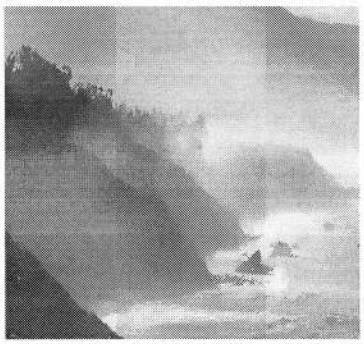
An Inventory of Agricultural Film Plastics

for the



Central Coast Recycling Market Development Zone

by

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Inventory of Agricultural Film Plastic

Purpose

The purpose of this project was to produce an inventory of Agricultural Film Plastic in the Central Coast Recycling Market Development Zone (CCRMDZ) comprising Monterey, San Benito, San Luis Obispo and Santa Cruz Counties.

Goals

The focus is to identify feedstock quantities that would support creation of regional recovery infrastructure and network for a film plastic washing facility, and/or recovery and reuse.

The goals of this project are:

1) To accurately estimate the annual quantity of each of the types of film plastic generated, diverted and disposed within the CCRMDZ.

2) To document existing material flow pathways for use, disposal and diversion, (including estimating existing feedstock presently under contract).

3) To make recommendations for the most effective methods to capture this film and get it to a washing and/or recovery/reuse facility.

4) To provide information that will facilitate the siting of a film plastic washing facility and/or a recovery and reuse facility in the central coast region.

Methodology

Environmental Planning Consultants (EPC)

1) Gathered information from suppliers, from collectors, landfills, and other sources

2) Developed a generation calculator

3) Identified current materials flow pathways to accurately determine what is moving, where and how

4) Identified recycling and reuse options for the material

1. Research and Evaluate Existing Information

EPC contacted landfill operators, film recyclers and other appropriate parties in each of the four counties, and throughout California, to obtain information on quantities used, disposed, and recovered for recycling, and to gather other useful data.

A list of individuals contacted is provided in the '**Contacts**' tab in the CCRMDZ AGRICULTURAL FILM 091606.xls spreadsheet.

CIWMB Contact

EPC contacted CIWMB staff, Christine Flowers and Muhammad Akhtar, to identify what information was available from the state. Through a conference call and follow up emails, CIWMB staff shared valuable information about their work on assessing the use and disposal patterns for agricultural film through out the state, and provided many web based resources and contacts for his project.

Survey of Landfill Operators

Patrick Matthew, County of Santa Cruz, Buena Vista Landfill
The Santa Cruz County Landfill is currently in the process of setting up a program for recycling agricultural film. They are asking that agricultural film and drip tape be separated prior to delivery. The landfill personnel then load drop boxes supplied by Cal-Plastics, who in-turn hauls them to their processing plant in Castroville, California. The proposed processing charge is $25/ton for drip tape, colored film plastics (plastic mulch), and clear film plastics (fumigation plastic).

To reduce the amount of agricultural film hauled to the landfill, in addition to the $54/ton for general refuse, there is a surcharge rate of $27/ton ($81/ton total for agricultural film). This will remain in effect for non-separated Agricultural plastics unless or until the processor changes the receiving standards to include mixed plastics.

There is currently no room at the Buena Vista Landfill to site an agricultural film washing and/or recycling facility.

Jose Gamboa, City of Santa Cruz Landfill
They accept all types of film at their landfill. The only condition is that it must come from within the City of Santa Cruz. Because of this requirement, they receive a very small amount of agricultural film. The tipping fee is $63.49/ton with no surcharge added for film.

Robert Ketley, City of Watsonville Landfill
Robert said that they do not accept any agricultural film at their landfill and do not have any desire to host a recycling facility at this time. No tonnages to report.

Mandy Rose, County of San Benito, John Smith Landfill
The John Smith landfill accepts all types of agricultural film. There are no conditions. The tip fee is $52 per ton. There is an additional special handling fee of $60 per load for all agricultural film. The tonnage received has dropped to almost zero since they added the special handling fee.

Alan Styles – Salinas Valley Solid Waste Authority, Johnson Canyon Landfill, Crazy Horse Landfill and Jolon Road Landfill
All 3 landfills are owned by the Salinas Valley Solid Waste Authority and run by Norcal Waste Systems. They do accept different types of agricultural plastics. Their tip fee is $54.50/ton for general refuse and a surcharge rate of $54.50/ton ($109/ton total for agricultural film). They have noticed the amount of film being taken to the landfill is dropping significantly and Alan believes it is due to the companies/people taking the film off the fields hauling it to other facilities. They expect almost no tonnage at any of their three landfills in 2007.

Rick Shedden, Monterey Regional Waste Management District, Marina Landfill
They accept all plastics with no conditions. Everything is being landfilled. They charge $66 per ton (increased on Jan. 1, 2006). The 2005 annual tonnage for "problem waste" (which includes agricultural film plastic) was 7,611 tons. The 2004 figures were 4400 for only agricultural film. The figure for January to June 2006 is 2,439 tons, which shows a continued decrease in tonnage.

John Ryan, Cold Canyon Landfill Operator
They currently have agricultural film recycling in place. They accept clean agricultural plastics (fumigation, mulch film, drip tape and other rigid plastics like planting pots) in all colors, sort the material by color (clear, from black, etc), then bale all agricultural plastic before transporting to processor. If they ship the material to a domestic processor, they use vans, flat beds or trucks. If they ship the material to an international processor, they place the bales directly in shipping containers (on site). It depends on the market as to whether they ship it over seas or if it stays here in the states. In some cases they use a broker (many times they don't know of certain processing facilities) and in some cases they go directly to the processor, which is what they prefer because they get paid better money for it. They receive approximately 100 tons a month. If the film is too dirty, the tip fee is $88 a ton and the film is landfilled (the normal tip fee is $20/ton).

Mike Hoover, Chicago Grade Landfill Operator
The landfill accepts all kinds of agricultural film for $45 a ton.

Brad Hagemann, City of Paso Robles, Paso Robles Landfill
They do accept all types of agricultural film. Most of the crops in the area are grapes and different types of orchards. They charge $38 a ton, no surcharge fee added. They don't have a lot of tonnage.

[NOTE: see the '**Agricultural Film Disposal 2005**' tab in the CCRMDZ AGRICULTURAL FILM 091606.xls spreadsheet]

The Marina Landfill listed 7,611 tons for all "Problem Waste", of which agricultural film is a portion. It is estimated that 4,400 tons of agricultural film were disposed in 2004.

Landfill disposal estimates for the four county region totaled 8,304 tons in 2005, while the total generation numbers are somewhat lower at 7,388 tons. We believe that this discrepancy largely results from the weight of the dirt and plant materials disposed with the plastic film. One source indicated that only 60% of the weight of agricultural film delivered to the landfill was actually film.

Recycling Facilities and Processors

Fred Bryant, California Plastics
California Plastics has been doing business in Northern California for over 3 years. They accept all types of agricultural film. The primary plastic is fumigation film. They are finding markets for the drip tape and mulch film, but they are paid much less for these plastics. They are working with landfills in the area to assist with a diversion program, and to offer recycling alternatives for greenhouses, hoop houses, fumigation and mulch films. They are working with the ag film removers for their film supply.

They just installed a wash line in Castroville, and are in the testing process. Next year they are hoping to add a faster wash line that will improve their volume. Right now, the wash line is currently not running, but they are hopeful it will be ready in the next few months. They are currently baling dirty plastics. Although their baler can bale up to 15 tons per hour, they are not at that capacity yet. They currently bale 1-2 containers each day, which is approximately 20-40 tons. Once the wash line is up and running, their goal is to wash 10 tons in one, eight hour shift.

From their Northern California facilities, they shipped 50-60 containers of agricultural film to Asia in 2004, and around 100 containers of film in 2005. They are projecting to far exceed that amount in 2006.

Pieter de Groot, Bonacor, LLC

Bonacor, LLC does not own a recycling facility; they found it to not be cost effective. They may place a washing facility somewhere, but that is a few years out. Pieter de Groot is part owner of Bonacor with Mike Bonasoro. Pieter is also part owner of Mipco Ag Plastics with Hank Monahan. Mipco sells fumigation and mulch film, Bonacor picks up the agricultural film. They provide balers for the farmers to use (baler and film pick up is at no charge). Once the bales are stockpiled, Bonacor will pick up the plastic and place it into overseas containers. The containers are shipped to China to be processed into pellets which are brought back to Los Angeles, where the pellets are processed into different types of tubing.

They never sell the material, but have sponsors such as Roberts Manufacturing and T-Tape (both companies sell drip tape), who assist with the costs so that they can keep the material in their possession. This process allows them to close the loop for their own product. Bonacor is processing 20-30 million pounds a year of agricultural plastics. Pieter said that the Central Coast area, from Oxnard to Watsonville, to Turlock, has about 60-80 million pounds of dirty agricultural film.

They pick up in Santa Maria, but have started coming up to Salinas and Watsonville area. Each shipping container holds 40,000 pounds (about 27 bales at 1500 lbs per bale), which is film from 3-4 acres. Out of the 40,000 pounds in the container, only about 24,000 pounds (or 60%) is actual plastic, the rest is dirt and rock.

Agri-Plas, Inc.

Agri-Plas is an Oregon company which is sourcing all types of agricultural plastics from farmers in Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Imperial and San Diego counties. They are setting up milk runs and picking up a variety of plastic agricultural products directly from the farmers, including baling twine, green house films, agricultural bag, and mulch film. They have domestic markets for 90% of the material they process and their market is growing.

Stan Kezar, Eno Plastics

Eno Plastics will be bringing an agricultural film washing facility on line in Camarillo (Ventura County) in the near future. Materials expected to be processed include fumigation, bedding, hoop house, drip tape and (black) construction films. Currently, Eno is stock piling materials in anticipation of the wash line's opening.

This facility will have two wash lines, one to process film plastics. The other wash line will be used for injection grade materials and rigid plastics. Some materials processed may come from MRFs, a far more complex assortment. Rigid plastics, such as drip tubing made from low density polyethylene will also be accepted. Pricing will be free for materials delivered to their dock.

