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TITLE

Petition for 3 Years Extension of Exclusive Data Use for Fluopicolide as Provided for Under FIFRA Section 3(c) (1) (F) (ii)

TEST GUIDELINE

None

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STUDY COMPLETION DATE

2016-11-04

PERFORMING LABORATORY

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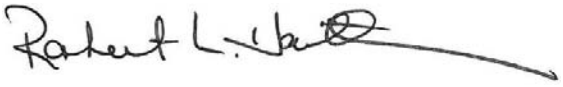
Signature 

Date November 4, 2016

GLP COMPLIANCE STATEMENT

This study does not meet the Good Laboratory Practice standards set forth by the United States Environmental Protection Agency, Code of Federal Regulation Title 40 Part 160; and differs in the following way(s):

- No new data generated.

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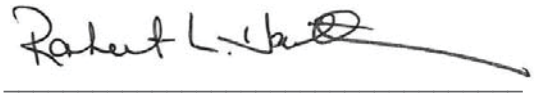
Signature  Date November 4, 2016

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1.0 Introduction

Valent USA, hereby petitions EPA to extend by 3 years the period of exclusive data use for Fluopicolide fungicide by applying the provision of FIFRA Section 3(c) (1) (F) (ii).

FIFRA Section 3(c) (1) (F) (ii) states that:

The period of exclusive data use provided under clause (i) shall be extended 1 additional year for each 3 minor uses registered after the date of enactment of this clause and within 7 years of the commencement of the exclusive use period, up to a total of 3 additional years for all minor uses registered by the Administrator if the Administrator, in consultation with the Secretary of Agriculture, determines that, based on information provided by an applicant for registration or a registrant, that –

(I) there are insufficient efficacious alternative registered pesticides available for the use;
(II) the alternatives to the minor use pesticide pose greater risks to the environment or human health;
(III) the minor use pesticide plays or will play a significant part in managing pest resistance; or
(IV) the minor use pesticide plays or will play a significant part in an integrated pest management program.

Fluopicolide Registrations

Fluopicolide technical (EPA Reg. No. 59639-139) and the end-use products, V-10161 4 SC Fungicide (59639-140), V-10161 VPP (59639-141), V-10162 Premix (59639-142), and V-10162 VPP (59639-143) were first granted US registration on January 28, 2008.

Currently registered (as of January, 12, 2015) use patterns are:

Terrestrial Food Uses On:

Grape Root and Tuber Vegetables	Crop Group 1
Leaves of Root and Tuber Vegetables	Crop Group 2
Bulb Vegetables	Crop Group 3
Leafy Vegetables (except Brassica Vegetables)	Crop Group 4
Brassica (Cole) Leafy Vegetables	Crop Group 5
Fruiting Vegetables	Crop Group 8
Cucurbit Vegetables	Crop Group 9

Outdoor Terrestrial Non-Food Uses On: Conifers and Deciduous Trees and Ornamental Plants Including: Bedding Plants, Conifers, Flowering Plants, Foliage Plants, Ground Covers, Non-Bearing Fruit Trees, Non-Bearing Nut Trees, Non-Bearing Vines, Ornamentals, Shrubs, Sod Farms, Tobacco and Turfgrass

Indoor Non-Residential Terrestrial Non-Food Uses On: Ornamental Plants in IndoorNurseries including Greenhouses, Shadehouses and Lathhouses. **Uses forwhich USEPA has accepted the required data and/or citations of data that the formulator has submitted in support of registration; and**

2.0 Fluopicolide Minor Use Crop Candidates and Residue Data

Residue trials were conducted in crops and the crop group representative crops, including major and minor crops, to support the numerous minor crops on which fluopicolide is currently registered. Table 1 shows the minor use crop candidates included in this petition for extension of exclusive use of data and the corresponding residue data used to support the registration of these minor crops.

Therefore, residue studies supporting registration are available for 18 minor use crop candidates. Of those, three minor use registrations (horseradish, ginseng, and garlic) supported by residue data generated on representative crops for crop group tolerances are given in Table 1

All of the minor use crop candidates were registered within the requisite seven year period (prior to January 28, 2015) and added to the technical fungicide label.

Table 1: Fluopicolide Minor Use Crop Candidates

Candidate No.	Crop Candidate	2012 Acres[1]	Residue Data to Support	MRID #	IR-4 Data	Date Registered	Crop Group No.	Document Section Number
1	Mustard green	6,925	Mustard green	47859901		4/20/2011	5B	3.0
2	Broccoli	128,938	Broccoli	47021701	x	5/30/2008	5A	4.0
3	Cabbage, head	66,035	Cabbage	47021702	x	5/30/2008	5A	5.0
			Tomato	46708536		1/28/2008	8	
		<31,854	Chili pepper	46708535		1/28/2008	8	
		49,762	Bell pepper	46708530		1/28/2008	8	
		71,911	Cantaloupe	46708531		1/28/2008	9	
		111,900	Cucumber	46708532		1/28/2008	9	
		58,486	Squash	46708538		1/28/2008	9	
			Grape	46708541		1/28/2008		
4	Head lettuce	154,968	Head lettuce	46708533		1/28/2008	4	6.0
5	Leaf lettuce	69,973	Leaf lettuce	46708534		1/28/2008	4	7.0
6	Celery	32,577	Celery	46708539		1/28/2008	4	8.0
7	Spinach	46,377	Spinach	46708540		1/28/2008	4	9.0
8	Horseradish	3,195	Radish	47021704	x	5/30/2008	1A	10.0
9	Ginseng	373	Sugar beet	47021706	x	4/20/2011	1A	11.0
10	Carrot	99,293	Carrot	47021705	x	4/20/2011	1A	12.0
11	Sweet potato	125,726	Potato	46708537		4/20/2011	1C	13.0
12	Onion, bulb	149,960	Onion, Bulb	47021703	x	5/30/2008	3	14.0
13	Garlic	24,162	Onion, green	47021703	x	5/30/2008	3	15.0
			Tobacco	48924102		1/12/2015		

[1]2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.

