

TORO

Count on it.

Crop Solutions

Drip Irrigation on Peppermint

Bob McKellip Farms, Nampa, Idaho

Benefits of Drip on Mint:

- Increased yields
- Reduced water use
- Reduced fertilizer use
- Reduced weed growth
- Reduced cultivation
- Reduced labor use
- Reduced energy use
- Improved resistance to insects and disease
- Ability to rotate to marginal soils
- Improved watershed water quality
 - Less soil erosion
 - Reduced leaching of nitrates to the aquifer
- Ability to grow higher value crops with conserved water



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Nampa, Idaho

Bob McKellip knows there is always risk in trying out new farming methods, but it didn't stop him from installing a 38 acre drip irrigation experiment on a new stand of mint earlier this year. Now that the first season and harvest is complete, he is happy with the results and is ready for more. "Drip is really good – it increased the yields and used less water at the same time. I think mint will convert to drip just like onions have."

This is good news for both the farmers and the Lower Boise Watershed Council. The Council supplied Bob with a 50% cost share on the \$1,400 per acre drip system costs because drip systems help farmers improve watershed water quality. But McKellip now knows that in addition to reducing runoff from the farm, the increased yields, reduced expenses and other benefits will allow his investment in drip irrigation to stand on its own in the future.

"If I could install drip on my whole farm, it would open up all kinds of new possibilities."

McKellip planted mint in the fall of 2011 on 30" centers, and installed Toro's Aqua-Traxx® premium drip tape (EA7081225) 7" beneath each row. This has resulted in a system net application rate of about 0.09 inches per hour and a five-zone system that requires 3.5 days to apply a week's worth of water during the peak of the season. He began irrigating in June using layflat submains to feed his drip tape, and media filters¹ to prevent clogging. When harvest was complete, the mint was immediately watered back up without issue. McKellip's local dealer, Clearwater Supply, helped design the system and provided the

components and ongoing installation and operations support.

"In July, a flush of secondary growth was evident which usually doesn't occur until the second year. It helped contribute to my first year yield success – 133 pounds of mint per acre compared to a furrow field nearby which yielded only 94



pounds per acre. That alone is worth about \$585 per acre," says McKellip. In addition, he cites another \$135 per acre savings in water and fertilizer use, plus savings in labor, fuel, equipment usage and insecticide costs. But perhaps most importantly, drip irrigation helped create stronger plants which resist verticillium wilt damage, even on poor soils. And by not corrugating the field annually, McKellip expects less crop impact from the introduction and spread of verticillium wilt. This means stand life – and the significant costs associated with stand re-establishment – might be prolonged beyond 4-5 years, and mint could possibly be grown on poor soils with less water. "Delaying these costs is a huge benefit," explains McKellip. "By being able to rotate mint to poorer soils, I can increase the percentage of my farm acreage to higher water demand, higher value crops."

¹ Filtration is critical to any drip irrigation system to prevent clogging and ensure the longevity of the emission device such as drip tape.

McKellip experienced a host of other benefits as well. He found that the drip fields closed in earlier, reduced weed pressure, and that the dry soil surface reduced mold and leaf drop. In addition, the plants weren't damaged from cleaning furrows with a cultivator since siphon pipes were no longer needed. And since plants are stronger, less insecticide was sprayed, which allowed beneficial insects such as lady bugs to thrive. "The University of Idaho is very interested in this aspect and will be setting up some trials to study it," says McKellip. He was also able to spoon feed the mint more frequently and uniformly with water and fertilizer. "Mint has a shallow rootzone and doesn't use all the furrow-irrigated water or the dry nitrogen that is applied four times a year. With drip irrigation, the result is a better crop, no runoff and a cleaner watershed." McKellip is also saving electricity compared to his sprinkler fields because the filters on his drip field only required 32 psi, while the sprinkler fields need 65-70 psi.

But like anything new, McKellip acknowledges that there was a learning curve with drip irrigation. He found that initially there was more labor, but not during the critical in-season period. He also found that there is a little more management with drip, but only at first. "With an automated drip

system, all I do is push a button to irrigate and fertigate. With siphon tubes, someone has to physically go change the water several times a day." Rodents must also be managed, but "aren't a deal breaker - they are simply part of the picture."

As president of the Mint Association, McKellip has been getting lots of calls from interested growers eager to learn from his experience. "I tell them the keys to success are to first, work with a good company to make sure the drip system is well engineered and installed. Second, pick a good field to learn on - don't cripple yourself from the outset with a challenging field. Third, pay close attention to the agronomics, the fertilizer, and the moisture status. And be sure to install moisture sensors to help you see what's happening beneath the surface."

