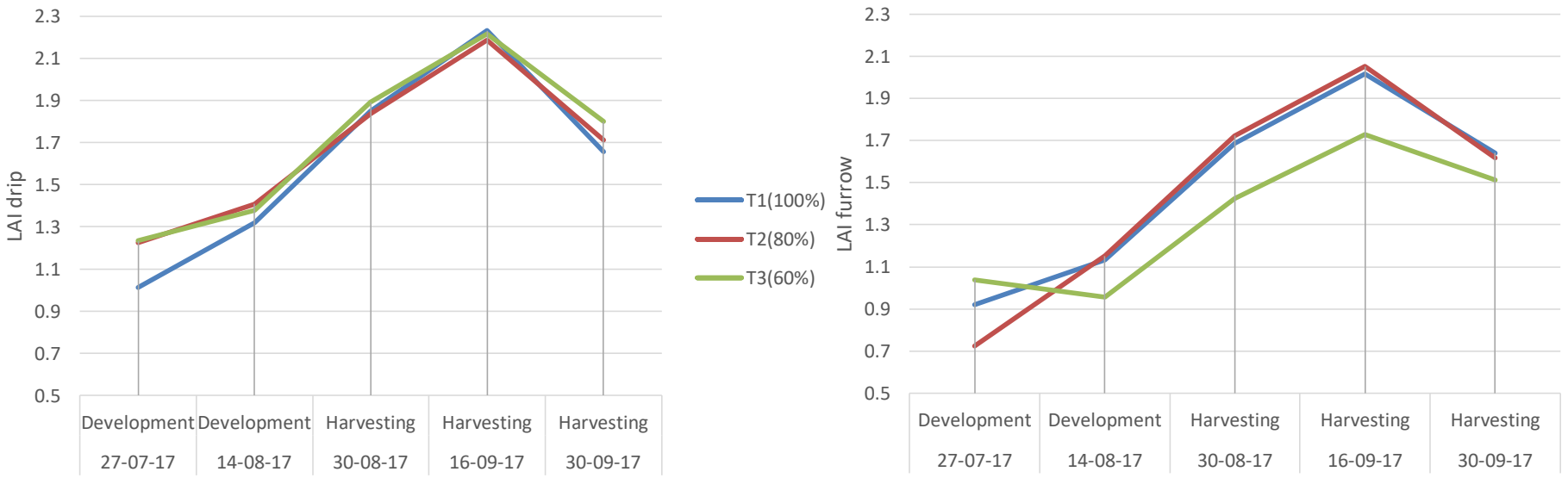
KEY RESEARCH FINDINGS

Seasonal African eggplant LAI (drip/furrow)