Residue studies supporting registration are available for 13 minor crops, thus qualifying fluopicolide for a 3-year extension of data exclusivity (1 year for each of 3 minor crops up to a maximum of 3 years) provided the other criteria listed below are met.

Valent USA believes that the registration of fluopicolide on 13 minor crops meets all of the requirements and therefore qualifies for a 3-year extension of data exclusivity (1 year for each of 3 minor crops up to a maximum of 3 years).

Table 2: Summary of the Criteria Met by Each of the Minor Use Crop Candidates

Candidate No	Candidate Crop	Key Fungal Diseases	Criteria				Document Section No.
			I	II	III	IV	
1	Mustard green	downy mildew; Pythium root rot; Phytophthora root rot	✓		✓		3.0
2	Broccoli	downy mildew; Pythium root rot; Phytophthora root rot	✓		✓		3.0
3	Cabbage	downy mildew; Pythium root rot; Phytophthora root rot	✓		✓		5.0
4	Head lettuce	downy mildew			✓	✓	6.0
5	Leaf lettuce	downy mildew			✓	✓	7.0
6	Celery	downy mildew			✓		8.0
7	Spinach	downy mildew, white rust			✓	✓	9.0
8	Horseradish	Pythium root rot	✓		✓		10.0
9	Ginseng	Pythium damping-off, Phytophthora foliar blight and root rot			✓	✓	11.0
10	Carrot	Pythium damping off, root rot, cavity spot, forking and stubbing			✓	✓	12.0
11	Sweet potato	mottle necrosis			✓	✓	13.0
12	Onion, bulb	downy mildew			✓	✓	14.0
13	Garlic	downy mildew			✓	✓	15.0

Criteria:

(I) There are insufficient efficacious alternative registered pesticides available for the use;
(II) The alternatives to the minor use pesticide pose greater risks to the environment or human health;
(III) The minor use pesticide plays or will play a significant part in managing pest resistance; or
(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Meeting the Criteria for Extension of the Period of Exclusive Data Use

Details of how fluopicolide meets the exclusivity criteria for various minor uses are described below.

Criteria:

(I) There are insufficient efficacious alternative registered pesticides available for the use;

(II) The alternatives to the minor use pesticide pose greater risks to the environment or human health;

(III) The minor use pesticide plays or will play a significant part in managing pest resistance; or

(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Each section gives: 1) the acreage for the particular crop(s) and the pest/crop problems; 2) the justification of how fluopicolide meets the criteria for the particular use; and 3) appropriate references for that section.

3.0 Justification for Fluopicolide Minor Use on Mustard Greens

3.1 Acreage, Production and Major Disease Problems.

According to the 2012 Crop Acreage Data Reported to FSA (1), there were 6925 acres of mustard greens (*Brassica juncea*) planted in the U.S. Mustard greens are grown for fresh market consumption and processing, and top-producing states are Arizona, Arkansas, Georgia, and Wisconsin. Diseases caused by the Oomycete class of plant pathogens are destructive in certain years or environments, and include downy mildew, Pythium root rot, and Phytophthora root rot. Downy mildew (*Peronospora parasitica*) is an important disease of mustard greens and other brassicas during times of cool and wet weather, and can cause severe spotting of foliage. Losses to downy mildew can approach 25% under disease-favorable conditions (2). Pythium root rot (caused by several species of *Pythium*) can be problematic on mustard and other brassicas at seeding or transplanting when conditions are wet and cool, and results in significant loss of plant populations (3). Brassicas, including mustard, may also be affected by Phytophthora root rot (*Phytophthora drechsleri*, *P. megasperma*), particularly in poorly-rotated fields and where moisture is high (4). Although Phytophthora root rot is a minor disease in general, individual fields can be severely affected where favorable conditions prevail.

3.2 Justification to meet Criteria:

(I) There are insufficient efficacious alternative registered pesticides available for the use

Conventional fungicides labeled for control of downy mildew, and which provide good efficacy against the disease, include azoxystrobin (FRAC group 11), pyraclostrobin (FRAC group 11), mefenoxam (FRAC group 4), cyazoxfamid (FRAC group 21), dimethomorph (FRAC group 40), mandipropamid (FRAC group 40), dimethomorph plus ametoctradin (FRAC groups 40 and 45), and fluopicolide (FRAC group 43) (5,6). Mefenoxam and fluopicolide are the only conventional fungicides labeled for Pythium root rot, and fluopicolide is the only conventional fungicide labeled for Phythophthora root rot.