Eno anticipates that once cleaned, separated and re-pelletized, that the material processed at their plant will be used for injection or extrusion type of applications.

Agricultural Plastics Recycles, Inc. & Netafim

Netafim, a distributor of drip irrigation products, has paired up with Agricultural Plastics Recycles, Inc. to recycle drip tape and tubing from farmers at no charge. Once the drip tape and tubing is placed in an appropriate location (specs are available) the farmer must fax in the "pick up" request, along with a picture of the items. Agricultural Plastics Recycles, Inc. will then do a site inspection to verify material is prepared properly and set a pick up date that can take between 2-8 weeks depending on the workload. After it is picked up, the material is taken to their wash facility in Kern County and sold domestically.

Agricultural Plastics Recycles, Inc. is located in Wasco, California (Kern County). They provide service from the Mexican border to Butte County, and out to the California coast. Currently they are processing 350,000 – 400,000 pounds per month and will be up to a million pounds by the end of September 2006.

They currently recycle drip tape and drip tubing but are looking into recycling shade cloth / cover and mulch film soon.

Yours Sunflower/Viscotec
Yours Sunflower is the parent company for Viscotec, which has begun a 5 month pilot program to collect plastics at the Visalia Airport. Viscotec is now accepting film (silage, fumigation, shrink wrap LDPE), baling twine (PP), drip tape (any type), and buckets and barrels made of HDPE. Viscotec showed some interest recycling other products, like nursery related plastics, given large and consistent stream of material. They will have two wash lines that are projected to be operational early in 2007, with the ability to add a third wash line, if needed.

Salinas Valley Tarp Pulling, Adam Gomez
Adam removes fumigation film only and works primarily in Santa Cruz, Monterey and San Benito County. He currently owns a baler that he takes to the different fields and bales the fumigation film. He bales about 40,000 pounds (20 tons) in one container, which is about 100 – 120 acres of fumigation film. It is then removed by a company that ships it to Hong Kong.

Fumigation Film is removed primarily in August, September and part of October. The bed (or mulch) film and drip tape is removed in December and January.

Fernandez Brothers Tarp Removers, Jose Fernandez
Fernandez Brothers primarily removes fumigation film, or tarps. They do not remove very much mulch film. They truck it to Castroville where we believe they take it to California Plastics. Neither of the brothers spoke English very well and was extremely difficult to communicate with. EPC was not sure what area they service other than Monterey County.

According to Victor Pongo in the Monterey County Agricultural Commissioner's office, Salinas Valley Tarp Pulling and Fernandez Brothers Tarp Removers, remove 80% of the ag film, with growers pulling the other 20%.

UC Agricultural Extension Staff

Richard Smith, UC Cooperative, Vegetable Farm Advisor
Richard works in San Benito, Monterey and Santa Cruz Counties. Strawberries and bell peppers primarily use mulch film and drip tape. The crops that would most likely use drip tape are: lettuce, annual artichokes, dry onions, radicchio, tomatoes, anise, squash, kale, cabbage, celery, broccoli, cauliflower. Crops that don't use drip tape: spinach, perennial artichokes, peas, asparagus, carrots, cilantro, and parsley.

Michael Cahn, UC Cooperative, Irrigation Specialist
Crops that use drip tape will use either 5/8" or 7/8" width. If they are going to reuse the drip tape, they will use a thicker plastic, such as 8-10 mil. If it is going to be a one time use, they usually use a 5 mil thickness. Vegetable crops will use an 8-10 mil thickness, because they will reuse their drip tape for 4 – 5 years. Crops that use drip tape include:

- Annual Artichokes: use drip tape, but it will be a higher mil to last and reuse for 4 to 5 years. 80" wide beds
- Broccoli: 10% of the crops use drip tape, more sprinklers
- Cauliflower: 10% of the crops use drip tape, more sprinklers
- Celery: 20% of the crops use drip tape. They use 6 mil and 5/8", but it can vary. Most reuse this for 8-10 crops (4-5 years).
- Endive, Lettuce: 40% of the crops use drip tape. They have 75% of the crops use 40" beds with 1 drip line. There is 25% of the crops use 80" wide beds with 3 drip lines. Of

this 40% of lettuce uses drip tape. They use more 7/8" and a higher mil (8-10) because they reuse them. Romaine is the crop that uses 80" wide beds.

- Bell & Chili Peppers: They use drip tape and mulch film. 60" beds (from center to center) with 1 drip line per bed.
- Squash: They use 40" beds usually (not positive) 10-20% use drip tape.
- Blackberries: They use a higher mil thickness with an 80" wide bed or spacing. This crop is a 5-7year.
- Vineyards: Use drip tubing, rarely tape.
- Perennial artichokes, beets, cabbage, kale, pumpkins, radicchio, spinach, tomatoes – all use sprinklers.
- Brussels Sprouts, Michael has a pilot going on and they are looking to have farmers switch over to drip. They use sprinklers right now.

Michael suggested we ask the Agricultural Water Advisory Committee within Monterey County if we could hand out a survey asking them what their members so for each crop (how wide the beds are, what type of film the use, etc).

Steve Tjosvold, UC Cooperative Extension, Farm Advisor
Steve works mainly with ornamental type plants, including bulbs and different flowers. In the Santa Cruz and Monterey areas, there are about 80-90 acres of bulbs being grown; of which 60% of the acreage is fumigated using tarps (not entire acreage is covered). They fumigate once a year.

Many growers will use either drip tape or drip tubing on cut flowers. It depends on the cost of the crop and how permanent it may be. If it is a perennial crop, it will most likely use drip tubing. If it is an annual crop, they will most likely use the drip tape. Most cut flowers would use drip tape. These flower crops can be both inside and outside. He is not sure of the percentage of drip on these types of crops. The rose farms they have in the county amount to about 25 acres.

Mulch film use in the area will depend on the value of the crop. The higher value the crop, the more they can afford to use mulch film (like strawberries). Steve didn't think that crops with lower value (such as most vegetables) would actually have the money to be able to use mulch film.

Mark Bolda, UC Cooperative Extension, strawberry and cane berry expert
Mark is the expert for strawberries and cane berries. He states that a significant part of the strawberry acreage uses fumigation film, but 20% is bed fumigated through the drip system. Less than 10% of the crop acreage does not fumigate. All of the strawberry crops use mulch film and drip tape. The mulch film is wrapped around the bed, so it is substantially wider than the bed width given above. The standard mulch film is 1.5 mil with a bed size ranging from 52" (on the coast) to 48" (inland), but this really depends on the grower preference

There are 3,300 acres of strawberries in Santa Cruz County and 7,600 acres of strawberries in Monterey. There are 2,700 cane berries in Santa Cruz County.

80% of cane berry farm the acreage is field fumigated (fumigation film / tarps) and 20% is not fumigated. Mulch film is not used. With drip tape, 60% of the farmers change it every 2 years, 30% change it every 3 years, 10% change it every 4 years. The standard drip tape dimensions can range from 5-8 mil thick x 13,000 feet in length x 5/8" – 7/8" wide, depending on the growers preference.

Hoop houses, which help improve production per acre and reduce the risk of crop loss from rains, are changed every 3 years. The hoop houses are 15 feet tall at peak, approximately 20 feet wide and 300 feet long. There are 7 hoop houses in each acre. Thirty percent of the cane berry acreage uses shade/hoop structures and this percentage is increasing. Hoop houses are covered with 3 mil thick film.

Film Suppliers

Doug Buessing, Trical Sales
Trical sells primarily fumigation and mulch film. They do not install or remove the film. Doug works in the Salinas, Watsonville, Monterey area. He claims that 80% of the fumigation film is being recycled (shipped off to China).

Dennis Peoples, Trical Sales
The standard fumigation film for strawberry crops is 13 feet wide x 4000 feet long x 1 mil thickness. While strawberries are the primary crop, any crop could benefit from it. Fumigation season starts in August and ends usually in October. Most growers remove the film using field laborers.

Hank Monahan, President of Mipco Agricultural Films
Mipco sells between 12 – 13 million pounds of film plastic a year primarily in California. They sell to 5 or 6 large companies and a handful of smaller companies. They sell green house film (3 million pounds), mulch film (7 ½ million pounds) and the remaining 2-3 million pounds are for other products.

Mipco sells film plastics; they do not remove it at this time. According to Hank, the primary crops that use mulch film are strawberries, cucumbers, bell peppers and some tomatoes. Most tomatoes grown in California are used for ketchup and other processing, which does not require the use of film. Lettuce, broccoli and watermelon generally do not use film. Mulch film is primarily used for crops that need to look good. Some crops use broadcast fumigation film (in 13ft wide sheets), which they lay on top of the soil and fumigate for 7 days. They then remove the film and place the mulch film (bed film) for planting. This is mainly used for weed control. Many other farmers will use the mulch film for fumigating, putting the film down and then planting.

In Southern California, a strawberry farmer would use mulch film that is 84" wide x 3000 feet long x 1.5 mils thick. They use approximately 2.75 rolls per acre. Each roll is 151.2 pounds. Depending on space between rows, they can use up to 3.75 rolls per acre. The general rule is 60" wide for veggies and 84"wide for strawberries. However, in the Central Coast, most farmers use 60" wide mulch film for strawberries and 48" wide mulch for vegetables.

Most crops use the same type of mulch films as the strawberries. The plastic will be down for about 9 months before it is removed. This may vary between farmers, they can use between 56", 60" or 66" wide depending on the size of their farm, and other factors.

Hank provided insight to the different mulch film colors available and their general use.
Black: This is the most widely used color for mulch film. It eliminates weeds, keeps a constant soil temperature and allows less water evaporation.
Clear: Clear plastic is rarely used anymore. It is primarily used for heating up the ground. The area gets full sun penetration, which heats up the soil, allowing a higher temperature. However, the plastic does not hold in the heat at night and does not control weed growth.
Clear on Black (clear center, black on the side of the beds): This is a new product Mipco is selling which Hank stated is extremely popular with farmers in San Benito, San Luis Obispo, Santa Cruz and Monterey Counties (even though more expensive than black). The black portion maintains a constant temperature, keeps the weeds away and allows less water evaporation. The clear center allows for faster growth of plants, shading the plastic from the sun allowing no weed growth.
Green: This is a photo selective product and allows most light to penetrate like the clear plastic, but can also act like the black plastic by inhibiting weed growth (only 90% of what black mulch film can do). The soil temperature gets much hotter like the clear plastic (not as hot as clear plastic allows) but keeps some of the temperature in at night. Green is used a lot in San Benito, San Luis Obispo, Monterey and Santa Cruz Counties. It seems to be very popular with strawberry growers.

