# Mathematical model to predict and simulate bulk tomatoes temperature stored in a nature-assisted low-cost-low-temperature storage structure for rift valley production area in Ethiopia

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### Introduction

Rift Valley (RV) of Ethiopia is a production belt of fruits and vegetables (Fig. 1)

The area characterized by hot and dry climate to accelerate deterioration of after harvesting life of the crops

Products after harvest left in hot and dry climate for days before marketing (Fig. 2)

High day time temperature and low RH accelerate rate of spoilage



Fig 1. Tomato farm in RV

Commercial mechanical refrigeration facility cannot be afforded by farmers

Need to develop an affordable low costlow- temperature storage room to remove field heat and respiration heat load



Fig 2. Harvested Tomatoes and Mangoes waiting market on assembling point



Figure 6. Product temperature

#### (10 pm-6 am)

## Results

Figure 4. Product temperature distribution after 10 hrs DEC cooling



### Conclusion

• Combined use of DEC + NV + HTM enables to reduce product temp by 9K (DEC) + 4K (NV) less than ambient air temp.

• Based upon Q<sub>10</sub> concept, 10K product temperature reduction extend storage time 2-3 times as compared to ambient air condition

• Longer storage life: less after harvest loss, more marketing time, more supply

8h

### Acknowledgments