A number of biopesticides based on microorganisms such as *Streptomyces* spp., *Bacillus* spp. and *Trichoderma* spp. (examples: Actinovate, Serenade, and Tenet) also have labels for these three diseases; however, these products are purely preventative in their recommended uses and require a tank-mix or alternation with another registered product when disease pressure is high (5). Potassium phosphite-based products are labeled for the combination of downy mildew, Pythium root rot, and Phytophthora root rot but suffer from the same limitations as biopesticides.

Fluopicolide (FRAC group 43) has a unique mode of action and is the only conventional product currently registered for control of the three Oomycete diseases (downy mildew, Pythium root rot, and Phytophthora root rot) that affect mustards and other brassicas. As such, fluopicolide fits well as a tank-mix or alternation partner for the biofungicides and potassium phosphites mentioned earlier.

(III) The minor use pesticide plays or will play a significant part in managing pest resistance

Key products for managing Oomycete diseases of mustard such as azoxystrobin (FRAC group 11), pyraclostrobin (FRAC group 11), mefenoxam (FRAC group 4), cyazoxfamid (FRAC group 21), dimethomorph (FRAC group 40), mandipropamid (FRAC group 40), and dimethomorph plus ametoctradin (FRAC groups 40 and 45) have a single-site mode of action and are therefore at risk for development of resistance (5). These products require users to adhere to resistance management tactics that include tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Fluopicolide has a unique mode of action (FRAC group 43) among the fungicides registered for use on mustard greens and is therefore ideally-suited for inclusion in resistance management programs.

3.3 References

1. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
2. Keinath, A. and Smith, J.P. 2004. Crop Profile for Leafy Greens and Collards (Fresh Markets) in South Carolina. Southern IPM Center. http://www.ipmcenters.org/cropprofiles/docs/SCleafygreens.pdf.
3. Damicone, J. 2014. Diseases of Leafy Crucifer Vegetables (Collards, Kale, Mustard, and Turnips). Fact Sheet EPP-7666, Oklahoma Cooperative Extension Service.
4. Koike, S., Gladders, P., and Paulus, A. 2007. Phytophthora root rot. Pp. 184-186 in: Vegetable Diseases: A Color Handbook. Academic Press, Boston MA.
5. CDMS Label Search. 2016. Greens (Mustard), United States, Fungicides. http://www.cdms.net.
6. Sikora, E. and Keinath, A. 2016. Efficacy of Products for Disease Control in Brassicas. Page 180 in: 2016 Vegetable Crop Handbook for the Southeastern United States. Farm Journal Media, Lenexa KS. 308 pp

4.0 Justification for Fluopicolide Minor Use on Broccoli

4.1 Acreage, Production and Major Disease Problems

The 2012 Crop Acreage Data Reported to FSA (7) indicates that there were 128,938 acres of broccoli (*Brassica oleracea*) produced in the U.S. Broccoli is grown for processing and fresh market consumption primarily in California, Arizona, Washington, Oregon, and Maine. Important diseases affecting broccoli and caused by the Oomycete class of plant pathogens are downy mildew, Pythium root rot, and Phytophthora root rot. Downy mildew (*Peronospora parasitica*) is the most important of these diseases and is particularly damaging to seedlings when cool and wet conditions prevail (8). Seedling death can occur from early infections and damage to foliage is common later in the season; where two crops per season are grown, early outbreaks can contribute to higher levels of disease in later crops. Varieties of broccoli grown for processing are most susceptible, and systemic infections result in heads being unsuitable for freezing. Pythium root rot (caused by several species of *Pythium*) may affect broccoli and other brassicas at seeding or transplanting, particularly when conditions are wet and cool or if plant densities are high. The level of damage caused by this disease varies by year and location (9). Brassicas, including broccoli, may also be affected by Phytophthora root rot (*Phytophthora drechsleri, P. megasperma*), particularly in poorly-rotated fields and where moisture is high (10). Although a minor disease in general, Phytophthora root rot can severely affect individual fields where favorable conditions prevail.

4.2 Justification to meet Criteria

(I) There are insufficient efficacious alternative registered pesticides available for the use

Conventional fungicides labeled for control of downy mildew, and which provide good efficacy against the disease, include azoxystrobin (FRAC group 11), pyraclostrobin (FRAC group 11), mefenoxam (FRAC group 4), cyazoxfamid (FRAC group 21), dimethomorph (FRAC group 40), mandipropamid (FRAC group 40), dimethomorph plus ametoctradin (FRAC groups 40 and 45), and fluopicolide (FRAC group 43) (11, 12). Mefenoxam and fluopicolide are the only conventional fungicides labeled for Pythium root rot, and fluopicolide is the only conventional fungicide labeled for Phthophthora root rot.

A number of biopesticides based on microorganisms such as *Streptomyces* spp., *Bacillus* spp. and *Trichoderma* spp. (examples: Actinovate, Serenade, and Tenet) also have labels for these three diseases; however, these products are purely preventative in their recommended uses and require a tank-mix or alternation with another registered product when disease pressure is high (11). Potassium phosphite-based products are labeled for the combination of downy mildew, Pythium root rot, and Phytophthora root rot but suffer from the same limitations as biopesticides.

Fluopicolide (FRAC group 43) has a unique mode of action and is the only conventional product currently registered for control of the three Oomycete diseases (downy mildew, Pythium root rot, and Phytophthora root rot) that affect mustards and other brassicas. As such, fluopicolide fits well as a tank-mix or alternation partner for the biofungicides and potassium phosphites mentioned earlier.