White on Black (white center, black on the sides of the bed): This film is used for hotter climates like the desert. The white reflects the sun so the baby plants do not burn and works against aphid infestation. The white keeps the soil cooler and works with the black to keep the weeds away and evaporation at a minimum.
Blue: Hank believes that blue provides the best results he has ever seen. It is not used because it is too expensive (blue film costs 1.5 times what black film costs, and red is 1.75 times the cost of black film) and farmers cannot justify spending the extra money. It acts much like the green color mulch film.
Brown: Operates much like the green color mulch film, but cost is higher. Hank does not believe it works as well as the green and wouldn't recommend it.
Red: Is rarely used in California and is primarily used for tomato crops on the east coast. For some reason, the red mulch film allows the tomatoes to be bigger, redder and juicier in the United States.
Silver: Is only used as a reflective material. They usually use it with a field that has aphid or white fly problems. The sun hits the film and reflects back up confusing the bugs so that they fly off to another farm. It is not widely used.

Paul McFadden, Roberts Manufacturing
Roberts Manufacturing sells drip tape and other non film related products. The drip tape varies by mil thickness and the mil thickness is determined by the type of crop it is being used for. For example, strawberries can use a medium thickness (5 mil) tape, where as lettuce needs a thicker product so that they can pick up and reuse. Drip tape is not always used with mulch film and it varies between what farmers prefer to do with their crop.

The drip tape used for strawberries is 5 mil thick and is 5/8" wide. The rolls average 12,000 – 13,000 linear feet, and weigh 75-77 pounds depending on the manufacturer.

John Violante, T-International, T-Tape
They sell drip tape throughout California. Around 75-80% of the growers in California use drip tape. All of the strawberry and bell pepper acreage uses drip tape. Bell peppers and strawberries remove the mulch film and drip tape yearly. The leafy vegetables such as lettuce or spinach may or may not use drip tape. It depends on the farmer and how they decide to manage their crops.

Most of the film is removed from the field between June and Oct, mainly from strawberries and cane berries. Vegetables can be processed year around depending on the crop, so material is being taken off the fields sporadically through the year. There are two trends: to use thicker plastics and reuse it over and over, or to use the thinner plastics and get rid of it each year.

Strawberries use a 5/8" width and between a 4 to 6 mil tape. Vegetables use a 7/8" width and between an 8 to 10 mil tape. Each roll of tape is 70 pounds. They cover 1.25 acres per roll if they use 2 lines of tape per bed. Some farmers use only 1 line of tape; others may use 3 lines, depending on the crop.

Dyan Wilcox, SoilFume, Inc.
SoilFume does not sell fumigation film. They provide the fumigation service.

Film Used per Acre

EPC identified quantities of film used, on a per acre basis, for fumigation, mulch, drip tape, hot house covering, greenhouse covering, and other film used in growing operations for each crop in each County.

[NOTE: see the '**Quantity Calculator**' tab, the 'film by USE' tab and the '**Film Weight**' tab in the CCRMDZ AGRICULTURAL FILM 091606.xls spreadsheet]

Frequency of Film Removal by Crop

- Strawberries are changed annually
- Cane berries are changed every other year
- Annual crops are changed annually

Estimates of Seasonal Film Removal

Most film removal is done between July and November. However, vegetable and flower crops may have film removed sporadically throughout the year depending on the type of crop and how many crops are planted. Some farmers may rotate 2 to 3 different crops each year.

With many crops the land is first fumigated under fumigation film (also known as broadcast film or tarps) which is removed within 10 days of laying film over the field. If the farmer chooses not to use the fumigation film method, they can use a different chemical via the drip line which is placed under the mulch film before planting. If drip tape is used (such as for strawberries), the tape is placed on the field before the mulch film and is removed with the mulch film, typically once a year after the crop has been harvested. The vegetable and flower crops that use drip tape often reuse it for 4 or 5 years before disposal.

Typically, growers sign contracts with a company to provide fumigation services. In most cases, the contract fumigators hire a tarp remover to pull the fumigation tarps off of the fields, so that the farmers are not directly involved with the disposal of the film. Agricultural Commissioners in two counties indicated that the tarp pullers are not registered with their offices, as no permits are required to remove the tarps.

Information about crops that were tarp fumigated was obtained from staff in charge of pesticide regulation within the Agricultural Commissioners office in each of the four counties. In some cases, staff provided crop specific information. In other cases, data for tarped acreage was of a more general nature.

Film Use by Crop Type

Strawberries

At most strawberry farms, the land is first fumigated by fumigation film and is removed within 10 days of laying film over the field. A significant part of the strawberry acreage uses fumigation film, but about 20% is bed fumigated through the drip system.

The drip tape and mulch film is then laid over the beds. All strawberry crops use mulch film and drip tape. The mulch film is wrapped around the bed, so it is substantially wider than the bed width given above. The standard mulch film dimensions are 1.5 mil thick x 3,000 feet in length x 60"-65" in width but this really depends on the grower preference. Once the crop is harvested, all of the mulch film and drip tape is removed at the same time, typically removed from June to October.

The typical strawberry bed size varies from 52" (on the coast) to 48" (inland). The standard fumigation film dimensions are 13 ft wide (156") x 1 mil thick x 4,000 feet in length. The standard drip tape dimensions are 5 mil thick x 13,000 feet in length x 5/8" wide.

Cane Berries

With most cane berry farms, 80% of the acreage is field fumigated (fumigation film / tarps) and 20% is not fumigated. The standard fumigation film dimensions are 13 feet wide (156") x 1 mil thick x 4,000 feet in length. Mulch film is not used. With drip tape, 60% of the farmers change it every 2 years, 30% change

it every 3 years, and 10% change it every 4 years. The standard drip tape dimensions can range from 5-8 mil thick x 13,000 feet in length x 5/8" – 7/8" wide, depending on the growers preference.

Hoop houses, which help improve production per acre and reduce the risk of crop loss from rain, are changed every 3 years. The hoop houses are 15 feet tall at peak, approximately 20 feet wide and 300 feet long. There are 7 hoop houses in each acre. Thirty percent of the cane berry acreage uses shade/hoop structures and the usage of these structures is increasing every year.

Blackberries use a higher mil thickness with an 80" bed or spacing. Blackberries are a 5-7 year crop.

Vegetable Crops

Most vegetable crops do not use fumigation film or mulch film. Squash, bell peppers and chili peppers are some of the higher value vegetable crops in the Central Coast that use mulch film. Most vegetable crops use a 40" wide bed with 48" mulch film. Some vegetables like artichokes and romaine lettuce have 80" beds with 3 drip lines. Squash typically has a 60" bed width.

Crops that use drip tape will use either 5/8" or 7/8" width. If the farmer is going to reuse the drip tape, they will use a thicker plastic, such as 8-10 mils. If it is going to be a one time use, they usually use a 5 mil thickness. An 8-10 mil thickness will be used on vegetable crops, because the farmers will reuse their drip tape for 4 to 5 years. These crops are: bell peppers, chili peppers, broccoli, cauliflower, celery, lettuce, endive, annual artichokes and squash.

Greenhouses

EPC spoke directly with several greenhouse growers, as well as staff at the Central Coast Greenhouse Growers Association and the California Cut Flower Commission. In the San Luis Obispo County Crop Report, the total square footage of greenhouse space is listed. Some of their houses are covered with film plastic. However, many greenhouses use a hard polycarbonate plastic, instead. This material has a long life span and is changed out infrequently.

Generally speaking, rose and cut flower production is done more in permanent type of greenhouses covered with rigid polycarbonate or fiberglass, rather than film plastic.

UCCE staff in San Luis Obispo County suggested taking the total greenhouse square footage listed in the crop report and multiplying it by 200-250% to come up with the amount of film that is used. These greenhouses are also covered with two layers of film plastic, a 4 mil sheet and a 6 mil sheet. The plastic is generally changed out every 3 years, though some greenhouse operators make the film last longer. One grower estimated that 70% of the film plastic lasts 3 years, and 30% lasts 4 years.

Because film used on greenhouses is wide enough to cover the greenhouse, one company reports that their film comes in rolls 36 feet wide by 180 feet long, but also said that width of film would vary depending on the greenhouse. Since the film is so wide, there are no glue strips used on greenhouse film.

Greenhouse growers report that they sometimes use debris boxes to dispose of the film, when it is removed from their greenhouses.

Central Coast Greenhouse Growers association staff reported that their organization, with 20 growers, includes most but not all of the greenhouse operators in the San Luis Obispo area. CCGGA staff said they would be willing to send an inquiry to their grower members to ask them to quantify the number of square feet of film plastic they use on an annual basis.

Definitions

Agricultural Films: Any film like plastics used in the agricultural community on their fields, such as fumigation film, mulch film and drip tape.

Fumigation Film: Also called broadcast film or tarps. This film is the large sheet that is used for fumigating a field. They lay the film flat over 100% of the acreage, placing glue at the seams to keep the film together. The farmers then fumigate the field for 9 days and remove it immediately.

Mulch Film: Also called bed film. This film ranges from .5- 1.5 mil in thickness. Its main purpose is to keep weeds away. 100% of strawberries use this film along with bell peppers and chili peppers. Most vegetable crops do not use mulch film due to cost.

Drip Tape: Is used for irrigating a field and used on annual crops. Drip tape averages about 5/8"-7/8" wide and between 5-10 mil thick. It is used on all strawberry, bell pepper and chili pepper crops and on a percentage of vegetable crops.

Drip Tubing: Is used for irrigating a field. Drip tubing is used on permanent crops, such as grapes, fruit trees, and blueberries (permanent, woody types of crops).

