Africa RISING in the Ethiopian Highlands

Farmer access to irrigation scheduling advice leads to sustainable intensification of high value crops

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Goal

IWMI under Africa RISING tested how access to irrigation advice and efficient water management could improve productivity and sustainable use of inputs (e.g. fertilizer, seeds) for smallholder farmers in Lemo, Hosanna, Ethiopia. The introduction of the wetting front detector (WFD) as a scheduling tool and the drip kits aimed at looking beyond the benefits of the water lifting technologies tested in Africa RISING and evaluate how to ensure sustainable intensification.

Research and development methodologies

- Problem identification through participatory approaches with farmers and local extension
- Trainings on wetting front detector installation and usage for stakeholders
- Biophysical and socio-economic data collection during the irrigation seasons
- Seasonal feedback meetings with participating farmers
- Comparison of irrigation performance of technology users against control group
- Replication of the on-farm trial at the Farmer Training Center

Technologies tested

Overview of the various water lifting and management technologies tested during the dry season of 2015 and/or 2016 for oats and vetch, cabbage, carrot and avocado (Figure 1):

Water lifting	Water management	Water application
Control (no technology)	Farmers practice	Watering can
Rope & Washer	Farmers practice	Watering can
	WFD	Watering can
Solar	Farmers practice	Hose
Tractor mounted pump	Farmers practice	Drip

Production increases with irrigation advice

- Farmers using the WFD applied slightly more water per irrigation event for cabbage, oats, oats and vetch but less frequently leading to similar total supplementary water application depths (Figure 2). The yields obtained for vegetables was slightly higher in the WFD plots compared to farmers practice for the R&W users and comparable to those obtained for Solar (Table 1).
- The use of WFD in guiding supplementary irrigation of oats and vetch has resulted in 64% yield increase for vetch as farmers irrigated less frequently but more (Table 1).
- The defined crop coefficients (kc) for the oats/vetch intercropping resulting in kc ini, mid and end values of 0.29, 1.08 and 0.71, respectively will allow for the calculation of the crop water demand of oats and vetch for different agro-ecological conditions.

Production increases with better application

- The use of drip kits increased vegetable yields compared to farmers using hoses or watering cans showing potential for more efficient usage of water, seed and fertilizer inputs. Further research is needed to understand whether the access to scheduling in this context could further improve crop and water productivity (Table 1).
- The net present value (NPV) was as tools to compare investment options. The assessment was conducted over a 5 year lifespan. Intensification through irrigation is financially feasible, with drip irrigation having higher returns compared to control farmers not having a technology in both kebeles given the improved water application efficiency through the drip emitters (Table 2).
- Further work is ongoing to asssess the economic feasibility of solar, service provision.

Opportunities for scaling

- Both from a socio-economic as well as technical perspective the use of both solar and service provision shows high potential options for small scale irrigators as higher yields were obtained compared to the control
- The access to irrigation advice and better water management technologies (e.g. drip) could boost production in a sustainable way.

Figure 1: Installation training of WFD (A), WFD managed cabbage (B), (photo credit: Apollo Habtamu).

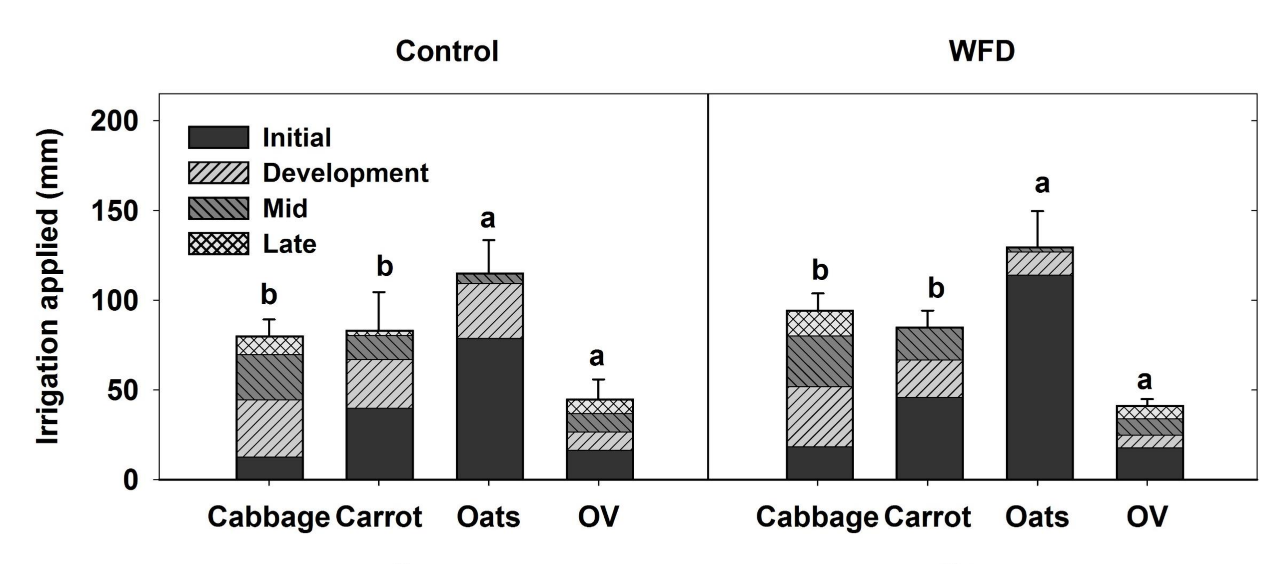

Figure 2: Supplementary irrigation amounts applied throughout the various cropping stages.

Table 1: Comparison of the produces grown without (FP) and with (WFD) irrigation scheduling.

	Yield (t ha^{-1})				
	Control	R&W		Solar	Tractor & drip
WM	FP	FP	WFD	FP	FP
Cabbage	40 ± 11^{a}	41 ± 12^{a}	48 ± 6^{ab}	49 ± 4^{b}	62 ± 4^{c}
Carrot	36 ± 8^{a}	37 ± 10^{a}	43 ± 7^{b}	38 ± 10^{a}	66 ± 5^{c}
Oats[1]	-	6 ± 1^{a}	7 ± 1^{ab}	5 ± 1^{a}	-
Oats[2]	-	13 ± 3^{a}	13 ± 2^{a}	-	-
Vetch[2]	-	4 ± 2^{a}	6 ± 1^{b}	-	-

[1] Oats alone (seed rate 100 kg ha^{-1}); [2] oats and vetch intercropped (seed rate 90 kg ha^{-1} oats & 30 kg ha^{-1} vetch). All fodder values are in dry matter whereas the vegetables are in fresh weight.

Table 2: Cost-benefit analysis of drip technology (USD) for an average Ethiopian land holding (0.25 ha) with different discount rates over 5 years.

NPV at different discount rates	Drip technology		Control	
	Upper Gana	Jawe	Upper Gana	Jawe
8%	$15,825	$15,197	$6,497	$7,187
12.25%	$13,161	$12,795	$5,054	$5,613
16.60%	$11,469	$11,250	$4,008	$4,469

Core partners

ILRI, CIAT, ICRISAT, ICARDA, CIMMYT, IWMI, World Agroforestry Centre, IFPRI, EIAR, CIP

We thank farmers and local partners in Africa RISING sites for their support

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