

**Cost Analysis of Single and Multiple Use
Drip Irrigation Tape Used for Strawberries**

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ABSTRACT

This senior project evaluates and compares the cost analysis of both single use and multiple use irrigation drip tape used by Reiter Affiliated Companies in the Santa Maria Valley. Single use drip tape is thin walled drip tape uses sizes 4-5 mil, while thicker walled multiple use drip tape uses 8-10 mil (1 mil=1 thousandths of an inch). This project will evaluate the labor costs, material costs, disposal costs, and retrieval costs for the retrieval and re-use of irrigation drip tape.

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INTRODUCTION

For years, Central California farmers have employed the use of surface drip tape irrigation for their row crops such as lettuce, broccoli, cauliflower, strawberries, and many more. Some of these growers (mainly vegetable growers) purchase thick walled reusable drip tape, while others, such as strawberry growers, use thin walled single use drip tape. The cost of disposal of irrigation drip tape is more than the price that you have to pay the landfill to take it off your hands; it is also the cost to the environment of disposing of a product that will not go away in our lifetimes. One way to help with this problem is to dispose of less drip tape by retrieving and reusing the product. The objective of this report is to find out whether it is economically feasible to use thick walled reusable drip tape as opposed to thin walled single use drip tape in strawberries.

LITERATURE REVIEW

A search was initiated to identify whether a cost analysis has been conducted as to where using multi-use thicker walled surface drip tape becomes more cost effective than using single-use thinner walled surface drip tape. There was no study found that directly identified a cost comparison of the two methods, but there was literature about aspects of the project being studied.

Reuse of drip does not only have the possibility of saving a grower money, but can save on the amount of drip tape that could end up in a landfill. The disposal of drip tape causes a huge problem for growers who have switched to microirrigation methods to conserve water resources only to produce more agricultural waste (Corcos, 2006). Although there have been advances in drip tape recycling, the common method of disposal is still the landfill (Corcos, 2006). The costs to the grower for this disposal remain relatively low, but the cost to the environment is significantly higher. The best way to curb these costs is to dispose of less drip tape material.

Through trial and error, growers have discovered that they can cut their annual cost by reusing the drip tape for many seasons, although this is not representative of all crops (Berreras, 2000). Retrieving and reusing drip tape has become standard operating procedure on many different vegetable crops including lettuce, cauliflower, broccoli, celery, and more, but strawberry growers for example use single-use drip tape for only one growing season before disposal, but keep their costs low by purchasing thinner walled drip tape such as 4 and 5 mil than that of vegetable growers that retrieve their tape that use 8-15 mil tape (1 mil=1 thousandths of an inch) products (Burt, 2006).

One major difference in drip tape retrieval between the vegetable grower and the strawberry grower is the use of plastic mulch over the beds. When it comes time to retrieve the drip tape and mulch, the process is commonly done in one step with the bundling of the products separated. During separation, the laborer will cut the mulch and across the bed, which ends up also slashing the drip tape underneath. Advancements in technology have made it possible to use machines that pick up the mulch and drip tape in one process such as the one made by Kennco Manufacturing (Kennco Manufacturing, 2010). Unfortunately there was no literature found that a machine could retrieve the plastic mulch and drip tape in two separate processes, which would be required for drip tape retrieval for reuse for the strawberry crop.

PROCEDURES AND METHODS

The factors analyzed in this report include:

1. Base Drip Tape Costs:
 - a. Thin Wall Single Use (cost/acre at a given cost/1000')
 - b. Thick Wall Multiple Use (cost/acre at a given cost/1000')
2. Retrieval Costs:
 - a. Single Use Drip Tape:
 - i. Labor to retrieve
 - ii. Cost of disposal
 - b. Multiple Use Drip Tape:
 - i. Machinery
 - ii. Fuel
 - iii. Labor
 - iv. Splicing
3. Life of Tape used:
 - a. Based on:
 - i. Number of irrigation events
 - ii. Number of times retrieved

All above costs and cultural practices have been discovered from interviews with growers, machinery manufacturers, irrigation manufacturers, machinery dealers, irrigation dealers, and farming company upper management. The last cost to be analyzed was the management costs of dealing with the logistics of the drip tape once out of the field, as well as the hassle costs associated with having extra processes to manage. This last cost is just a judgment cost of what a grower or organization would be willing to deal with for the benefit being shown.

RESULTS

Single Use:	\$240/acre to retrieve for disposal						
Multiple Use:	\$320/acre to retrieve for re-use						
			Wall Thickness	Size	Price/roll	ft/roll	Cost/1000'
Single Use:	Drip Tape Cost=\$300/acre	5 mil	5/8"	\$180.00	13,000	\$13.85	
Multiple Use:	Drip Tape Cost=\$500/acre	8 mil	5/8"	\$145.00	7,500	\$19.33	
				Total Cost / Acre		Cost/Acre-Season	
For 1 Season Single Use Drip Tape:							
	= 300+240=			\$540		\$540	
For 1 Season Multiple Use Drip Tape:							
	= 500+240=			\$740		\$740	
For 2 Seasons Single Use Drip Tape:							
	= 300+240+300+240 =			\$1,080		\$540	
For 2 Seasons Multiple Use Drip Tape:							
	= 500+320+240 =			\$1,060		\$530	
For 3 Seasons Single Use Drip Tape:							
	= 300+240+300+240+300+240 =			\$1,620		\$540	
For 3 Seasons Multiple Use Drip Tape:							
	= 500+320+320+240 =			\$1,380		\$460	
For 4 Seasons Single Use Drip Tape:							
	= 300+240+300+240+300+240+300+240 =			\$2,160		\$540	
For 4 Seasons Multiple Use Drip Tape:							
	= 500+320+320+320+240 =			\$1,700		\$425	

Table 1. This table shows costs of single-use drip tape vs. multiple-use drip tape over multiple seasons.