Hoop House Plastic: A layer of agricultural plastic that is placed over a hoop to cover cane berries. The hoop houses are 15 feet tall at peak, approximately 20 feet wide, 300 feet long and 4-6 mil thick. Hoop houses are used to improve production per acre and reduce the risk of crop loss from rains.

Methyl Bromide: A chemical used in the fumigation process, mostly used when an entire field is fumigated at once

2. Other Usable Plastics

This section describes the use of such materials as flower pots, trays, buckets, drip irrigation pipe and tubing, and dirty retail film such as potting soil bags.

Drip tubing
Drip tape is generally used on crops of a more transitory nature, while drip tubing is used on crops that will be in place for a number of years. UCCE staff mentioned grapes, fruit trees, and blueberries as examples of the permanent, woody type of crops that would be watered with drip tubing, rather than drip tape. Drip tubing is changed out infrequently, generally when the crop is removed, once each 10-25 years.

Pesticide buckets
Assistant Agricultural Commissioner Bob Roach mentioned that there is a program sponsored by the Pesticide Container Recycling Council. In Monterey County, larger pesticide applicators, triple wash their plastic pesticide containers, remove the metal handles and labels, and store them at their yard. The containers are later picked up by a contractor, Lee Brown, and recycled. Pick ups used to be monthly. However, this program is under economic pressure, so the frequency of collection has been reduced. There is now a charge for this service.

Smaller operators can bring their buckets to the Marina Landfill on special collection days. Agricultural Commissioner staff wondered if a program to capture agricultural films for recycling could also be expanded to include the pesticide containers as well.

Shade cloth/cover

Mark Gaskell, a Farm Advisor with UC Extension in Santa Maria, asked if we would be working to divert agricultural shade cloth as well. This material is made out of polypropylene and HDPE and is usually discarded after 8 to 10 years. He estimated that there are 50 acres that are covered with shade cloth in San Luis Obispo County. While this material is discarded less frequently, it is a part of the waste stream generated by nurseries.

Nursery containers

Greenheart Farms, a transplant plug grower, indicated that they had 30 pallets full of polystyrene (PS) and polypropylene (PP) nursery flats that that they wanted help in diverting it. This material, enough to fill a semi truck, had an approximate weight of 5 tons. It was generated over the course of 3 to 4 years.

The grower had located a recycler, Talco Plastics, based in Corona who was willing to pay for the PS and take the PP at no charge. However, because of the expense of trucking these materials to the recycling, the company asked for help in finding another recycler.

EPC contacted Agricultural Plastics Recycle in Kern County to see if they were interested in this material. Agricultural Plastics Recycle contacted a couple of other companies who declined to take the material, saying they needed a larger volume of material, 10 to 20 tons per shipment. They suggested consolidating a number of smaller quantities from several sources into a shipment. We passed that idea along to our nursery contact.

Ian Greene, Chairman of the California Cut Flower Commission's Research and Production Committee, said that his industry does use a lot of plastic and would like to be able to recycle it. Injection molded and blow molded containers are used, in addition to fumigation film and drip tape. Plastic resins used for containers include PS, PP and high density polyethylene (HDPE).

Future efforts to recycle this material should consider establishing a consolidation point that would allow growers to drop-off materials for later recycling. Alternately, the growers could form a recycling cooperative, where they each accumulated their own material, and the materials would be picked up for recycling on an annual or semiannual basis. There are recyclers who are interested in picking up full truck loads of materials only, so consolidation points may be a necessity for smaller growers. Using local landfills as consolidation points may be one option.

3. Identify Washing Facility Requirements

This section includes discussions with representatives of the ENO film plastic washing facility in Ventura County, the Central Coast Regional Water Quality Control Board and the Monterey Bay Unified Air Pollution Control District, regarding washing facility requirements and permits.

Washing Facility Requirements – by ENO Plastics

According to a discussion with Stan Kezar from ENO Plastics, support from State and local governmental agencies are necessary before any of the following conditions should be considered. The first thing you need to know is if there is enough demand for the finished product to justify the installation and where this demand is located. If ready markets are east of the Rockies, it may not be economical to process material in California and then ship to customers located in the mid west or east coast. Once these issues are determined, the focus can be placed on the other requirements listed below.

1. There must be 30,000,000 pounds annually of usable feedstock within a 75-mile radius of the plant. This insures that the plant has enough material to maintain high production levels, helping

to make it cost effective to operate and reducing transportation costs. The value of plastic should also be considered.

2. The location of the building should be in an industrial area that allows outside storage of feedstock and equipment.
3. The building should be at least 50,000 square feet with a ceiling height of 20'-30' and should be located on 4 usable acres of land. An additional 1,500' of office space is also needed.
4. Power available must be a minimum of 2,500 amps, 3-phase.
5. A work force of 25 to 40 employees is needed, with skills ranging form entry level to specialist.
6. Major transportation arteries must be close by. A rail siding would be helpful.
7. Financial incentives need to be available to help locate, set-up and start up the plant.
8. Local water discharge regulations should be fully considered.
9. At least one loading dock is needed to receive and ship material.
10. Cost to lease or purchase the building must be reasonable

Washing Facility Permit Requirements

Central Coast Regional Water Quality Control Board

John Robertson with the Central Coast Regional Water Quality Control Board oversees landfills for this region. Because the washing facility would be recycling, the plastic would not be considered a waste. As such, the facility would not be subject to the Water Board's landfill regulations [Title 27].

As for other permits from this agency, the proposed recycling facility would need coverage under the State Water Board's industrial storm water permit. This would be handled by the Storm Water group, headed by Chris Adair. A link to this general permit follows.

http://www.swrcb.ca.gov/rwqcb3/SWNEW/PhaseI/Industrial/Index.htm

Through the washing process, this facility will generate wastewater, which will have to be treated prior to discharge/disposal. This potentially requires treatment facilities that would likely need a discharge permit [waste discharge requirements] from the Board. Discharge could potentially go through a wastewater treatment plant, if sited near a municipality like Salinas]. Costs for permits are typically based on flow levels [volume]. The discharge permit application follows.

http://www.swrcb.ca.gov/rwqcb3/Applications/Form200/Form200.pdf

Water Board Staff indicated that the City of Santa Maria may already be recycling film plastic, adjacent to their landfill east of town.

Monterey Bay Unified Air Pollution Control District

Bob Pettit, an engineer with the Monterey Bay Unified Air Pollution Control District indicated that at least 3 or 4 permits would probably be required from their agency. Mentioned were permits for dust safety equipment, for each boiler, and a back up diesel generator, if it is greater than 50 horsepower. Pettit suggested that the Board's web page as a good starting point. www.mbuapcd.org

There are additional County specific regulations which would need to be addressed as well. The scope of this project did not provide sufficient time to evaluate the regulations specific to each County.

4. Summary

Several companies are now actively sourcing film plastics in the central coast region. Mipco has made presentations to the horticulture industry in the San Luis Obispo area and were talking directly with farmers in Monterey County. California Plastics in Castroville is operational and actively seeking materials. California Plastics worked with Santa Cruz County on the development of a flyer announcing their services. EPC has shared the flyer with several people who were all happy to receive this information.

To increase film diversion, a one page flyer could be developed that would summarize the options available to farmers and film plastic removers for the diversion of film plastics. The Santa Cruz County Agricultural Commissioner's Office in particular showed considerable interest in having such a flyer, which they could send to growers in a mailing and also make available as a flyer in their office. The Monterey County Agricultural Commissioner's Office was also interested. The horticulture industry has expressed interest in diverting plastics of all kinds, so any informational pieces should be shared with the Central Coast Greenhouse Growers Association and the California Cut Flower Commission as well.

Projections

Although farmers are looking to other alternative chemicals, it appears that methyl bromide is still widely used for strawberries, cane berries and other vegetable crops using fumigation film. Those farmers that choose not to use methyl bromide for fumigation will use alternative chemicals via the drip line or under the mulch film. California Plastics, who works closely with Trical, said that they don't see any changes to the fumigation process (methyl bromide) occurring in the next few years. If the fumigation film was no longer used, it would cause significant problems with the volume of material they currently receive, especially considering the fumigation film is easier to manage, cleaner and has a higher market value.

Bob Roach, Assistant Agricultural Commissioner in Monterey County, said that he expects the amount of fumigation film to decrease substantially with the phase out of Methyl Bromide, probably in 2008. Mark Bolda, strawberry and cane berry expert from UCCE, also indicated that he expects the amount of full field/tarp fumigation to decrease.

With the decrease in the amount of fumigation film used, surcharges on film plastics at the local landfills, and the increase in market demand for recovered film [spurred by higher fuel prices], it is projected that there will be less film hauled to landfill each year. Additionally, to meet their supply requirements, some of the ag film washers and recyclers will likely source other types of plastics.

Several companies have opened film washing facilities, and others are evaluating their options for additional facilities. In the short term, much of the recovered film is being shipped to China for processing into flake, however, the use of recovered file in the manufacture of new products, especially drip tubing, is expanding.

The plastics recyclers are traveling longer distances to supply their demand. As a result, reducing the amount of dirt trapped on the plastic may become more important to the economics of the system. So washing facilities, or mechanical methods of removing the dirt, will likely be a part of the future recycling system.