(III) The minor use pesticide plays or will play a significant part in managing pest resistance

Key products for managing Oomycete diseases of broccoli such as azoxystrobin (FRAC group 11), pyraclostrobin (FRAC group 11), mefenoxam (FRAC group 4), cyazoxfamid (FRAC group 21), dimethomorph (FRAC group 40), mandipropamid (FRAC group 40), and dimethomorph plus ametoctradin (FRAC groups 40 and 45) have a single-site mode of action and are therefore at risk for development of resistance (11). These products require users to adhere to resistance management tactics that include tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Fluopicolide has a unique mode of action (FRAC group 43) among the fungicides registered for use on broccoli and is therefore ideally-suited for inclusion in resistance management programs.

4.3 References

7. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
8. Pscheidt, J. and Ocamb, C. 2015. Broccoli (*Brassica olereacea*) – Downy Mildew (Staghead). In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2015. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. http://pnwhandbooks.org/plantdisease/broccoli-brassica-oleracea-downy-mildew-staghead.
9. Pscheidt, J. and Ocamb, C. 2015. Broccoli (*Brassica oleracea*) – Damping-Off. In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2015. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. http://pnwhandbooks.org/plantdisease/broccoli-brassica-oleracea-damping.
10. Koike, S., Gladders, P., and Paulus, A. 2007. Phytophthora root rot. Pp. 184-186 in: Vegetable Diseases: A Color Handbook. Academic Press, Boston MA.
11. CDMS Label Search. 2016. Broccoli, United States, Fungicides. http://www.cdms.net.
12. Sikora, E. and Keinath, A. 2016. Efficacy of Products for Disease Control in Brassicas. Page 180 in: 2016 Vegetable Crop Handbook for the Southeastern United States. Farm Journal Media, Lenexa KS. 308 pp.

5.0 Justification for Fluopicolide Minor Use on Cabbage

5.1 Acreage, Production and Major Disease Problems

According to the 2012 Crop Acreage Data Reported to FSA (13), there were approximately 66,000 acres of cabbage (*Brassica oleracea*) planted in the U.S. Fresh market consumption and processing are the primary uses for cabbage. The major cabbage-producing states are Arizona, California, Florida, Georgia, New York, and North Carolina. Diseases caused by the Oomycete class of plant pathogens are important constraints to cabbage production, and include downy mildew, Pythium root rot, and

Phytophthora root rot. Downy mildew (*Peronospora parasitica*) impacts cabbage and other brassicas during times of cool and wet weather (14). Seedling death can occur from early infections and damage to foliage is common later in the season; where two crops per season are grown, early outbreaks can contribute to higher levels of disease in later crops. Heavy leaf-spotting can result in heads being unmarketable. Pythium root rot (caused by several species of *Pythium*) occurs on cabbage and other brassicas at seeding or transplanting, particularly when conditions are wet and cool or if plant densities are high. The level of damage caused by this disease varies by year and location (15). Brassicas, including cabbage, may also be affected by Phytophthora root rot (*Phytophthora drechsleri, P. megasperma*), particularly in poorly-rotated fields and where moisture is high (16). Although a minor disease in general, individual fields can be severely affected by Phytophthora root rot where favorable conditions prevail.

5.2 Justification to meet Criteria

(I) There are insufficient efficacious alternative registered pesticides available for the use; or

Conventional fungicides labeled for control of cabbage downy mildew, and which provide good efficacy against the disease, include azoxystrobin (FRAC group 11), pyraclostrobin (FRAC group 11), mefenoxam (FRAC group 4), cyazoxfamid (FRAC group 21), dimethomorph (FRAC group 40), mandipropamid (FRAC group 40), dimethomorph plus ametoctradin (FRAC groups 40 and 45), and fluopicolide (FRAC group 43) (17, 18). Mefenoxam and fluopicolide are the only conventional fungicides labeled on cabbage for Pythium root rot, and fluopicolide is the only conventional fungicide labeled for Phythophthora root rot.

A number of biopesticides based on microorganisms such as *Streptomyces* spp., *Bacillus* spp. and *Trichoderma* spp. (examples: Actinovate, Serenade, and Tenet) also have labels for downy mildew, Pythium diseases, and Phytophthora diseases of cabbage; however, these products are purely preventative in their recommended uses and require a tank-mix or alternation with another registered product when disease pressure is high (17). Potassium phosphite-based products are labeled for the combination of downy mildew, Pythium root rot, and Phytophthora root rot but suffer from the same limitations as biopesticides.

Fluopicolide (FRAC group 43) has a unique mode of action and is the only conventional product currently registered for control of the three Oomycete diseases (downy mildew, Pythium root rot, and Phytophthora root rot) that affect cabbage and other brassicas. As such, fluopicolide fits well as a tank-mix or alternation partner for the biofungicides and potassium phosphites mentioned earlier.