DISCUSSION

In the above results, there are many different factors that have been omitted. These factors include all other processes pertaining to installation and retrieval of drip tape that have equal costs for both multiple use drip tape retrieval, as well as single use drip tape retrieval. An example of this would include the mowing of the plants prior to retrieval. This is done in both processes using the same equipment, and running at the same speed which gives us an equal cost, so it has been omitted from the calculations.

It is clear from the results that using thicker multiple use drip tape over more than two seasons, is more cost effective than purchasing single use drip tape year after year. All factors that crossed over to both processes were removed from the calculations. What is left is only the cost/acre to purchase each type of drip tape, and the costs to retrieve for disposal or re-use. Final numbers used in calculations were obtained from Reiter Affiliated Companies Santa Maria division. The costs were averages from several growers on land totaling around 450 acres of strawberries.

The multiple use drip tape costs were from a single ranch that retrieved tape for re-use on another ranch. Costs for single use retrieval include the labor costs associated with the process. Disposal at this time for this area is free at various recycling plants, but that luxury is expected to change in the near future. Retrieval costs for multiple use drip tape includes machinery, fuel, labor, re-use drip tape reel, and splicing costs.

The last two aspects that need to be analyzed are the life of the tape, and the management costs that go into dealing with an extra process of retrieving for re-use, storing, and the logistics of deciding what field that tape must go in next. Both of these aspects of the management of the drip tape are judgment calls.

The only numbers that we are able to base our judgments on are costs that are associated with the re-use of drip tape in vegetable crops which have a short season, so it is not possible to relate those costs directly to the strawberry crop that has a season of drip tape use of around 12-14 months because of the amount of variables involved which would include number of retrieves, number of irrigation events, tape flushing practices, and filtration practices. I have spoken to vegetable growers that will use multiple use drip tape for around 5 years in constant rotation. Using this timeline strictly, and omitting all other variables, it would be feasible for a strawberry grower to re-use drip tape for up to 4 seasons.

In interviews, growers have stated that if there was any provable evidence suggesting that they can save money on a cost/acre basis, they would be more than willing to put in the extra work for the added benefit.

There are many issues with the numbers obtained. Because these numbers are just a snapshot from a certain grower using his own retrieval practices that are not necessarily the best way

possible to go through the retrieval process, we can assume that the efficiency would get better and better with practice retrieving multiple use drip tape. Another issue is that there is not a cost analysis of repair costs over the life of the drip tape. The more that this drip tape is put in and taken out of the field, the more of a chance there is to damage the tape. We also have to assume a life expectancy for this drip tape which would not be proven until this practice is put into use.

One problem that I ran into with this project was the reluctance from the vegetable growers contacted to give information about their cultural practices in regards to their drip tape installation and retrieval, as well as getting information on the costs associated with those practices. The project finally had to rely on information obtained from Central Coast Berry Farm's, which is a division of Reiter Affiliated Companies. They are a large company that grows on hundreds of acres with multiple partners and were able to average all the costs of those growers. They also had one example of where they had purchased, installed and retrieved drip tape for re-use. It was the numbers that were obtained in this interview that formed the basis for this report, so the report is in no way all inclusive, or prove that this practice will save growers money.

RECOMMENDATIONS

The calculations show that strawberry growers in the Santa Maria Valley could save money in seasons 2-4 purchasing and using multiple use drip tape. Because these numbers are based on such a limited source, I do not think that a grower should necessarily put this process into practice on a large scale. This project proves only one thing; the practice of purchasing and using multiple use drip tape for strawberries in the Santa Maria Valley is very promising, and deserves to have much more extensive research done. It is my recommendation that growers interested in using this practice start off on a small scale, and analyze the drip tape used over multiple seasons tracking all costs associated.

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APPENDIX A

HOW PROJECT MEETS REQUIREMENTS FOR THE ASM MAJOR

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ASM Project Requirements

The ASM senior project must include a problem solving experience that incorporates the application of technology and the organizational skills of business and management, and quantitative, analytical problem solving. This project addresses these issues as follows.

Application of Agricultural Technology. The project involves the application of mechanical systems, and power transmission.

Application of Business and/or Management Skills. The project involves business/management skills in the areas of machinery management, cost and productivity analyses, and labor considerations.

Quantitative, Analytical Problem Solving. Quantitative problem solving techniques include the cost analysis of both systems involved.

Capstone Project Experience

The ASM senior project must incorporate knowledge and skills acquired in earlier coursework (Major, Support and/or GE courses). This project incorporates knowledge/skills from these key courses.

- BRAE 141 Ag. Machinery Management
- BRAE 142 Ag. Power and Machinery Management
- BRAE 203 Ag. Systems Analysis
- BRAE 301 Hydraulic/Mechanical Power Systems
- BRAE 340 Irrigation Water Management
- BRAE 342 Agricultural Materials Management
- BRAE 348 Energy for a Sustainable Society
- BRAE 418/419 Ag Systems Management
- BRAE 438 Drip/Micro Irrigation
- ENGL 148 Technical Writing

ASM Approach

Agricultural Systems Management involves the development of solutions to technological, business or management problems associated with agricultural or related industries. A systems approach, interdisciplinary experience, and agricultural training in specialized areas are common features of this type of problem solving. This project addresses these issues as follows.

Systems Approach. The project involves the integration of multiple functions (lifting, cutting, and hydraulic bundling systems), and the integration of machines and operator to provide an improved waste management and a reusable system for strawberry growers.

Interdisciplinary Features. The project touches on aspects of mechanical systems, waste management, and business management.

Specialized Agricultural Knowledge. The project applies specialized knowledge in the area of irrigation management.