Agency	County	Contact Name	Title	Phone	Email	Date of Contact	Notes
UC Cooperative Extension							
	Monterey	Sonya L Varea Hammond	County Director	831-759-7350	slvareahammond@ucdavis.e	6/27	
		Larry Bettiga	Farm Advisor, Grapes	831-759-7350; 831/759-7361	lbettiga@ucdavis.edu	8/22	Said drip tubing was used on grapes, not tape. Very little mulch or fume film. Said to contact Steve Koike about vegetable crops.
		Mike Cahn	Irrigation Specialist	831-759-7350	mdcahn@ucdavis.edu	8/23	Referral from Steve Koike as possible source of info on of drip tape; provided info on usage of drip tape in vegetable crops.
		Steve Koike	Farm Advisor	831-759-7350	stkoike@ucdavis.edu	8/21	Indicated that little fumigation is done on vegetable crops. Suggested contacting Mark Bolda about film used on strawberries and Mike Cahn about use of drip tape.
	San Benito	Laura Tourte	County Director and Farm Advisor	831-763-8040	ljtourte@ucdavis.edu	6/27	
	San Luis Obispo	Richard Enfield	County Director and 4-H Youth Development Advisor	805-781-5940	rpenfield@ucdavis.edu	6/27	referred me to Mary Bianch. MB out of town until 7/3.
		Mary Bianchi	Horticulture Advisor	805-781-5949	mlbianchi@ucdavis.edu	7/3	Said primary use of film is for strawberries, some specialty vegetables, and greenhouses. Growers don't use film or drip tape on permanent woody perennial crops like apples, grapes, and avocados. Suggested I talk to Mark Gaskell about the "tunnels made of plastic" used on blueberries.
		Mark Gaskell	Farm Advisor, Specialty Crops	805-934-6240	mlgaskell@ucdavis.edu	8/22	Specialty crops contact for Santa Barbara County; Works in SLO, too. Provided some suggestions on how to estimate the amounts of greenhouse and hoop house film used in SLO. Said other hard plastics were also used in connection with transplant plug production. Mentioned the disposal of shade cloth on an 8-10 year cycle. Suggested I contact Julie Newman, UCCE Ventura Co. about fume film used annually on cut flower, flower seed and bulbs
	Santa Cruz	Mark Bolda	Farm Advisor Strawberries & Caneberries	831-763-8040 831-254-8040 (cell)	mpbolda@ucdavis.edu	6/21	Provided details on use of film in strawberries and cane berries. Suggested I contact Steve Tjosvold about other crops in Santa Cruz Co.
		SteveTjosvold	Farm Advisor	831-763-8013	satjosvold@ucdavis.edu	6/27	Potted plants, LS, green houses
		Mike Cahn	Irrigation Specialist	831/759-7377		8/29	Monterey, Santa Cruz, San Benito Cty; was referred to me by Richard Smith
		Richard Smith	Farm Advisor, Veggies	831/759-7357	rifsmith@ucdavis.edu	8/29	Monterey, Santa Cruz, San Benito Cty was referred to me by Steven Tjosvold.
	Ventura	Julie Newman	Horticulture Advisor	805-645-1459	jpnewman@ucdavis.edu	8/30	Mark Gaskell suggested I contact her about fumigation film used on fields for cut flowers, flower seed and bulbs.

Agency	County	Contact Name	Title	Phone	Email	Date of Contact	Notes
County Ag Commissioners							
	Monterey	Bob Roach	Asst. Ag Commissioner	831-759-7325	roachb@co.monterey.ca.us	6/28	Extensive phone interview. Suggested I contact Strawberry Commission staff: Dan Legard (research) and Maria Vidauri (grower liaison), Tri Cal and Soil Fume for tarp removal contacts; Rhonda Montiel, Monterey County Vintners Assoc Larry Bettiga, Monterey Farm advisor about drip tape and film used on grapes. 8/23 Clarified that acreage in crop reports is just for area in cultivation. Does not include roads etc. Sent Ag Film flyer on CA Plastics.
	Monterey	Karen Stahlman	Ag Program Manager	831-759-7325	stahlmank@co.monterey.ca.	8/30	Pesticide regulation staff. Provided exact acreage of specific crops that were tarp fumigated in 2005. Suggested I talk to Jim Bryant of David Kramer at the Grower Shipper Association about other types of film used by growers.
	Monterey	Victor Pongo		831-759-7318		9/18	
	San Benito	Ron Ross	Deputy Ag Commissioner	831-637-5344	staff@agcom.co.san-benito.c	8/31	Pesticide person. Knowledgeable about use of tarp film in San Benito Co. Said usage of tarp was more common in Salinas/Watsonville area. Reported actual acreage that was tarp fumigated, but said 2005 was not a typical year, which would have had about 150 acres fumigated. Indicated that the contract fumigators also find the tarp pullers. Tarp pullers not regulated by Ag Comm. office; the 2 he knows are based outside of Co. One is called "Former Farmer." Could provide phone number for pullers with some research.
	San Luis Obispo	Robert Lilley	Ag. Commissioner	805-781-5910	agcommslo@co.slo.ca.us	6/27	7/5 referred me to John Schmitz, Pesticide Use Enforcement Inspector
		John Schmitz		805-473-7098	jschmitz@co.slo.ca.us	7/5	Provided specific acreage info for flower fields and strawberry fields that were tarp fumigated in 2005. Suggested I contact Maria at the Strawberry Commission and the CC Green House Growers Association.
	Santa Cruz	Lisa Le Coump	Pesticide contact	831-763-8080	agc024@agdept.com	6/27	Pesticide regulation person. In addition to strawberries and cane berries, tarp fumigation is done by some flower growers. Indicated other fumigation is very rare/ infrequent. Asked for a 1 page flyer summarizing options growers have to recycle film. Could be mailed to the growers or displayed in the Ag Comm's office. Emailed Castroville flyer to her. Also, Lisa indicated that stockpiling film has gotten some growers in trouble with Env. Health.

Agency	County	Contact Name	Title	Phone	Email	Date of Contact	Notes
Farm Bureau							
	Monterey	Bob Perkins		831-751-3100	MoCoFB@Redshift.com	6/27	7/5 Referred me to the Grower-Shipper Association
	San Benito			831-637-7643	sbcfb@garlic.com	6/27	
	San Luis Obispo	Jackie Crabb		805-543-3654	jackie@slofarmbureau.org	6/27	7/7 Forwarded my email on to "someone who may be able to help"
	Santa Cruz	Jess Brown		831-714-1356	sccfb@sbcglobal.net	6/27	
Film Type	**Company**	**Contact Name**	**Title**	**Phone**	**Email**	**Date of Contact**	**Notes**
Film Suppliers							
Fumigation Film							
	TriCal			831-637-0195	jcooper@trical.com; www.trical.com	7/29	
	TriCal	Denny Peoples	Contact for AEP (fumigation film)	949-751-8892	dppoly@aol.com	8/21	
	AEP, Inc.	Carl Opperman	x2309	800-999-2374	http://www.aepinc.com/agriculture/fumigation.html		
Mulch Film							
	MIPCo	Hank Monahan	President	760-779-9401	rozhank@msn.com	7/29	
Drip Tape							
	T Sytems Inter'l, T-Tape	John Violante	Sales Rep for Central Coast	1-800-765-1860	jviolante@t-tape.com	8/28	http://www.t-tape.com/NorthAmerica/Products/DripTape.html
Agency	**Company**	**Contact Name**	**Title**	**Phone**	**Email**	**Date of Contact**	**Notes**
Distributors/Appliers/Removers							
	Mipco Ag Films	Hank Monahan	President	760-779-9401	rozhank@msn.com	7/31	
	Roberts Manufacturing	Paul McFadden		760-744-4511	pmcfadden@robertsirrigation	7/31	
	Roberts Marvel Plastic Mulch			800-478-2214		7/31	
	Fernandez Brothers Tarp Pulling	Jose Fernandez	Tarp Remover	408-671-7881 831-596-2576			
	California Grey Be	Will Horne		831-479-1055	whorne@greybears.org		
	Salinas Valley Tarp Pulling	Adam Gomez		831-809-5133		7/31	removes and bales fumigation film
Fumigators							
	TriCal	Doug Buessing	Sales Rep	831-637-0195	jcooper@trical.com; www.trical.com	7/30	408-804-4001 cell phone
	Soil Fume, Inc.	Dave Fry		831-728-1732	soilfume@yahoo.com		
	Soil Fume, Inc.	Dyan Wilcox	Front Office	831-728-1732	dmwcad@pacbell.net		

Location	Company	Contact Name	Title	Phone	Email	Date of Contact	Notes
Farmers/ Greenhouse Operators							
San Benito Co	Speedling San Juan Bautista	Ming Tee	Site manager	831-623-4432	speedlingsjb@aol.com	8/31	600,000 sq ft greenhouses. Uses 200,000 to 300,000 sq ft each of .4 and .6 mil film annually. 70% film lasts 3 years and 30% lasts 4 years.
San Luis Obispo Co.	Greenheart Farms	Kelly Delaney		805-481-2234 main 805-202-2481 direct	kelly@greenheartfarms.com	8/30	Uses plastic film on greenhouses. Will research sq. ft. used each year and get back to me. No drip tape or mulch film. Does use shade cloth. Stockpiling used PP and PS nursery flats for recycling.
San Luis Obispo Co.	Speedling	Graham Wright		805-489-8500	gwright@speedling.com	8/30	Said that greenhouses typically use a two layers of film, 4 mil and 6 mil. Film is replaced every 3 years. Speedling uses 36 foot wide film to cover their greenhouses. No glue is used.
San Luis Obispo Co.	Clearwater Farm	Eric Djasroodi		805-929-3241		9/1	Referred to by Angela Thompson from the CC Greenhouse Growers Assoc: Has 37 acres "under cover"
San Luis Obispo Co.	All Season Flower	Ed Castillo		805-343-4004		9/1	Referred to by Angela Thompson from the CC Greenhouse Growers Assoc
Monterey Co.	Grower Transplanting	Kevin Doyle		831-443-8528		8/30	Staff at Speedling San Juan Baurtista thought this nursery used film plastic.
Monterey Co.	Natividad Nursery	Rick Shido		831-443-1334		8/30	Provided specific square footage of film used to cover their greenhouses. Disposing of film in a debris box now. Mailed them info about the new Castroville wash line.