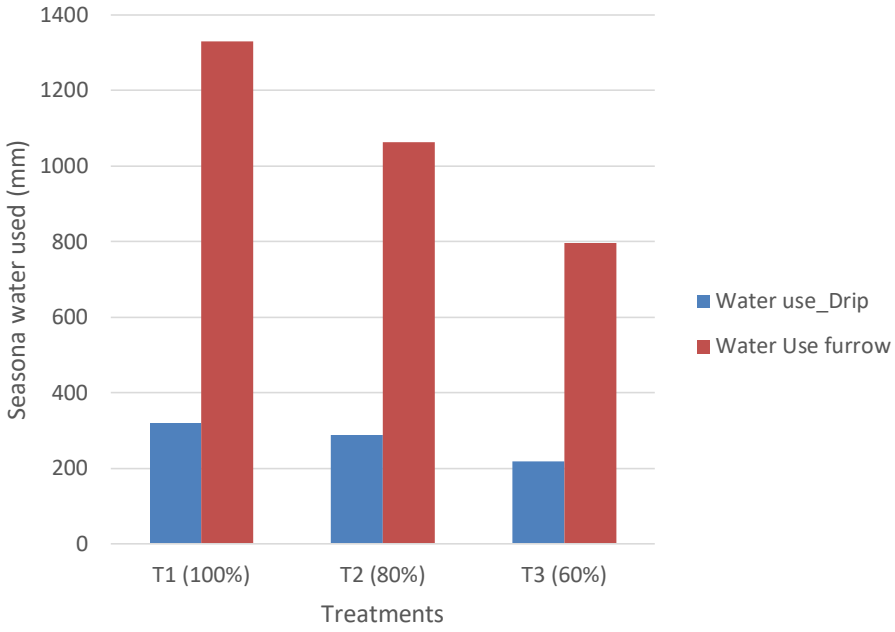
KEY RESEARCH FINDINGS

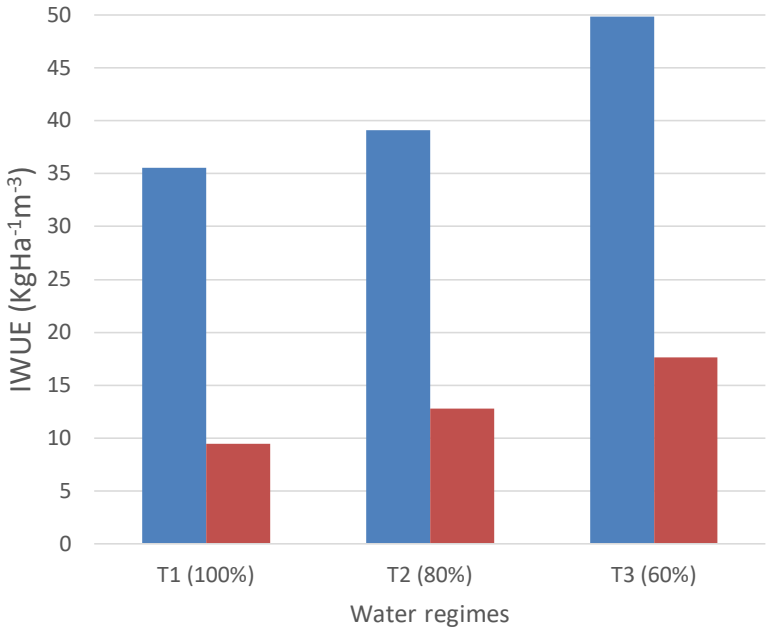
Seasonal tomato LAI (drip/furrow)