"With drip irrigation, the result is a better crop, no runoff and a cleaner watershed."

McKellip is excited about the prospects of using drip on additional mint acreage, as well as other crops. "I'd like to try it on more mint, on sod, and maybe even my rotation crops of grain corn, sugarbeets, and wheat." Upon further reflection he mused, "If I could install drip on my whole farm, it would open up all kinds of new possibilities."



First year mint stand grown with drip irrigation.



First harvest of drip irrigated mint.



First harvest of drip irrigated mint.

Peppermint planted Fall 2011 at Bob McKellip Farms

2012 Crop Year Data	Drip Irrigation, average	Furrow Irrigation, average	Difference	Percent change using drip irrigation
Yield, lbs mint/acre	133	94	39	41% increase in yield and revenue
Value/ac @ \$15/pound	\$1,995	\$1,410/ac	\$585/ac	
Water use/acre, inches	25.6	54	28.4	53% decrease in water use
Lbs of mint/inch of water	5.19	1.74	3.45	198% increase in pounds of mint per inch of water
Inches of water/lb of mint	0.19	0.57	0.38	67% decrease of water use per pound of mint
Nitrate fertilizer, lb/ac	140	300	160	53% decrease
Value/ac @ \$.85/lb	\$119	\$255	\$136	

2013 Crop Year Update:

Another season has passed, and Bob McKellip is happy to report that his second year of utilizing drip irrigation on mint was even better than the first. "This Spring, I started up the drip system and everything worked perfectly," explains McKellip. "I have found that the system is very simple and easy to operate once it's set-up, and that it's just like any other piece of modern farm equipment. With drip, I easily spoon fed my crop with the water and fertilizer it needed on a weekly basis, and harvested unheard of yields on second-year mint – 188 pounds of mint oil per acre!"

"I harvested unheard of yields on second-year mint – 188 pounds of mint oil per acre!"

McKellip noted that this was achieved in spite of record heat, minimal rainfall, and variable soils with differing water holding capacities. "With drip, I was able to fine tune the irrigation schedule to accommodate different soil types and get more water where it was needed."

As a result, not only were yields boosted, but water and fertilizer use was down as well. "We used about half as much water and fertilizer as conventional fields – even less than planned. In addition, ground and air application expenses of \$46/acre are eliminated with drip. Drip is just a really great way to apply fertilizer."

In spite of record yields, McKellip believes they could have been even better. "Petiole samples taken prior to harvest revealed that the crop was deficient in N, P, K and S. We'll fine tune it next year and hopefully boost yields even higher."

McKellip explains that the water savings are just as important as the yield increase. "Some areas have a two acre foot per acre allocation, which usually forces growers to fallow some acreage. With drip, we can grow an outstanding crop with less water, leaving more water to grow more valuable crops and avoiding fallowing."

"We used about half as much water and fertilizer as conventional fields – even less than planned."

McKellip wants to amortize the drip system over multiple years, thus drip system maintenance is a priority. This spring, he replaced the end of the line flush valves with a 3" Toro layflat flushing manifold. "Instead of manually flushing a few lines at a time, I now just open one valve and flush 30 lines at a time. Now, I flush the system in minutes instead of hours." A side benefit to the ease of flushing is improved system uniformity.



Bob McKellip of Bob McKellip Farms and Jim Klauzer of Clearwater Supply inspect mint grown with drip irrigation.

"Last year, there was a 2 psi pressure drop from the beginning of the 1,320' lateral to the end. Now there is no measureable pressure loss, and the mint growth shows it – the field looks completely uniform."

With the help of Jim Klauzer of Clearwater Supply, McKellip scheduled irrigations using four WaterMark moisture sensor stations on 38 acres. Each station consisted of three sensors: one buried 18 inches deep to monitor the moisture status beneath the buried Aqua-Traxx® drip

tape lateral, and the other two straddled 15 inches away from the tape lateral and buried 8 inches deep. "Our goal was to keep the moisture status of the 18 inch sensor stable, and the 8 inch sensors moist within a specific moisture range. When the 8 inch sensors read over 20 centibars, we initiated four-hour irrigation cycles until adequate soil moisture was achieved." The moisture data is transmitted to data-loggers positioned at the edge of the field for easy access by field staff for direct download to a computer. "We keep the irrigation schedule on a three-week calendar whiteboard that hangs in the office for

everyone to see. I program the controller, but my local field staff handles everything else."