(III) The minor use pesticide plays or will play a significant part in managing pest resistance; or

Key products for managing Oomycete diseases of cabbage such as azoxystrobin (FRAC group 11), pyraclostrobin (FRAC group 11), mefenoxam (FRAC group 4), cyazoxfamid (FRAC group 21), dimethomorph (FRAC group 40), mandipropamid (FRAC group 40),

and dimethomorph plus ametoctradin (FRAC groups 40 and 45) have a single-site mode of action and are therefore at risk for development of resistance. These products require users to adhere to resistance management tactics that include tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Fluopicolide has a unique mode of action (FRAC group 43) among the fungicides registered for use on cabbage and is therefore ideally-suited for inclusion in resistance management programs.

5.3 References

13. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
14. Pscheidt, J. and Ocamb, C. 2015. Cabbage and Cauliflower (Brassica spp.) – Downy Mildew (Staghead). In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2015. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. http://pnwhandbooks.org/plantdisease/cabbage-and-cauliflower-brassica-sp-downy-mildew-staghead.
15. Pscheidt, J. and Ocamb, C. 2015. Cabbage and Cauliflower (Brassica spp.) – Damping-Off (Wirestem). In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2015. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. http://pnwhandbooks.org/plantdisease/cabbage-and-cauliflower-brassica-sp-damping-wirestem.
16. Koike, S., Gladders, P., and Paulus, A. 2007. Phytophthora root rot. Pp. 184-186 in: Vegetable Diseases: A Color Handbook. Academic Press, Boston MA.
17. CDMS Label Search. 2016. Cabbage, United States, Fungicides. http://www.cdms.net.
18. Sikora, E. and Keinath, A. 2016. Efficacy of Products for Disease Control in Brassicas. Page 180 in: 2016 Vegetable Crop Handbook for the Southeastern United States. Farm Journal Media, Lenexa KS. 308 pp.

6.0 Justification for Fluopicolide Minor Use on Head Lettuce

6.1 Acreage, Production and Major Disease Problems

The 2012 Census of Agriculture reported 154,968 acres of head lettuce planted in the U.S., with the majority of production taking place in California and Arizona (19). Downy mildew, caused by the oomycete *Bremia lactucae*, is a major constraint to the production of head lettuce, and its greatest impact is in regions or seasons in which temperatures are cool (20). Downy mildew occurs as lesions on leaves, and losses of quantity and quality occur through direct damage by the disease and by invasion of secondary pathogens that cause rots in the field and in transit.

6.2 Justification to meet Criteria

(III) The minor use pesticide plays or will play a significant part in managing pest resistance

Eight of the currently-labeled fungicides for lettuce downy mildew belong to one of three FRAC groups: Group 11 (azoxystrobin, fenamidone, pyraclostrobin) Group 33 (fosetyl-AL, phosphite, others]), and Group 40 (dimethomorph, dimethomorph + ametoctradin, mandipropamid). Each of these, along with mefenoxam (FRAC group 4), propamocarb (FRAC group 28), and oxathiapiprolin (FRAC group U15), have a single-site mode of action pose varying levels of risk for development of resistance (20, 21). Users of these fungicides are required to follow strict resistance management guidelines such as tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Of the fungicides registered for lettuce downy mildew, fluopicolide has a unique mode of action (FRAC group 43) and therefore is well-suited for use in alternations or tank-mixes to manage resistance.

(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Integrated management tactics are crucial for management of lettuce downy mildew (20). Use of cultural practices, resistant varieties, and fungicides in a coordinated program serves to slow the appearance of new pathogen races (which may overcome varietal resistance to downy mildew), delay resistance to fungicides, and increase the overall level of disease control. Fluopicolide, with its unique mode of action and strong efficacy, would be a strong partner in integrated management programs for lettuce downy mildew.

6.3 References

19. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
20. Matheron, M.E. 2015. Biology and Management of Downy Mildew of Lettuce. University of Arizona Cooperative Extension Bulletin AZ1682, 3 pp.
21. CDMS Label Search. 2016. Lettuce, United States, Fungicides. http://www.cdms.net.

7.0 Justification for Fluopicolide Minor Use on Leaf Lettuce

7.1 Acreage, Production and Major Disease Problems

The 2012 Census of Agriculture reported 69,973 acres of leaf lettuce planted in the U.S., with the majority of production taking place in California and Arizona (22). Downy mildew, caused by the oomycete *Bremia lactucae*, is a major constraint to the production of leaf lettuce, and its greatest impact is in regions or seasons in which temperatures are cool (23). Downy mildew occurs as lesions on leaves, and losses of quantity and quality occur through direct damage by the disease and by invasion of secondary pathogens that cause rots in the field and in transit.

7.2 Justification to meet Criteria

(III) The minor use pesticide plays or will play a significant part in managing pest resistance;

Eight of the currently-labeled fungicides for lettuce downy mildew belong to one of three FRAC groups: Group 11 (azoxystrobin, fenamidone, pyraclostrobin), Group 33 (fosetyl-AL, phosphite, others]), and Group 40 (dimethomorph, dimethomorph + ametoctradin, mandipropamid). Each of these, along with mefenoxam (FRAC group 4), propamocarb (FRAC group 28), and oxathiapiprolin (FRAC group U15), have a single-site mode of action pose varying levels of risk for development of resistance (23, 24). Users of these fungicides are required to follow strict resistance management guidelines such as tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Of the fungicides registered for lettuce downy mildew, fluopicolide has a unique mode of action (FRAC group 43) and therefore is well-suited for use in alternations or tank-mixes to manage resistance.