	Company	Contact Name	Title	Phone	Email	Date of Contact	Notes
Ag Film Processing Facilities							
	California Plastics	Fred Bryant		831-758-8828, 925-209-9305 cell	california-plastics@comcast.net - plexcorp@sbcglobal.net		
	California Plastics	Tony Heo		415-566-2088 415-812-1166	office cell		
	Bonacor, LLC	Pieter de Groot		805/431-3119	cpdegroot@earthlink.net, www.bonacor.com		Bonacor is the company who picks up agricultural film from farmers, puts bales in containers, ships it to China for processing and the pellets are brought back to their processing facilities in Los Angeles to make PVC pipe.
	Eno Plastics	Stan Kezar		805-987-6655	stan@enoplastics.com	8/16	Met at CRRA conference. Eno Washline is scheduled to be fully operational by 12/06.
	Ag Plastics Recycle, Inc	William Duncan		661-477-2798	bduncplastic@aol.com	8/23	Kern Co. washline that is actively sourcing materials from the CC, in partnership with Netafim. Will pick up drip tape for free. No fume film, because of the glue strip. Also accepts drip tubing and shade cloth. Hopes to be able to pick up mulch film in 6 weeks. Check back to confirm.
	Coastal Plastics					8/10	Contact from C.Flowers. Coastal plastics is a part of RKO, a Florida based company, is looking to expand in CA under the name, Coastal Plastics.
	Agri-Plas, Inc	Dari Jongsma		503-390-2381	dariagriplas@yahoo.com		8/10 Contact from C. Flowers. Oregon based: Is sourcing plastic from Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Imperial and San Diego. Will pick up directly from farmers.
	Your's Sunflower or Viscotec, Inc	Andreas Tornblom		(447)-899-5274	andreas@yours-sunflower.com		9/06 Contact from Dan De Grassi. Started a temporary plastic collection site at the Visalia Airport. Focusing on film (silage, fumigation, shrink wrap, LDPE), baling twine (PP), drip tape, any type (HDPE), and buckets and barrels (HDPE). Plans to have a washline operational January 2007.

County	Landfill	Contact Name	Title	Phone	Email	Date of Contact	Notes
Landfills							
Co. Santa Cruz	Buena Vista	Patrick Matthews	County of Santa Cruz	831-454-2160, 831-454-2377 (direct)	dpw119@co.santa-cruz.ca.u:	8/14	
City of Santa Cruz	Santa Cruz	Jose Gamboa	City of Santa Cruz	831-420-6273	jgamboa@ci.santa-cruz.ca.u:	8/14	
City of Watsonville	Watsonville	David Cook	City of Watsonville	831-768-3104	dcook@ci.watsonville.ca.us	8/14	
City of Watsonville	Watsonville	Robert Ketley	City of Watsonville	831-768-6173	rketley@ci.watsonville.ca.us		
Co. San Benito	John Smith	Mandy Rose	San Benito Cty Integrated Waste Mgt Dept.	831-636-4110	sbciwm@iwm.co.san-benito.	8/14	
Co. Monterey	Johnson Canyon	Alan Styles	Salinas Valley Solid Waste Authority	831-755-1300	alanst@svswa.org	8/14	
Co. Monterey	Crazy Horse	Alan Styles	Salinas Valley Solid Waste Authority	831-755-1300	alanst@svswa.org	8/14	
Co. Monterey	Jolon Rd.	Alan Styles	Salinas Valley Solid Waste Authority	831-755-1300	alanst@svswa.org	8/14	
Co. Monterey	Marina	Rick Shedden	Monterey Regional WMD	831-384-5313		8/14	
Co. San Luis Obispo	Cold Canyon	John Ryan	Cold Canyon Landfill	805-543-0280 x12; 805-471-7972 cell	www.coldcanyonlandfill.com ; johnry@wasteconnections.com	8/14	
Co. San Luis Obispo	Chicago Grade	Mike Hoover	Chicago Grade Landfill	805-466-2985 x12	www.chicagogradelandfill.co	8/14	
Co. San Luis Obispo	Paso Robles	Brad Hagemann	City of Paso Robles	805-237-3861		8/14	

	Agency	Contact Name	Title	Phone	Email	Date of Contact	Notes
Other							
	CIWMB	Christine Flowers		916-341-6267	CFlowers@CIWMB.ca.gov		
	CIWMB	Muhammad Akhtar		916-341-6507	makhtar@ciwmb.ca.gov		
	CA Strawberry Commission	Dan Legard	Research	831-724-1301 x	dlegard@calstrawberry.org	6/30	Left VM and sent follow up email. No response.
	CA Strawberry Commission	Maria Vidauri	Grower Liason	831-724-1301	mvidauri@calstrawberry.org	6/30	Indicated that the info we wanted was only available from the growers, but would not provide grower contact info, saying the info was confidential. Suggested we could get grower contact info from each Ag Comm's office.
	CA Strawberry Commission	Carolyn O"Donnell		831-724-1301	codonnell@calstrawberry.org	8/16	Contact from Dan De Grassi; Willing to publicize Ag Film recycling opportunities to the members of the strawberry
	Tulare County	Bill Hayter			bhayter@co.tulare.ca.us	6/13	Per C.Flowers, Bill works on on Ag issues for Tulare Co. and developed a survey on film.
	Tulare County	John Stevens			jstevens@co.tulare.ca.us		Contact from Dan De Grassi
	Monterey County Vintners and Growers Assoc.	Rhonda Montiel		831-375-9400	www.montereywines.org	8/31	Contact provided by Bob Roach, Monterey Ag Comm.
	Monterey County Vintners and	Scott Storm		831-382-4456		9/12	Contact provided by Rhonda Montiel from the Monterey County Growers and Vintners Assoc.
	County of Ventura	Peter Kaiser	Manager		peter.kaiser@ventura.org		Ag Film Calculator Contact
	County of Ventura	David Goldstein	Environmental & Energy Resources Division	(805) 658-4312	david.goldstein@ventura.org		Ag Film Calculator Contact
	California Cut Flower Commission	Kathryn Miele	Director of Marketing	831-462-8035	miele2@mindspring.com	9/1	Referred me to the chair of the Cut Flower Commission's Production and Research Committee, Ian Greene
	California Cut Flower Commission	Ian Greene	Chair, Cut Flower Comm. Production and Research Committee	831-728-0500 x220	igreene@goldenstatebulb.co	9/1	Works for Golden State Bulb Growers; Very interested in seeing all of the plastic from the cut flower industry recycled. Asked about recycling plastic pots, both hard plastic and blow molded. Said for his nursery alone, they fumigate 500 acres per year and use drip tape on 1000+ acres. Because info was not County specific and application rates for drip tape per acre were not given, we were unable to to use on Qty Calc spreadsheet. Did not have the time to respond further at this time, but clearly very interested in seeing all plastics recycled. Emailed flyer about CA Plastics.
	Central Coast Greenhouse Growers Association	Angela Thompson		1-800-961-8901	angela@cgga@yahoo.com	9/1	The CGGA has 20 grower members. Said she could query members about annual amounts of film that they used. Recommended I talk to All Seasons Flowers and Clearwater. Mipco had recently done a presentation to their group about diverting film plastic. Mipco will drop off a baler and pick up the baled film at no charge.
	Grower Shipper Association	Jim Bogart David Kramer		831-422-8844	jsbogart@yahoo.com	8/31	Referral from the Monterey Co. Ag. Comm. Based on info included with the 2005 Crop Report, this may be an organization that can share info with growers.
	Talco Plastics	Ron Petty		480-752-9080 951-531-2000		9/14	9/14 Contact from Greenheart Farms. Greenheart reported that Talco will pay for used PS nursery flats dropped off at their facility; accepts used PP nursery materials at no charge. Talco is at 1000 W. Rincon St. Corona, CA 92880

Ag Film Quantity Calculator

CCRMDZ TOTALS - 2005

Crop	Total Acres	Percentage of Acreage with Film	Acres with Ag Film	Frequency Changed (per year)	Weight per acre (lbs)	Total Weight (tons)
caneberries: fumigation	3,417	80%	2,734	0.50	300	205
caneberries: drip tape	3,417	100%	3,417	0.50	24	21
caneberries: hoop house	3,417	30%	1,025	0.33	937	158
strawberries: mulch	13,412	100%	13,412	1.00	350	2,347
strawberries: fumigation	13,412	86%	11,516	1.00	300	1,727
strawberries: drip tape	13,412	100%	13,412	1.00	108	724
bell peppers: mulch	3,497	100%	3,497	0.33	254	147
bell peppers: drip tape	3,497	100%	3,497	0.33	165	95
chili peppers: mulch	119	100%	119	0.33	252	5
chili peppers: drip tape	119	100%	119	0.33	165	3
broccoli: drip tape	61,420	10%	6,142	0.25	165	127
cauliflower: drip tape	20,296	10%	2,030	0.25	165	42
celery: drip tape	11,673	20%	2,335	0.25	165	48
lettuce (all): drip tape	150,196	40%	60,078	0.25	165	1,239
endive: drip tape	169	40%	68	0.25	165	1
artichokes: drip tape	6,325	25%	1,581	0.25	82	16
squash: mulch	832	20%	166	1.00	288	24
squash: drip tape	832	20%	166	1.00	165	14
wine grapes: fumigation	75,598		161	1.00	300	24
flowers: fumigation	1,398		430	1.00	300	64
Subtotal	**386,458**					**7,032**
misc, hoop houses			0	0.50	937	0
misc, fumigation <>			1,336	1.00	350	234
misc, greenhouse			466	0.33	1562	121
Subtotal						**355**
TOTAL	**386,458**					**7,388**

<> This category includes different crops and landscapes that use fumigation film.