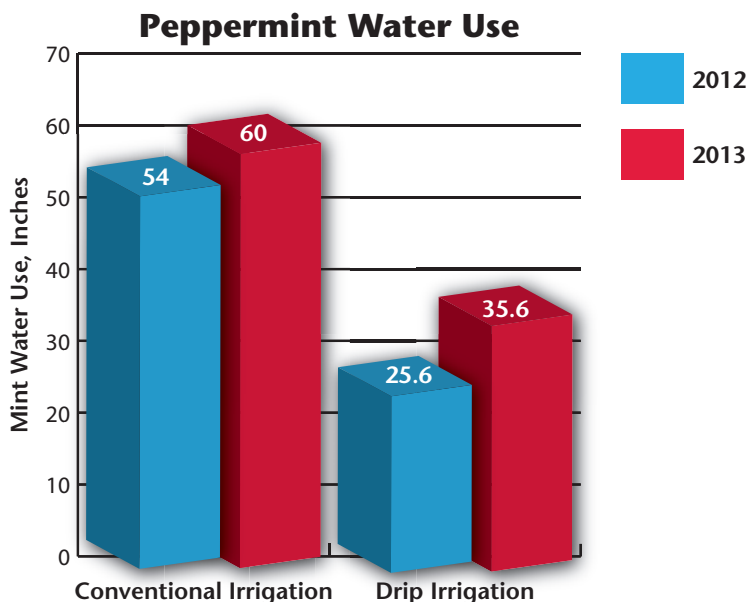
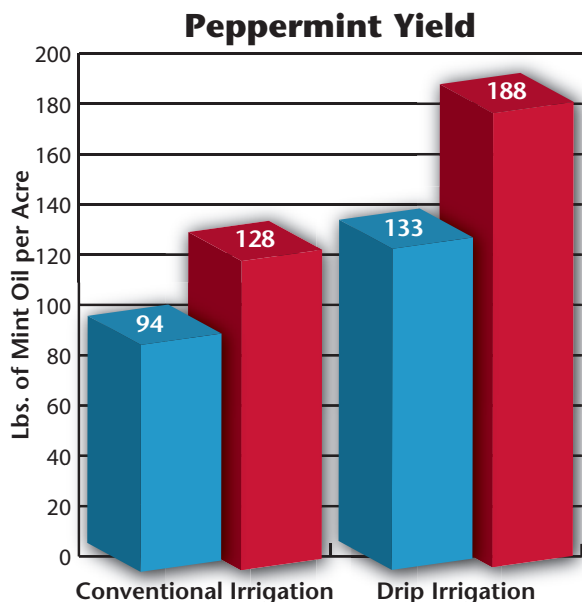
What is unknown is whether the drip system will allow the crop to last more than the typical 5-7 years. "If I can delay the cost of re-establishment for an extra year, that will be one more very valuable benefit to add to the list." Unsurprisingly, Bob is getting a lot of calls from his neighbors.

"The system is very simple and easy to operate."



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Peppermint planted Fall 2011 at Bob McKellip Farms

2013 Crop Year Data	Drip Irrigation, average	Furrow Irrigation, average	Difference	Percent change using drip irrigation
Yield, lbs mint/acre	188	128	60	47% increase in yield and revenue
Value/ac @ \$17/pound	\$3,196	\$2,176	\$1,020	
Water use/acre, inches	35.6	60	24.4	41% decrease in water use
Lbs of mint/inch of water	5.28	2.13	3.15	148% increase in pounds of mint per inch of water
Inches of water/lb of mint	0.19	0.47	0.28	60% decrease of water use per pound of mint
Nitrate fertilizer, lbs/ac	152	300	148	~50% decrease in overall fertilizer use
Value/ac @ \$1.10/lb	\$167	\$330	\$163	
Phosphorus (P), lbs/ac	25	50	25	
Potash (K), lbs/ac	25	50	25	
Sulfur (S), lbs/ac	58	75	17	
Fertilizer Application Cost	0	\$46/ac	\$46/ac	\$46 per acre savings by eliminating fertilizer application costs (ground and air)

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 Micro-Irrigation Business
 1588 N. Marshall Avenue, El Cajon, CA 92020-1523, USA
 Tel: +1 (800) 333-8125 or +1 (619) 562-2950
 Fax: +1 (800) 892-1822 or +1 (619) 258-9973

toro.com
driptips.toro.com



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