(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Integrated management tactics are crucial for management of lettuce downy mildew (20). Use of cultural practices, resistant varieties, and fungicides in a coordinated program serves to slow the appearance of new pathogen races (which may overcome varietal resistance to downy mildew), delay resistance to fungicides, and increase the overall level of disease control. Fluopicolide, with its unique mode of action and strong efficacy, would be a strong partner in integrated management programs for lettuce downy mildew.

7.3 References

22. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
23. Matheron, M.E. 2015. Biology and Management of Downy Mildew of Lettuce. University of Arizona Cooperative Extension Bulletin AZ1682, 3 pp.
24. CDMS Label Search. 2016. Lettuce, United States, Fungicides. http://www.cdms.net.

8.0 Justification for Fluopicolide Minor Use on Celery

8.1 Acreage, Production and Major Disease Problems. Acreage, Production and Major Disease Problems.

Celery is grown mainly in California, Arizona, Florida, and Michigan; 32,577 acres were reported in 2012 (25). Diseases caused by oomycete pathogens are relatively minor in celery, and downy mildew (*Peronospora umbellifera*) is a common, although sporadic, example. Greatest potential for loss occurs during lengthy periods of leaf wetness, and the disease impacts foliage (26).

8.2 Justification to meet Criteria

(III) The minor use pesticide plays or will play a significant part in managing pest resistance; or

Although downy mildew is a relatively minor disease of celery, a number of fungicides are registered for control of this disease (27). This list of products is similar to that for downy mildew of other leafy vegetables. Eight of the fungicides labeled for downy mildew of celery are classified in one of three FRAC groups: Group 11 (azoxystrobin, fenamidone, pyraclostrobin), Group 33 (fosetyl-AL, phosphite), and Group 40 (dimethomorph, dimethomorph + ametoctradin, mandipropamid). Each of these has a single-site mode of action and are susceptible to the development of resistance (27). Labels for these products require users to follow strict resistance management guidelines such as tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Fluopicolide is the only FRAC group 43 fungicide registered for celery downy mildew and therefore is a strong choice for alternations or tank-mixes to manage resistance.

8.3 References

25. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
26. Davis, R. M. & Raid, R. M. 2002. Compendium of Umbelliferous Crop Diseases. American Phytopathological Society Press.
27. CDMS Label Search. 2016. Celery, United States, Fungicides. http://www.cdms.net

9.0 Justification for Fluopicolide Minor Use on Spinach

9.1 Acreage, Production and Major Disease Problems

Spinach is grown in the U.S. for processing and fresh-market uses, with the majority of production taking place in California and Arizona; smaller-scale production occurs in New Jersey, Oklahoma, and Texas. An estimated 46,377 acres were harvested in 2012 (28). Downy mildew, caused by the oomycete *Peronospora farinosa* f. sp. *spinaciae*, is the most important disease of spinach in California, while white rust, caused by *Albugo occidentalis* is more problematic in eastern production areas (29, 30). Downy mildew occurs as lesions on leaves, affecting produce quality and weight. Additionally, leaves damaged by downy mildew are prone to post-harvest rots while in storage or transit (29). White rust damages foliage initially and under favorable environmental conditions, whole-plant collapse is common (30).

9.2 Justification to meet Criteria

(III) The minor use pesticide plays or will play a significant part in managing pest resistance

Of the currently-labeled fungicides for spinach downy mildew and white rust, eight fall into one of three FRAC groups: Group 11 (azoxystrobin, fenamidone, pyraclostrobin), Group 33 (fosetyl-AL, phosphite), and Group 40 (dimethomorph, dimethomorph + ametoctradin, mandipropamid). These fungicides, as well as mefenoxam (FRAC group 4), propamocarb (FRAC group 28), and oxathiapiprolin (Orondis, FRAC group U15), have a single-site mode of action, and are at risk of resistance development (31, 32). Strict resistance management guidelines, such as tank-mixing or alternation with a different mode of action (designated by FRAC grouping), must be followed by applicators. Fluopicolide, the sole member of FRAC group 43, is effective against downy mildew and white rust and has a unique mode of action, making it well-suited for use in alternations or tank-mixes to manage resistance.

(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Management of spinach downy mildew and white rust requires an integrated approach that includes sound cultural practices, host resistance, and fungicides (r2, r3). Integrated disease management programs serve to slow the appearance of new pathogen races (which may overcome varietal resistance to downy mildew), delay resistance to fungicides, and provide the best-possible control of both downy mildew and white rust. Fluopicolide, with its unique mode of action and strong efficacy, would be a strong partner in integrated management programs for downy mildew and white rust of spinach.

9.3 References

28. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
29. LeStrange, M. and Koike, S. 2012. UC IPM Pest Management Guidelines: Spinach. UC ANR Publication 3467. http://www.ipm.ucdavis.edu/PMG/r732100111.html
30. Anonymous. 2016. Spinach Texas Plant Disease Handbook. http://plantdiseasehandbook.tamu.edu/
31. CDMS Label Search. 2016. Spinach, United States, Fungicides. http://www.cdms.net.
32. Pfeufer, E. 2015. Disease Control: Greens. 2016-2017 Vegetable Production Guide for Commercial Growers. University of Kentucky Cooperative Extension Service Publication ID-36. http://www2.ca.uky.edu/agcomm/pubs/id/id36/001-056.pdf.

