**2006 Precision Cultivation Evaluations**

University of California Cooperative Extension, Monterey County
Richard Smith, Farm Advisor

**Summary:** Close cultivation requires great precision. The EcoDan® guidance system provides technology and an opportunity to cultivate closer than traditionally practiced in the Salinas Valley. One advantage of this technology would be to provide more precision in cultivation operations without sacrificing speed. These studies examined cultivating broccoli and lettuce at the standard 4 inch cultivation width and compared it with a 2 inches wide cultivation width. Trial No. 1 was conducted on broccoli and the two inch cultivation strip controlled weeds by 52.9% while the four inch cultivation strip controlled 19.3% of the weeds. The two inch cultivation reduced time to weed the broccoli by 0.5 hour per acre, but there was a reduction of the stand of broccoli and a trend indicating a reduction in yield. Trial No. 2 was conducted on romaine and weed pressure was spotty and light. As a result, it was difficult to determine if the reduction in weeds was due to the spotty weed pressure or to closer cultivation. A reduction in stand was also observed in this field. Trial No. 1 illustrated the potential for improved weed control with closer cultivation; however there was more damage to the stand in both trials at this cultivation width.

These trials had less dramatic results than those seen in 2005. It is possible that it is unfair to expect an excellent job of cultivation at the very narrow 2 inch band width without a great deal of experience and practice. This is especially true in the large cultivation rig that was used to conduct these trials (three 80-inch beds wide and 15 seedlines). I walked behind the cultivator as it was making its pass and some of the problems that we encountered, I feel confident could be resolved with more time fine tuning the precision of the adjustments. It is possible that it would be more realistic to move the cultivation knives out to 2.5 to 3.0 inches to over come some of the potential injury issues, but still improve the level of weed control provided by cultivation.

**Methods:** Two trials were conducted utilizing the EcoDan® guidance system connected to a cultivation rig. ***Trial No. 1:*** The trial was conducted in cooperation with Israel Morales at American Farms in Chualar. The trial was conducted on Broccoli grown on 4 seedline, 80 inch wide beds. A three-bed cultivation rig was used that was set up with coulters and knives. The broccoli was one month old and had 2 true leaves at the time of cultivation. The cultivator is normally set up to leave a 4 inch wide uncultivated strip around the seedline of broccoli. The cultivator driver adjusted the cultivator to leave a 2 inch wide uncultivated strip for the 2 inch cultivation treatment. The 2 inch wide treatment was applied to 6 80-inch wide beds by the length of the field on July 26. Weed counts were made prior to cultivation of the 6 inch wide band marked by the planter press wheel on July 25. After cultivation, weed counts were made of the live weeds surviving in the uncultivated strips on July 27. Evaluations of hours per acre to weed were made by hand hoeing the uncultivated strip to remove all weeds and timing how long it took to weed the strips. Evaluations were made of a 60 foot long strip of the 4 seedlines on the bed in each of the 2 and 4 inch wide cultivation bands. The evaluation areas were

replicated six times down the row. Stand counts were made on August 1 and yield evaluations were made on October 9 and 13 by evaluating mean head weight and counting harvested heads collected by the commercial harvest crew. ***Trial No. 2:*** The trial was conducted in cooperation with Israel Morales at American Farms in Chualar. The trial was conducted on romaine lettuce grown on 5 seedlines on 80 inch wide beds. The cultivation and evaluation areas were the same as described above for trial no. 1. The pre-cultivation weed counts were made on August 11 and post cultivation counts on August 14. Cultivation was conducted on August 14. Evaluations were made as described for trial no. 1 except that five seedlines were evaluated. Time of weeding evaluations was conducted on August 16 and stand count was taken after thinning on August 31. The field was harvested on September 19. Commercial yields from the cultivated treatments were collected from the harvest crew from the cultivated beds by the length of the field.