Ag Film Use - Quantity Calculator

Monterey County - 2005

Crop	Total Acres	Percentage of Acreage with Film	Acres with Ag Film	Frequency Changed (per year)	Weight per acre (lbs)	Total Weight (tons)
caneberries: fumigation	621	80%	496.80	0.50	300	37
caneberries: drip tape	621	100%	621.00	0.50	24	4
caneberries: hoop house	621	30%	186.30	0.33	937	29
strawberries: mulch	9,294	100%	9294.00	1.00	350	1,626
strawberries: fumigation	9,294	86%	7974.25	1.00	300	1,196
strawberries: drip tape	9,294	100%	9294.00	1.00	108	502
bell peppers: mulch	964	100%	964.00	0.33	254	40
bell peppers: drip tape	964	100%	964.00	0.33	165	26
chili peppers: mulch	0	100%	0	0.33	252	0
chili peppers: drip tape	0	100%	0	0.33	165	0
broccoli: drip tape	48,922	10%	4892.20	0.25	165	101
cauliflower: drip tape	17,380	10%	1738.00	0.25	165	36
celery: drip tape	9,965	20%	1993.00	0.25	165	41
lettuce (all): drip tape	122,313	40%	48925.20	0.25	165	1,009
endive: drip tape	0	40%	0.00	0.25	165	0
artichokes: drip tape	6,081	25%	1520.25	0.25	82	16
squash: mulch	325	20%	65.00	1.00	288	9
squash: drip tape	325	20%	65.00	1.00	165	5
wine grapes: fumigation	39,710		161.00	1.00	300	24
flowers: fumigation	577		0	1.00	300	0
Subtotal	**277,271**					**4,702**
misc, hoop houses			0.00	0.50	937	0
misc, fumigation <>			1,062	1.00	350	186
misc, greenhouse			2.75	0.33	1562	1
Subtotal						**187**
TOTAL	**277,271**					**4,889**

<> This category includes different crops and landscapes that use fumigation film. 342 acres head lettuce, 357 acres outdoor field transplants, 213 acres dry onions, 150 acres all other sites =1,062 acres

Ag Film Use - Quantity Calculator

San Benito County - 2005

Crop	Total Acres	Percentage of Acreage with Film	Acres with Ag Film	Frequency Changed (per year)	Weight per acre (lbs)	Total Weight (tons)
caneberries: fumigation**	0	80%	0.00	0.50	300	0
caneberries: drip tape **	0	100%	0.00	0.50	24	0
caneberries: hoop house	0	30%	0.00	0.33	937	0
strawberries: mulch **	0	100%	0.00	1.00	350	0
strawberries: fumigation **	0	86%	0.00	1.00	300	0
strawberries: drip tape **	0	100%	0.00	1.00	108	0
bell peppers: mulch	1,642	100%	1642.00	0.33	254	69
bell peppers: drip tape	1,642	100%	1642.00	0.33	165	45
chili peppers: mulch	119	100%	119.00	0.33	252	5
chili peppers: drip tape	119	100%	119.00	0.33	165	3
broccoli: drip tape	695	10%	69.50	0.25	165	1
cauliflower: drip tape	118	10%	11.80	0.25	165	0
celery: drip tape	697	20%	139.40	0.25	165	3
lettuce (all): drip tape	13,776	40%	5510.40	0.25	165	114
endive: drip tape	169	40%	67.60	0.25	165	1
artichokes: drip tape	244	25%	61.00	0.25	82	1
squash: mulch	237	20%	47.40	1.00	288	7
squash: drip tape	237	20%	47.40	1.00	165	4
wine grapes: fumigation	0	0%	0.00	1.00	300	0
flowers: fumigation	705	0%	0.00	1.00	300	0
Subtotal	**20,400**					**253**
misc, hoop houses			0.00	0.50	937	0
misc, fumigation <>			274	1.00	350	48
misc, greenhouse			5.74	0.33	1562	1.49
Subtotal						**49**
TOTAL	**20,400**					**302**

** These crops are part of the miscellaneous category with 212 acres for 10 crops. We do not have accurate acreage for these individual crops.

<> This category includes different crops and landscapes that use fumigation film. 150 acres for other crops tarp fumigated, 28 acres of vegetables, 96 acres from 1 grower = 274 acres

Ag Film Use - Quantity Calculator

San Luis Obispo County - 2005

Crop	Total Acres	Percentage of Acreage with Film	Acres with Ag Film	Frequency Changed (per year)	Weight per acre (lbs)	Total Weight (tons)
caneberries: fumigation	0	80%	0.00	0.50	300	0
caneberries: drip tape	0	100%	0.00	0.50	24	0
caneberries: hoop house	0	30%	0.00	0.33	937	0
strawberries: mulch	800	100%	800.00	1.00	350	140
strawberries: fumigation	800	86%	688.00	1.00	300	103
strawberries: drip tape	800	100%	800.00	1.00	108	43
bell peppers: mulch	891	100%	891.00	0.33	254	37
bell peppers: drip tape	891	100%	891.00	0.33	165	24
chili peppers: mulch **	0	100%	0.00	0.33	252	0
chili peppers: drip tape **	0	100%	0.00	0.33	165	0
broccoli: drip tape	11,461	10%	1146.10	0.25	165	24
cauliflower: drip tape	2,512	10%	251.20	0.25	165	5
celery: drip tape	1,011	20%	202.20	0.25	165	4
lettuce (all): drip tape	8,127	40%	3250.80	0.25	165	67
endive: drip tape	0	40%	0.00	0.25	165	0
artichokes: drip tape	0	25%	0.00	0.25	82	0
squash: mulch	270	20%	54.00	1.00	288	8
squash: drip tape	270	20%	54.00	1.00	165	4
wine grapes: fumigation	35,313	0%	0.00	1.00	300	0
flowers: fumigation	116	26%	30.00	1.00	300	4
Subtotal	**63,262**					**465**
misc, hoop houses			0.00	0.50	937	0
misc, fumigation <>			0.00	1.00	350	0
misc, greenhouse			458	0.33	1562	119
Subtotal						**119**
TOTAL	**63,262**					**584**

** These crops are part of the miscellaneous category with 6,545 acres for 38 crops. We do not have accurate acreage for these individual crops. They reuse the drip tape for 4 to 5 years for vegetables, which is a very small percentage of the film.

<> This category includes different crops and landscapes that use fumigation film.

Ag Film Use - Quantity Calculator

Santa Cruz County - 2005

Crop	Total Acres	Percentage of Acreage with Film	Acres with Ag Film	Frequency Changed (per year)	Weight per acre (lbs)	Total Weight (tons)
caneberries: fumigation	2,796	80%	2236.80	0.50	300	168
caneberries: drip tape	2,796	100%	2796.00	0.50	24	17
caneberries: hoop house	2,796	30%	838.80	0.33	937	130
strawberries: mulch	3,318	100%	3318.00	1.00	350	581
strawberries: fumigation	3,318	86%	2853.48	1.00	300	428
strawberries: drip tape	3,318	100%	3318.00	1.00	108	179
bell peppers: mulch	0	100%	0.00	0.33	254	0
bell peppers: drip tape	0	100%	0.00	0.33	165	0
chili peppers: mulch	0	100%	0.00	0.33	252	0
chili peppers: drip tape	0	100%	0.00	0.33	165	0
broccoli: drip tape	342	10%	34.20	0.25	165	1
cauliflower: drip tape	286	10%	28.60	0.25	165	1
celery: drip tape **	0	20%	0.00	0.25	165	0
lettuce (all): drip tape	5,980	40%	2392.00	0.25	165	49
endive: drip tape	0	40%	0.00	0.25	165	0
artichokes: drip tape **	0	25%	0.00	0.25	82	0
squash: mulch **	0	20%	0.00	1.00	288	0
squash: drip tape **	0	20%	0.00	1.00	165	0
wine grapes: fumigation	575			1.00	300	0
flowers: fumigation	0		400	1.00	300	60
Subtotal	**25,525**					**1,613**
misc, hoop houses			0.00	0.50	937	0
misc, fumigation <>			0.00	1.00	350	0
misc, greenhouse			0.00	0.33	1562	0
Subtotal						**0**
TOTAL	**25,525**					**1,613**

** These crops are part of the miscellaneous category with 2,588 acres for 18 crops. We do not have accurate acreage for these individual crops. They reuse the drip tape for 4 to 5 years, which is a very small percentage of the film.

<> This category includes different crops and landscapes that use fumigation film.

Weight per Acre	
Strawberries: fumigation	4,000 feet (length of fumigation film roll) x 13 feet (width of fumigation film) / 43,560 feet (sq. feet in an acre) = sq. ft. of fumigation film used = 1.19 rolls x 250 pounds per roll (standard weight for each roll) = 300 pounds per acre
Strawberries: Drip Tape	20,000 linear feet per acre (UC strawberry cost report) / 13,000 linear feet (standard length of drip tape per roll) x 70 pounds (standard drip tape roll weight) = 108 pounds per acre
Caneberry: Drip Tape	4,400 linear feet per acre (UC raspberry cost report) / 13,000 linear feet (standard length of drip tape per roll) x 70 pounds (standard drip tape roll weight) = 24 pounds per acre
Caneberry: Hoop House	300 ft length x 20 ft wide x 15 ft high, (pi x diameter = circumference) 3.14 x 20 = 62.8; take half of circumference for the arc of film = 31 sq. feet. 31 (half circumference of film) x 300' (length) = 9300 square feet per hoop house. There are 7 hoop houses per acre, so 7 x 9300 = 65,100 square feet film used / 43,560 ft /acre = 1.49 acres film used; or 937 pounds per acre
Bell & Chili Pepper: mulch	43,560 feet (feet per acre) / 3.33 feet (feet in a 40" bed) = 13,081 feet (linear feet of mulch film needed); 1 roll of mulch film at 48" wide x 1.5 mil thick x 3000 ft long = 108 pounds per roll. Would need 2.75 roll = 254 pounds per acre.
Bell & Chili Pepper: Drip Tape	According to UC Bell Pepper cost report, they use 8 mil thickness in a 40" bed that is 13,200 linear feet. According to the standard drip tape lengths, they would use 2.25 rolls (5,560 length) = 70 pounds per roll = 165 pounds per acre
Drip tape for: Broccoli, Endive, Cauliflower, Celery, and Lettuce	According to Richard Smith (UC Cooperative), these crops use a 40" bed that uses one line of 43,560 feet (feet per acre) / 3.33 feet (feet in a 40" bed) = 13,081 feet (linear feet of drip tape needed); drip tape per acre = 1 roll of drip tape at 7/8" wide and 8 mil thick = 5,560 ft = 70 pounds. Would need 2.25 rolls = 165 pounds per acre
Annual Artichokes: drip tape	According to Richard Smith (UC Cooperative), this crop uses an 80" bed that uses one line of drip tape per acre 43,560 feet (feet per acre) / 6.66 feet (feet in a 80" bed) = 6,541 feet (linear feet needed for drip tape) 1 roll of drip tape at 7/8" wide and 8 mil thick = 5,560 ft = 70 pounds. Would need 1.25 roll = 82 pounds per acre
Squash: mulch	8,000 linear feet per acre (mulch film used -off UC squash cost report) / 4,000 linear feet (mulch film length used according to UC squash cost report) = 2 rolls needed. Using a 1.5 mil thickness x 5 ft wide x 4000 long = 144 pounds per roll x 2 = 288 pounds per acre
Squash: drip tape	According to Richard Smith (UC Cooperative), it is a 40" bed that uses one line of drip tape per acre 43,560 feet (feet per acre) / 3.33 feet (feet in a 40" bed) = 13,081 feet (linear feet needed for drip tape) 1 roll of drip tape at 7/8" wide and 8 mil thick = 5,560 ft = 70 pounds. Would need 2.25 roll = 165 pounds per acre
Greenhouse film	Greenhouses use a double layer of film on their houses, 4 and 6 mil. Amount of film used annually in square feet / 43,560 square feet per acre = acres of film used. Acres of film used x 625 pounds/acre (weight per acre for 4 mil film) = weight of 4 mil film used. Acres of film used x 937 pounds/ acre (weight per acre for 6 mil film) = weight of 6 mil film used. The double layer film = 625+937 = 1562 pounds per acre