10.0 Justification for Fluopicolide Minor Use on Horseradish

10.1 Acreage, Production and Major Disease Problems

Horseradish is a small-acreage crop (3,195 harvested acres in 2012) grown primarily in Illinois (approximately 1,500 acres), followed by Pennsylvania, Oregon, Washington, Wisconsin, and California (33). Horseradish has relatively few disease problems; however, soilborne diseases caused by *Pythium* spp., generally sporadic in nature, can be problematic at seeding or after plant emergence when conditions are wet and cool, resulting in stand losses (34).

10.2 Justification to meet Criteria

(I) There are insufficient efficacious alternative registered pesticides available for the use;

Mefenoxam, azoxystrobin, and fluopicolide are the only conventional fungicides labeled for Pythium root rot (36, 37).

A number of biopesticides based on microorganisms such as *Streptomyces* spp., *Bacillus* spp. and *Trichoderma* spp. (examples: Actinovate, Serenade, and Tenet) also have labels for Pythium root rot; however, these products are purely preventative in their recommended uses and require a tank-mix or alternation with another registered product when disease pressure is high (35, 37). Potassium phosphite-based products are labeled for the combination of downy mildew, Pythium root rot but suffer from the same limitations as biopesticides.

Fluopicolide (Presidio, FRAC group 43) has a unique mode of action and is one of the few conventional product currently registered for control of Pythium root rot that affects Horseradish. As such, Presidio fits well as a tank-mix or alternation partner for the biofungicides and potassium phosphites mentioned earlier.

(III) The minor use pesticide plays or will play a significant part in managing pest resistance;
Pythium root rot is relatively minor disease of horseradish, and few products are registered for control of this disease (36). Each of these has a single-site mode of action and is susceptible to the development of resistance. Labels for these products require users to follow strict resistance management guidelines such as alternation with a different mode of action (designated by FRAC grouping) (36). Fluopicolide is the only FRAC group 43 fungicide registered for Pythium root rot on horseradish and therefore is a strong choice for alternations or tank-mixes to manage resistance.

10.3 References

33. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.

34. Considine, D.M. 1982. Foods and Food Production Encyclopedia. Van Nostrand Reinhold, New York.

35. Anonymous. 2007. Horseradish (Amoracia) – Plant Health Problems. Connecticut Agricultural Experiment Station. http://www.ct.gov/CAES/cwp/view.asp?a=2823&q=377746

36. CDMS Label Search. 2016. Horseradish, United States, Fungicides. http://www.cdms.net.

37. Anonymous. 2016. Horseradish. 2016 Mid-Atlantic Commercial Vegetable Production Recommendations. Virginia Cooperator Extension Service. https://pubs.ext.vt.edu/456/456-420/456-420-pdf.pdf

11.0 Justification for Fluopicolide Minor Use on Ginseng

11.1 Acreage, Production and Major Disease Problems

Ginseng is grown for use as a medicinal herb, and is produced on approximately 374 acres in the U.S., with the majority of production taking place in Wisconsin (38, 39). Diseases caused by Oomycete pathogens can be particularly destructive during periods of excessive moisture on soil or foliage. Pythium damping-off (*Pythium* spp.) can cause significant damage to ginseng seedlings, while Phytophthora foliar blight and root rot (*Phytophthora cactorum*), among the most significant diseases of ginseng, can cause extensive blighting of foliage, root necrosis, and plant death (40).

11.2 Justification to meet Criteria

(III) The minor use pesticide plays or will play a significant part in managing pest resistance;

There are a number of options registered for control of Oomycete pathogens, and these fall into broad categories of biofungicides, protectants, and single-site inhibitors (41). Of the currently-labeled single-site fungicides for use on ginseng only two, Reason (fenamidone, FRAC group 11) and Presidio (fluopicolide, FRAC group 43) are registered for control of both Pythium damping-off and *Phytophthora* diseases. The labels of both products require strict resistance management guidelines, such as tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Fluopicolide, the sole member of FRAC group 43, has a unique mode of action, making it well-suited for use in alternations or tank-mixes to manage resistance.

(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Recommended management practices for Pythium damping off and Phytophthora root rot / foliar blight of ginseng are based on integration of sound cultural practices (timing of planting, moisture management) and fungicides (40). Integrated disease management programs delay resistance to fungicides and provide the best-possible control of both Pythium root rot and *Phytophthora* diseases. Fluopicolide, with its unique mode of action and strong efficacy, would be a strong partner in integrated management programs for diseases of ginseng caused by Oomycete pathogens.

11.3 References

38. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
39. Randall, J. and Cook, J. 2013. American Ginseng in Iowa: Ecology and History. Iowa State University Publication F-400. 4 pp.
40. Hausbeck, M. 2013. Pest Management in the Future: A Strategic Plan for the Michigan and Wisconsin Ginseng Industry. National IPM Database. https://ipmdata.ipmcenters.org/documents/pmsps/MI_WI_ginseng_PMSP_2013.pdf.
41. CDMS Label Search. 2016. Ginseng, United States, Fungicides. http://www.cdms.net.