KEY RESEARCH FINDINGS

Seasonal irrigation water and IWUE for tomatoes



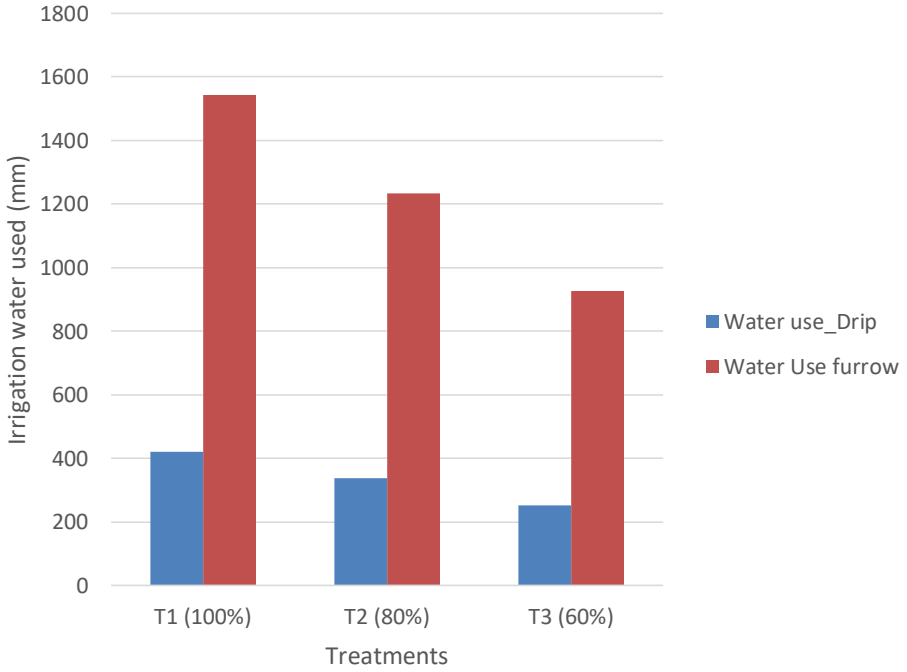


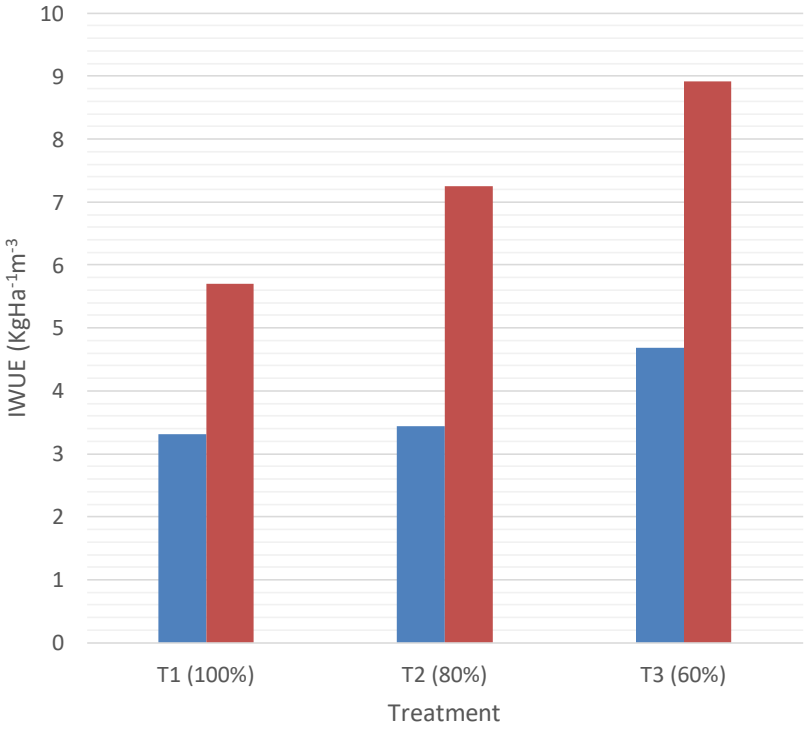
Furrow use 400%>>>drip

IWUE drip >>>> 300% furrow

KEY RESEARCH FINDINGS

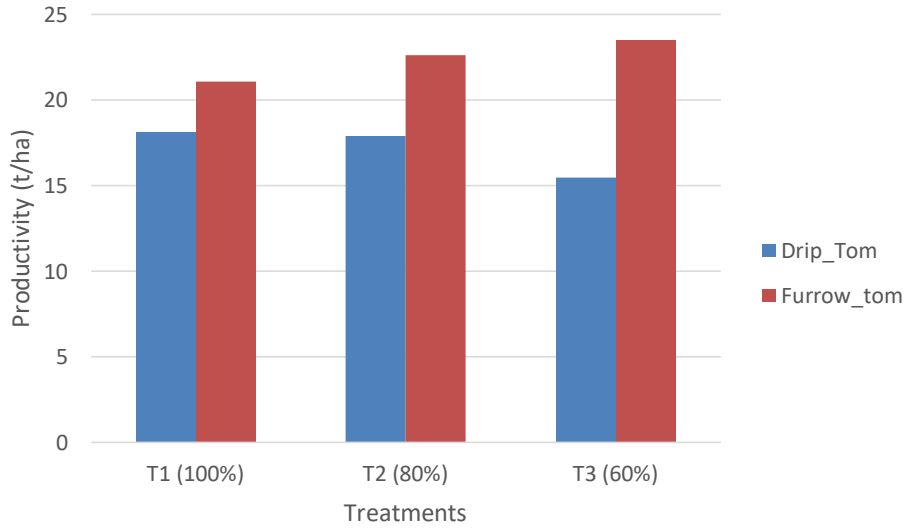
Seasonal irrigation water used and IWUE for African eggplant





