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BACKGROUND

Agricultural interventions to address food insecurity have been shown to improve HIV health outcomes through nutritional, mental health, and health behavior pathways, but little is known about their costs and cost-effectiveness.

METHODS

We conducted a cluster-randomized trial ([NCT02815579](#)) of *Shamba Maisha*, which provided farming commodities, including a human powered water pump, seeds, and training to enhance agricultural skills and crop yields among people in stable care for HIV in western Kenya.¹

Intervention

Climate-adaptive multisectoral agricultural intervention

- Human powered water pump for irrigation (photo)
- Training in sustainable agricultural techniques
- Bank loan to purchase farming commodities
- Training in financial literacy & starting an aaribusiness



Data Collection and Analysis

Incremental costs were estimated using standard micro-costing, interviews with study coordinators and time-and-motion activities with study staff. Effectiveness was assessed based on change over 24 months in food insecurity, depression, social support, and length or height for age (stunting) among young children (6-24 months). Literature-derived estimates were used to convert health outcomes to disability-adjusted life-years (DALYs) averted. Incremental cost-effectiveness was represented as incremental cost per DALY averted.

RESULTS

The trial included 720 adults with HIV (366 intervention, 354 control). Results were also assessed among 207 children aged 6-24 months (95 intervention, 112 control).

Costs

The incremental cost of implementation of *Shamba Maisha* compared to control was \$642 per person (\$841 intervention, \$199 control, Table 1). Most costs were associated with personnel effort and farm commodities. Personnel effort included stakeholder engagement and protocol development (project director), farm assessments (research assistants and driver), training (project director and agricultural trainers), coordination with lender and feed store (assistant project director), and staff supervision (project director and assistant project director; Figure 1).

Effectiveness

We observed statistically significant relative improvements in household food insecurity (-15.8% vs -5.1%), depressive symptoms (-35.8% vs -17.6%) and lack of social support among adults (-3.7 vs -0.7 points), and maintenance of length or height for age among dependent children (-0.05 vs -0.44 standard deviation, Figure 2 and Table 2).

Cost-effectiveness

These relative improvements in health outcomes correspond to an estimated 0.158 DALY averted per person (Table 2) and an estimated incremental cost-effectiveness ratio of \$4071 per DALY averted.

Shamba Maisha - a climate-adaptive multi-sectoral agriculture intervention – cost **\$642 per person** and averted an estimated **0.158 DALY per person** through decreased food insecurity (0.027 DALY) and depression (0.053 DALY) and increased social support (0.044 DALY) among adults with HIV and increased height for age among dependent children aged 6-24 months (0.034 DALY). The overall incremental cost-effectiveness ratio was **\$4071 per DALY averted**. This falls below a willingness to pay threshold of three times the per-capita GDP in Kenya (\$6020 USD in 2021).

Table 1. Incremental Cost per Person

	Intervention	Control	Difference
Personnel	\$ 565	\$ 178	\$ 387
Capital Goods	\$ 212	\$ 3	\$ 209
Recurrent Goods	\$ 32	\$ 10	\$ 22
Recurrent Services	\$ 33	\$ 8	\$ 24
Total	\$ 841	\$ 199	\$ 642