**Results:** ***Trial No. 1:*** There was moderate weed pressure in this field. The two inch cultivation strip removed a greater percentage of the weeds than the 4 inch wide cultivation strip and reduced weeding time by 0.5 hour per acre (Table 1). However, the two inch cultivation treatment had fewer broccoli plants per acre and it was observed during the cultivation that there were more plants being damaged as the cultivators traveled through the field in this treatment. This problem probably could be corrected if the cultivator driver had more experience cultivating at this narrower setting. There was no statistical difference in the yield between the 2 and 4 inch treatments plants per acre, but there was a trend indicating a lower number of heads in the 2 inch treatment which would reflect the reduced stand (Table 2). ***Trial No. 2:*** Weed pressure in this trial was light. The trial had initially more weeds in the 4 inch strips. After cultivation there was less weeds in the 2 inch cultivation treatment, but there was not a reduction in the percent of weeds controlled in the 2 inch treatment (Table 3). There was a reduction in the hours per acre to weed the 2 inch treatment relative to the 4 inch treatment, but unfortunately given the spotty nature of the weed population at this site, we cannot conclude that it was due to the cultivation treatment. There was a reduction in the number of plants per acre in the 2 inch cultivation treatment and after thinning. There were 3,796 lbs of lettuce/A less in the 2 inch cultivation than the 4 inch cultivation as measured by a commercial harvest.

**Acknowledgements**
Israel Morales, American Farms, Chualar
Niels Andrews, Local Positioning Systems, Salinas
Dave Miltz, Research Assistant

Table 1. Broccoli - Trial No. 1: Pre and post cultivation weed counts, hours to weed and stand.

| Cultivation Band Width | Pre Cultivation (July 24) Weeds/6" band(60 foot strip – 30 ft$^2$) | | | | Post Cultivation Weeds/cultivated band (July 27)[1] | | | | | Stand Plants per Acre | Time to Weed (hrs/A) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Purslane | Shepherds Purse | Other Weeds | Total Weeds | Purslane | Shepherds Purse | Other Weeds | Total Weeds | Percent Control | | |
| 2 inches | 14.0 | 2.8 | 3.0 | 19.8 | 5.1 | 1.5 | 1.2 | 7.8 | 52.9 | 64,644.5 | 3.6 |
| 4 inches | 11.5 | 2.6 | 2.0 | 16.1 | 8.8 | 2.3 | 1.7 | 12.8 | 19.3 | 67,127.5 | 4.1 |
| LSD (0.05) | n.s. | n.s. | n.s. | 3.6 | 2.0 | n.s. | n.s. | 2.3 | 10.3 | 2,308.7 | 0.2 |

1: 2 inch band = 9.9 ft$^2$; and 4 inch band = 19.9 ft$^2$.

Table 2. Broccoli - Trial No. 1: Commercial yield

| Cultivation Width | Harvestable Heads (Number) Oct 9 | Mean Head Weight (lbs) Oct 9 | Harvestable Heads (Number) Oct 13 | Mean Head Weight (lbs) Oct 13 | Total Heads (Number) |
|---|---|---|---|---|---|
| 2 inches | 16,674.7 | 0.49 | 24,175.8 | 0.36 | 40,850.5 |
| 4 inches | 16,335.0 | 0.49 | 26,255.4 | 0.35 | 42,590.4 |
| LSD (0.05) | n.s. | n.s. | n.s. | n.s. | n.s. |

Table 3. Romaine - Trial No. 2: Pre and post cultivation weed counts, hours to weed, stand count and commercial yield.

| Cultivation Band Width | Pre Cultivation (Aug 11) Weeds/6" band(60 foot strip – 30 $ft^2$) | | | Post Cultivation Weeds/cultivated band (Aug 14)[1] | | | | Stand Plants per Acre | Time to Weed (hrs/A) | pounds/A |
|---|---|---|---|---|---|---|---|---|---|---|
| | Malva | Shepherds Purse | Total Weeds | Malva | Shepherds Purse | Total Weeds | Percent Control | | | |
| 2 inches | 2.1 | 0.9 | 3.4 | 1.2 | 0.2 | 1.4 | 55.4 | 32,844.2 | 4.15 | 33,625 |
| 4 inches | 2.4 | 1.8 | 4.7 | 1.3 | 1.0 | 2.5 | 56.6 | 35,316.3 | 5.48 | 37,421 |
| LSD (0.05) | n.s. | n.s. | 1.1 | n.s. | 0.4 | 0.6 | n.s. | 947.4 | 0.33 | |

1: 2 inch band = 9.9 $ft^2$; and 4 inch band = 19.9 $ft^2$.