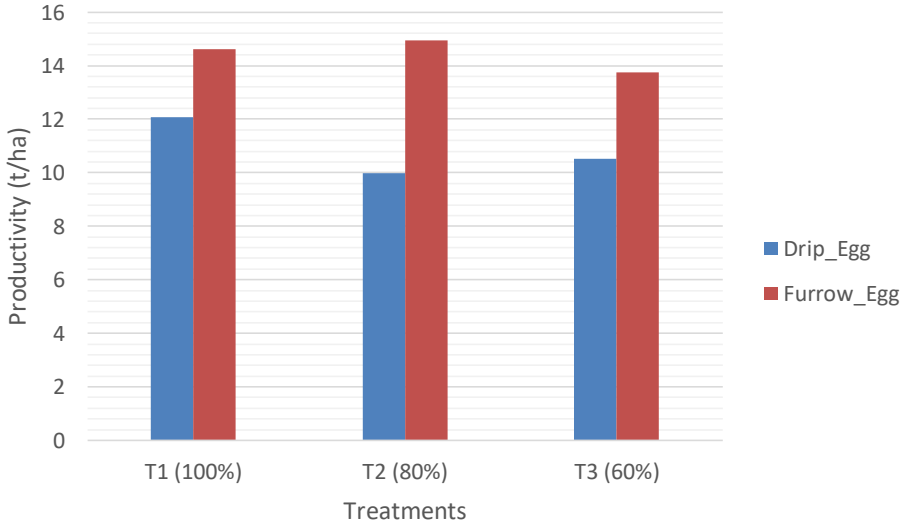
KEY RESEARCH FINDINGS

Seasonal productivity for tomatoes (drip/furrow)

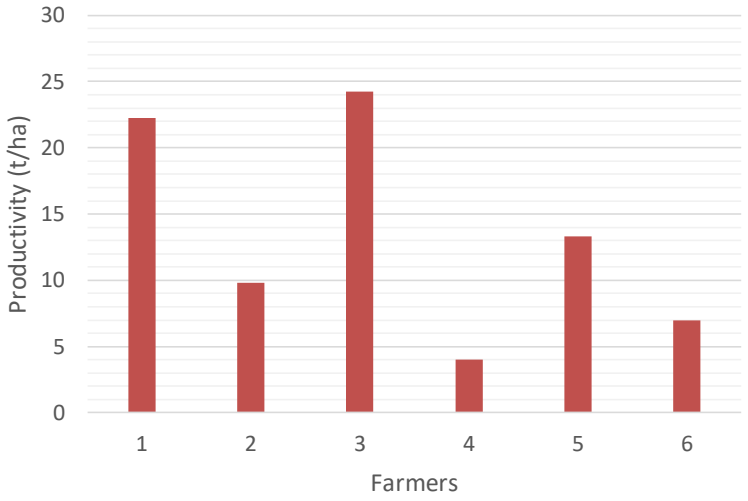


KEY RESEARCH FINDINGS

4. Seasonal productivity for African eggplant and farmers 1-6



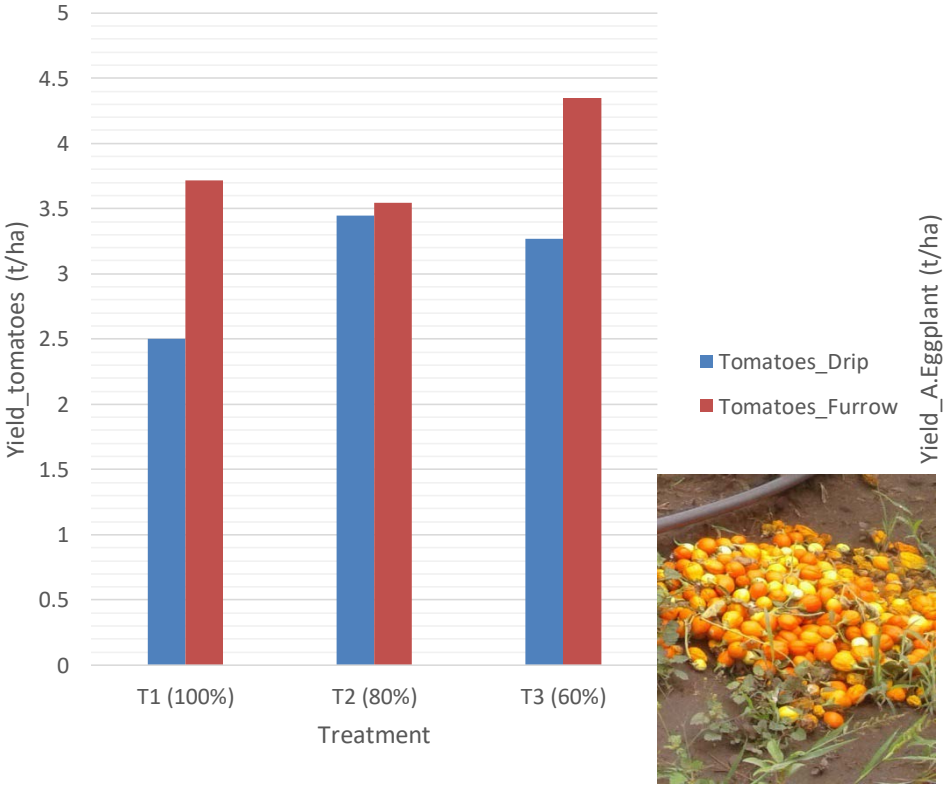
5 harvests (research plot)