Figure 1. Staff Effort by Intervention Arm

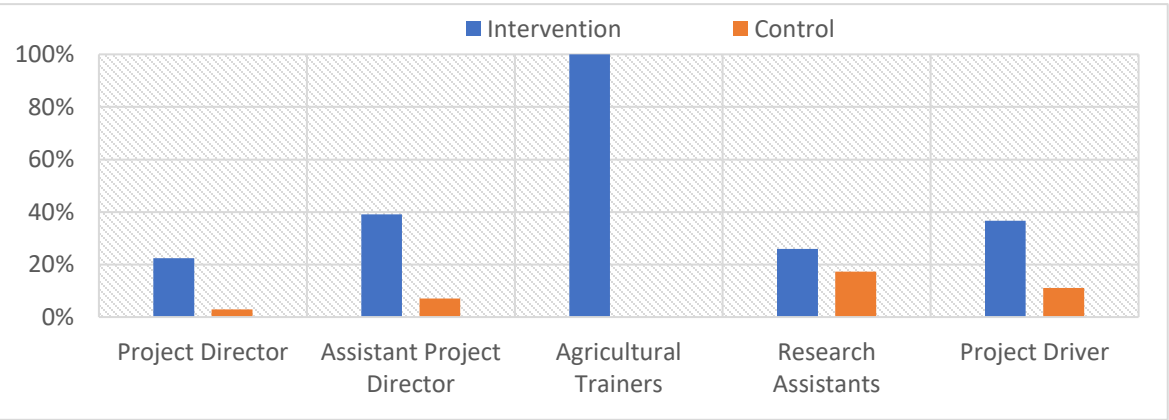


Figure 2. Intervention Effectiveness¹

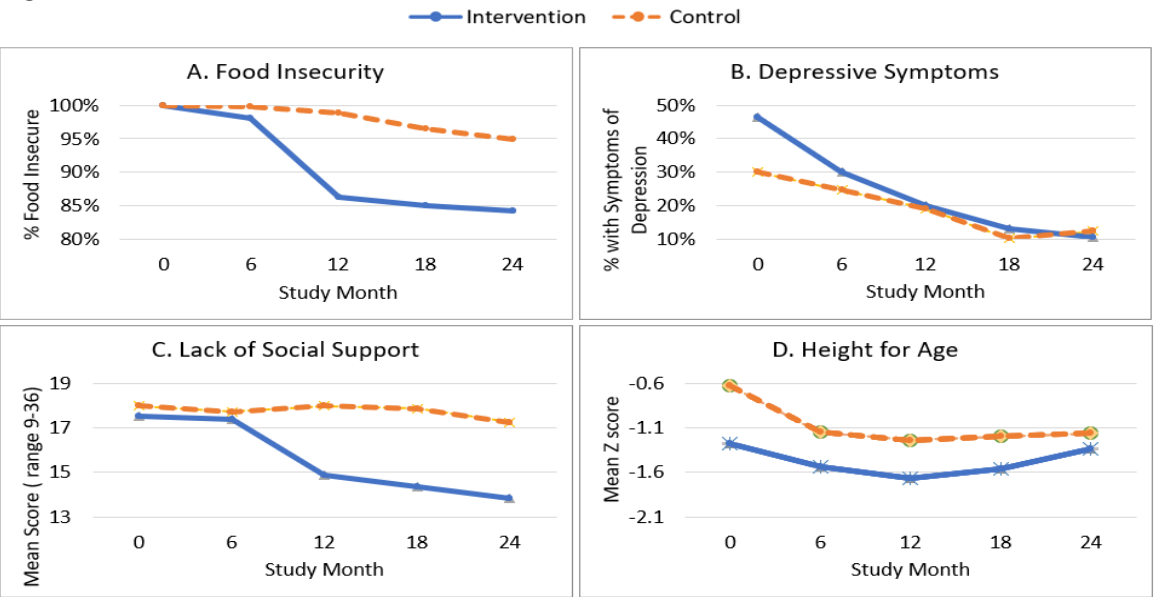


Table 2. Disability-Adjusted Life-Year Averted per person

	Effectiveness	Mortality		Morbidity		DALYs averted
	Relative improvement	Mortality (%)	Discounted DALYs	Disability Weight	Duration (years)	Benefit of intervention
Food Insecurity (%)	10.7%			0.126	2.0	0.0270
Depression (%)	18.2%			0.145	2.0	0.0528
Social Support (mean)	3.00			0.007	2.0	0.0437
Height for Age (mean)	0.107	0.016	0.318			0.0342
Total						0.1577

CONCLUSIONS

Shamba Maisha was cost-effective based on the WHO willingness to pay threshold of three times the annual GDP per capita (\$6020.49 USD in 2021). Future analyses will account for reduced health care costs associated with improved health outcomes.

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1. Cohen CR, Weke E, Frongillo EA, et al. *JAMA Netw Open*. 2022;5(12):e2246158. doi:10.1001/jamanetworkopen.2022.46158