Ag Film Usage by CROP				
[from Dan deGrassi] Updated by EPC 09/06				
Crop	**Fumigation**	**Mulch**	**Drip tape**	**Hoop**
Raspberries				
qty	25% of field each year	no	yes	yes, 90% of caneberry crops
Film Info	The growers alternate pulling the plants up (1/4 of the field each year) and only fumigate those areas.	no	Use both 5/8" and 7/8" and can use between a 5, 8 and 10 mil thickness depending on growers.	Replaced every 3 yrs (reuse). 4-6 mil plastic.
Crop Info	Caneberries: 60% of crops are changed out every 2 years, 30% of crops changed out every 3 years, 10% of crops changed out every 4 years.	Standard, caneberries are changed out every 2 years.		
freq	every 4 yrs	no	1 line per 7-11' wide row	yes, ≤25% acreage
source	Tri-Cal, SoilFume		many	
Strawberries				
qty	whole field, 80% of acreage is flat fumigated, other 20% is fumigated in drip lines	100% of fields use mulch film (even organic). 90lbs/ac (3.63 rolls on 40" bed)	100% of fields use drip tape.	no
Film Info	Standard: 13 ft wide x 4,000 ft long x 1 mil thickness	Standard: 84" wide x 3,000 ft long x 1.5 mil thickness	Standard: 5/8" width x 13,000 ft long x 5 mil thick	no
Crop Info		48" - 52" beds, 40" - 64" mulch film which wraps around bed. 48" bed = 40" film, 54" beds = 64" film, 64" beds = 84" film	1-2 lines / 48"-52" wide bed	
freq	annual (removal July - November	annual (June - Oct.).	annual (June - Oct.).	no
source	Tri-Cal (Dennis Peoples), UC Cooperative (Mark Bolda)	Mipco (Hank Monahan), UC Cooperative (Mark Bolda)	UC Cooperative (Mark Bolda), T-Tape (John Violante)	no

Crop	Fumigation	Mulch	Drip tape	Hoop
Bell Peppers & Chili Peppers				
qty	no	100% of fields use mulch film	100% of fields use drip tape.	no
Film Info	no	Standard: 60" wide x 3,000 ft long x 1-1.5 mil thickness	Standard: 7/8" width x 5,000 ft long x 8-10 mil thick (70lbs for one roll)	no
Crop Info		60" beds	1 drip line per row	
freq	annual	Every 3 years	Every 3 years	no
source	UC Cooperative (Michael Cahn and Richard Smith)	Mipco (Hank Monahan), UC Cooperative (Michael Cahn and Richard Smith)	UC Cooperative (Michael Cahn and Richard Smith), T-Tape (John Violante)	no
Vegetables				
qty	no	Only Bell Peppers, Chili Peppers and Squash use mulch film.	Many vegetable crops use drip tape. Most use sprinklers.	no
Film Info	no	Standard: 60" wide x 3,000 ft long x 1 mil thickness	Standard: 7/8" width x 5,000 ft long x 8-10 mil thick	no
Crop Info			% of crop that uses drip tape: Broccoli 10%, Cauliflower 10%, Celery 20%, Endive & Lettuce 40%, Squash 10-20%,	
freq	annual	Every 4-5 years	Drip tape changed every 4 - 5 years	no
source	UC Cooperative (Michael Cahn and Richard Smith)	Mipco (Hank Monahan), UC Cooperative (Michael Cahn and Richard Smith)	UC Cooperative (Michael Cahn and Richard Smith), T-Tape (John Violante)	no
qty = amount used per acre; measured either in # of rolls, # of feet or weight per acre				
freq = frequency of removal				
source = where we found information				

Typical Agricultural Film Weights

Mulch Film: Rolls

Width (in inches)			36	48	60	72	84
	Mil Thickness	Film Length	Pounds	Pounds	Pounds	Pounds	Pounds
	0.6	2000	17.28	23.04	28.8	34.56	40.32
	0.6	3000	25.92	34.56	43.2	51.84	60.48
	0.6	4000	34.56	46.08	57.6	69.12	80.64
	1	2000	28.8	38.4	48	57.6	67.2
	1	3000	43.2	57.6	72	86.4	100.8
	1	4000	57.6	76.8	96	115.2	134.4
	1.25	2000	36	48	60	72	84
	1.25	3000	54	72	90	108	126
	1.25	4000	72	96	120	144	168
	1.5	2000	43.2	57.6	72	86.4	100.8
	1.5	3000	64.8	86.4	108	129.6	151.2
	1.5	4000	86.4	115.2	144	172.8	201.6

** Formula was given to us by Robert Marvel Plastic Mulch Company and is considered the industry standard.
Formula = (inches of width) x 12 x (mil thickness) / 30 x (film length)
length in thousands; 4 (instead of 4000) or 3 (instead of 3000)
General rule, 60" wide for vegetables and 84" wide for strawberries (according to Mipco)
Average for Strawberries highlighted in square above

Fumigation Film: Rolls

Width (in inches)			90	156	180
	Mil Thickness	Film Length	Pounds	Pounds	Pounds
	1	3000	108	187.2	216
	1	4000	144	249.6	288
	1	5000	180	312	360
	1.25	3000	135	234	270
	1.25	4000	180	312	360
	1.25	5000	225	390	450
	1.5	3000	162	280.8	324
	1.5	4000	216	374.4	432
	1.5	5000	270	468	540

** Formula was given to us by AEP, Inc. and is considered the industry standard.
Formula = (inches of width) x (inches in length <ex.4000x12>) x (mil thickness) / 15 / 2
(film comes in single wound film sheets)
Average for fumigation film highlighted above

40,000 pounds of baled fumigation film, in one container. This equals approx. 100 - 120 acres
40,000 pounds / 2000 lbs = 20 tons in one container
20 tons / 100 acres = 5 (1 ton per 5 acres) (info provided by Adam Gomez, Fumigation Film remover)
1 ton per 2.5 acres. According to Mark Bolda who spoke with a tarp puller (not sure which one).

Drip Tape: Rolls

Width (in inches)			5/8"	7/8"
	Mil Thickness	Tape Length (linear feet)	Pounds	Pounds
	4	15,000	60	
Used for	5	13,000	60	
Strawberries	6	10,000	60	
5/8" width	6	7,380		65
	7	7,800	70	
	8	5,560		65
Used for Vegetabl	8	7,545	65	
with a 7/8" width	10	4,400		65
	15	3,000		65
	15	4,100	65	

** Information for Drip Tape was found on www.t-tape.com.
Average for Strawberries highlighted in square above

Info from Distributors

Roberts Manufacturing — 5 mil, 5/8" thick, 12-13K ft = 75 pounds, for strawberries. This figure is a bit higher than the above info.

Michael Cahn, UC Cooperative — 43,560 sq feet in an acre. If bed width is 40" or 3.33 feet (center to center):
43,560/3.33 = linear feet needed for drip tape (1 drip tape)

CENTRAL COAST RECYCLING MARKET DEVELOPMENT ZONE
AGRICULTURAL FILM PLASTIC
2005 - LANDFILL DISPOSAL ESTIMATES

LANDFILL		accept film	conditions	type of film	tip fee	surcharge	total fee	tons/yr	seasonal	tons/type
					$ per ton					
COUNTY OF SANTA CRUZ										
Buena Vista		yes	yes	all	$ 54.00	$ 27.00	$ 81.00	800	yes	mix
Santa Cruz		yes	no	all	$63.49	0	$63.49	?	yes	mix
Watsonville		no	no	none				?	yes	no
COUNTY OF SAN BENITO										
John Smith		yes	no	all	$ 52.00	$ 60.00	$ 112.00	25	yes	25 - drip
COUNTY OF MONTEREY										
Johnson Canyon	all 3 LFs:	yes	no	all	$ 54.50	$ 54.50	$ 109.00	185	oct-dec	mix
Crazy Horse		yes	no	all	$ 54.50	$ 54.50	$ 109.00	1681	oct-dec	mix
Jolon Road		yes	no	all	$ 54.50	$ 54.50	$ 109.00	13	oct-dec	mix
Marina		yes	no	all	$ 66.00	0	$ 66.00	4400	yes	mix
COUNTY OF SAN LUIS OBISPO										
Cold Canyon		yes	no	all	$ 20.00	$ 68.00	$ 88.00	1200		mix
Chicago Grade		yes	no	all	$ 45.00		$ 45.00			mix
Camp Roberts										
Paso Robles		yes	no	all	$ 38.00	0	$ 38.00	?	n/a	n/a

TOTAL WEIGHT	**8304**

Some percentage of the Total Weight brought to landfill is dirt that is attached to the film. For mulch film it is estimated that 40% of the disposed weight is dirt. For other films there is much less dirt.

Prepared by Dan deGrassi, Santa Cruz County DPW, 8/2004
Updated by Tracie Bills, Environmental Planning Consultants 8/2005