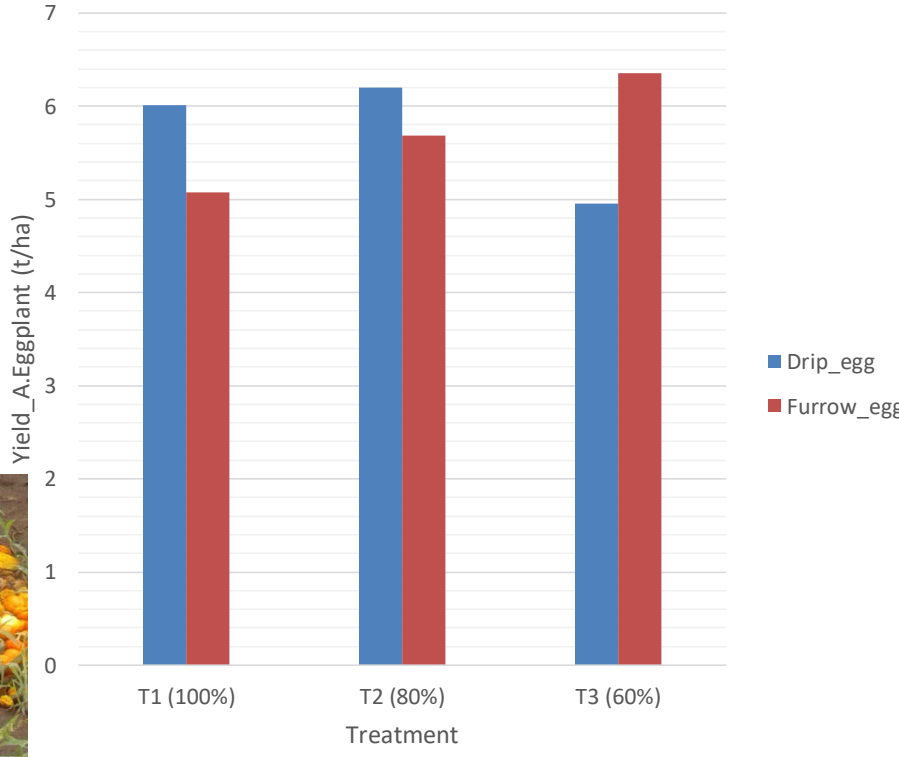


3 – 10 harvests (farmers) - furrow

KEY RESEARCH FINDINGS

7. Yield losses tomatoes vs African eggplant

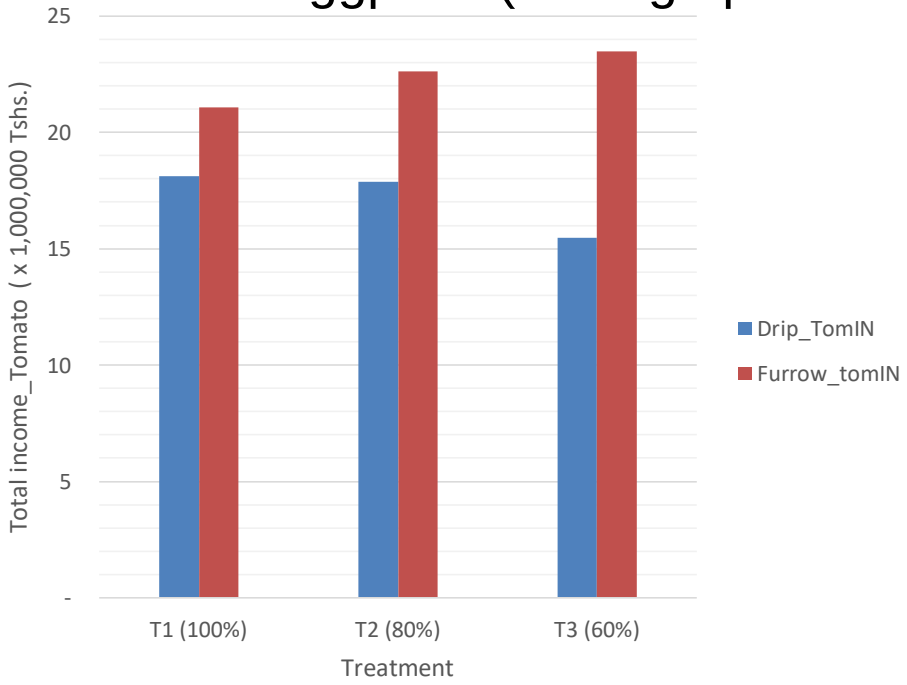


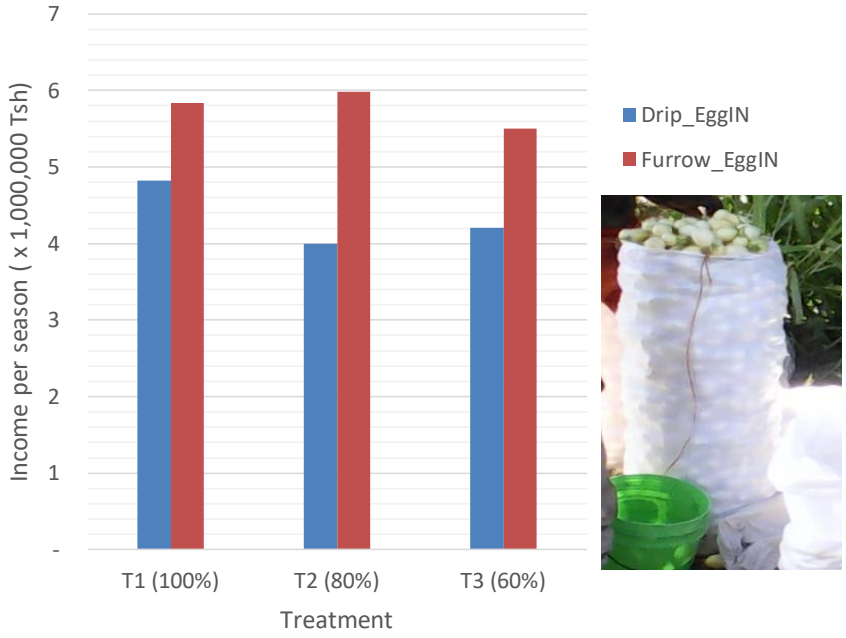


KEY RESEARCH FINDINGS

9. Income generated

- Tomato (average price = 15,000/15 kg) vs
- African eggplant (average price = 20,000/60 kg)





KEY RESEARCH FINDINGS

11. Cash flow in production (Tshs/Ha)

	African eggplant	Tomatoes
Costs (Tshs)	4,200,000.00	5,300,000.00
Income (Tshs)	12,500,000.00	22,000,000.00
Net (Tshs)	8,300,000.00	16,700,000.00

- This is under ideal condition
- However, tomatoes are affected much by diseases such as fusarium wilt

POCKET GARDEN

- Pocket gardens were introduced to improve nutrition of the household especially children under 5 years
- The gardens are grown within the household premises
- Hypothesized to use less amount of water
- Simplifies management and reduce women workload
- It is measured by the increased level of vegetable consumption
- This was mainly focussing women who takes a major role in feeding the family

POCKET GARDEN

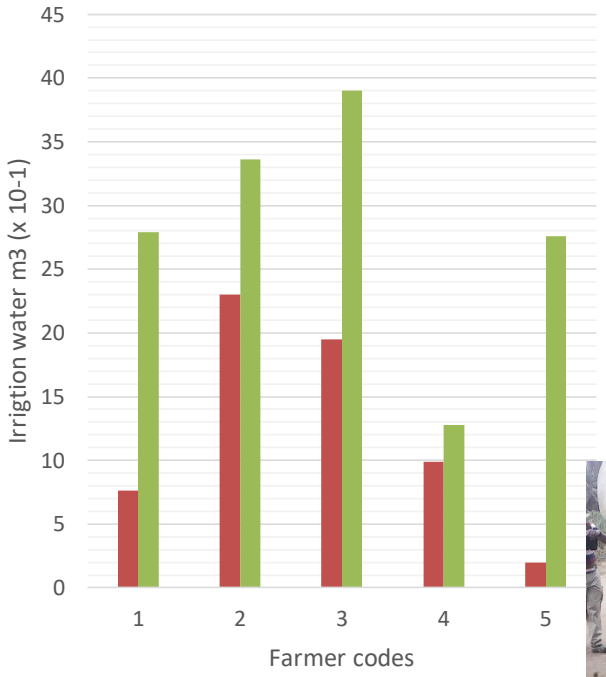


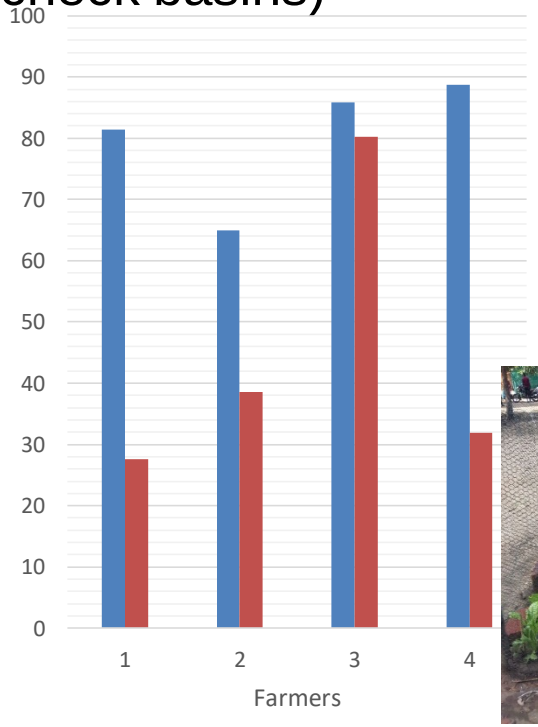



Fertile soil 6 buckets, manure 2-3 buckets, course aggregates 1.5 buckets, - Sand -2 buckets

KEY RESEARCH FINDINGS – POCKET GARDEN

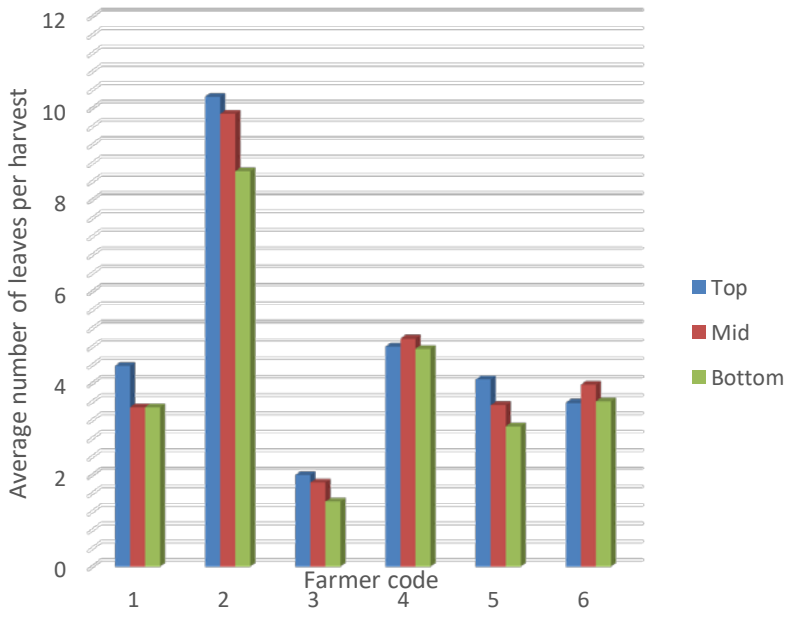
- Irrigation water and IWUE (pocket vs check basins)

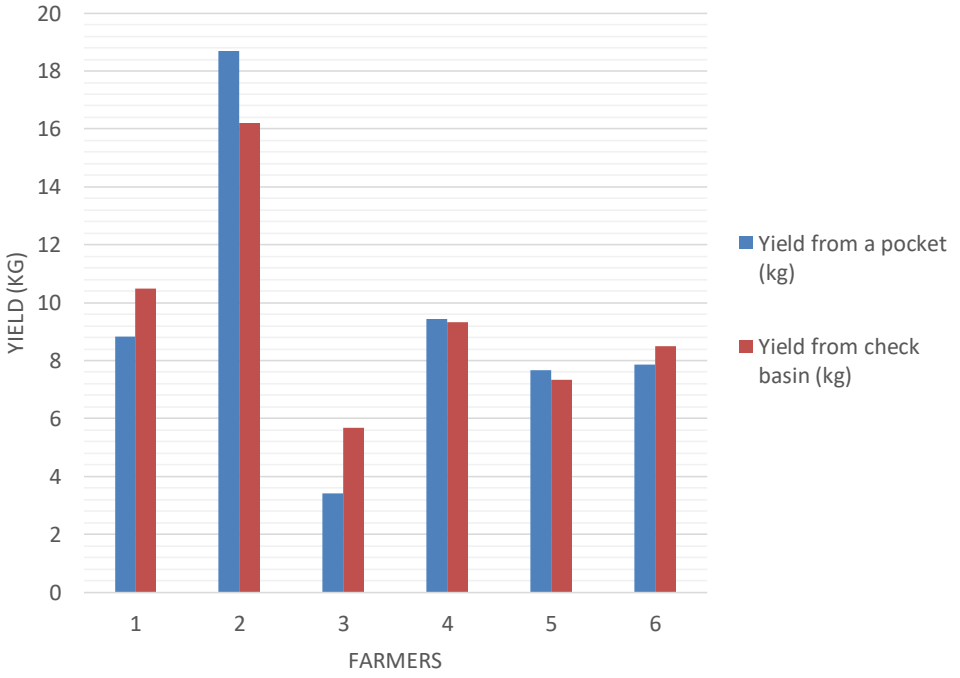




KEY RESEARCH FINDINGS – POCKET GARDEN

- Yields





KEY MESSAGES

1. Farmers can use significantly less amount of water for irrigation without affecting crop yields
2. Water use technologies can assist to increase farmers income, improve household nutrition and livelihood
3. Under normal conditions, tomatoes have higher economic returns (>100%) than African eggplant though it is associated with higher diseases risks
4. Farmers income can increase significantly if measures on causes of losses are taken into account
5. Water pump model is profitable to farmer groups, however group size may need to be reduced to 3-4 instead of the current 8 for farmers to increase their field size from 0.25 acre to 1 acre per farmer and realize more profit
6. Pump sharing can be profitable to dedicated farmer groups and with time they can break-even and be able to pay back the capital investment
7. Smallholder farmers need assistance of start up capital, and technical expertise to fight against pests and diseases

RECOMMENDATIONS

1. Farmers should be emphasized to use less amount of water for irrigation (even 60%) of CWR for African eggplant and 80% or less on tomatoes production thus reduce pressure on water resources and pumping costs
2. Pocket garden implementation improves nutrition status for a household but also reduces significantly the amount of irrigation water
3. To increase economical returns especially on African eggplant production, more research should be oriented on reduction of losses of the products
4. Pump on credit to individual farmers, have higher possibility of paying back pumps than farmers in groups

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