12.0 Justification for Fluopicolide Minor Use on Carrot

12.1 Acreage, Production and Major Disease Problems

Carrots are an important root crop grown in the United States for both fresh market and processing uses. Acreage in 2012 was reported to be 99,923 with greatest production taking place in California, Washington, Texas, Michigan, and Florida (42). Carrots are a cool-season crop and are prone to diseases caused by Pythium spp. (Oomycete) such as damping-off, root rot / dieback, cavity spot, and forking (43). These diseases are particularly damaging when soils are cool and moisture levels are high (44).

12.2 Justification to meet Criteria

(III) The minor use pesticide plays or will play a significant part in managing pest resistance;

Diseases of carrot caused by *Pythium* spp. can be destructive under favorable environmental conditions. Numerous fungicides are registered for control of this disease (45). These include biofungicides (Actinovate, Bio-Tam, Cease, Double Nickel, Rhapsody, Rootsheid, Serenade, and SoilGard). A majority of conventional products are based on two active ingredients: metalaxyl / mefenoxam (FRAC Group 4), and azoxystrobin (FRAC Group 11); fenamidone (Reason) is also a member of FRAC Group

11. Other fungicides registered for *Pythium* diseases of carrot include cyazofamid (Ranman, FRAC Group 21) and polyoxin-D (PH-D, FRAC Group 19). These fungicides have a single-site mode of action and are at a medium-to-high level of resistance risk (45). Labels for these products require users to follow strict resistance management guidelines such as tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Biofungicides also require a tank-mix or alternation with another registered product when disease pressure is high. Fluopicolide is the only FRAC group 43 fungicide registered for diseases of carrot caused by *Pythium* spp. and is an efficacious choice for alternations or tank-mixes to manage resistance.

(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Recommended management practices for *Pythium* diseases of carrot are based on combining cultural practices (timing of planting, moisture management) and fungicides (44). Integrated disease management programs slow the development of resistance to fungicides and provide the optimal control *Pythium* diseases. The unique mode of action and excellent efficacy of fluopicolide make it a suitable partner in integrated management programs for diseases of carrot caused by Oomycete pathogens.

12.3 References

42. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
43. Davis, R.M. and Raid, R.N. 2002. Compendium of Umbelliferous Crop Diseases. American Phytopathology Society Press, St. Paul MN. 75 pp.
44. Nunez, J., Davis, R.M., and Turini, T.A. UC Pest Management Guidelines – Carrot. 2016. http://ipm.ucanr.edu/PMG/r102100411.html.
45. CDMS Label Search. 2016. Carrot, United States, Fungicides. http://www.cdms.net.

13.0 Justification for Fluopicolide Minor Use on Sweet Potato & Yam

13.1 Acreage, Production and Major Disease Problems.

Sweetpotato (*Ipomoea batatas*) is native to the Americas; the term yam" is often used interchangeable with sweetpotato, however true yams belong to *Dioscorea* spp. and are unrelated. Sweet potato production occurs primarily in the southern US, with North Carolina being the leading production state with 63,000 acres producing 12.4 million cwt valued at $177.3 million in 2012 (46). Mississippi (24,000 acres producing 3.5 million cwt) and Louisiana (10,000 acres producing 1.9 million cwt) are also major southern production centers and ranked 3 and 4 in the US. Texas, Florida, Arkansas and New Jersey have 1.2 to 6.4 thousand acres. Sweetpotato production has increased significantly in California which currently ranks 2nd nationally with 18,000 acres producing 6.2 million cwt. Total US production is 26.4 million cwt on over 130,000 acres valued at more than $500 million. Sweetpotatoes are grown from early spring when pre-sprouted seed are bedded to produce transplants which are then

grown in the field and harvested in late fall (47). Diseases caused by *Pythium* spp. are of minor importance, occurring mainly after transplanting and before harvest; these diseases tend to be most severe during periods of high soil moisture. Mottle necrosis is the most common Pythium disease of sweetpotato (48,49,50).

13.2 Justifications of How Fluopicolide Meets the Above Criteria

(III) The minor use pesticide plays or will play a significant part in managing pest resistance

Diseases caused by Pythium spp. are a minor issue in production of sweetpotatoes. A number of fungicides are registered for control of these diseases (51), and include biofungicides (Actinovate, Double Nickel, Rhapsody, Serenade). The majority of single-site inhibitors registered for Pythium diseases of sweetpotato are grouped into two modes of action: azoxystrobin (Quadris and generic products, FRAC Group 11), fenamidone (Reason, FRAC Group 11), metalaxyl / mefenoxam (Ridomil Gold and generic products, FRAC Group 4). Cyazofamid (Ranman, FRAC Group 21) is labeled for *Pythium* diseases of sweetpotato as well. Such fungicides are at a medium-to-high level of resistance risk, and labels for these products require users to follow resistance management guidelines such as tank-mixing or alternation with a different mode of action (51). Biofungicides also require a tank-mix or alternation with another registered product when disease pressure is high. Fluopicolide is the only fungicide in FRAC group 43 that is labeled for diseases of sweetpotato caused by *Pythium* spp. and is an efficacious choice for alternations or tank-mixes to manage resistance.

(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Recommended management practices for *Pythium* diseases of sweetpotato include cultural controls (timing of planting, moisture management) and fungicides (48, 50). Integrated disease management programs help to slow the development of resistance to fungicides and are the most effective way to manage *Pythium* diseases. The unique mode of action and strong performance of fluopicolide make it a suitable partner in integrated management programs for diseases of sweetpotato caused by *Pythium* spp.

13.3 References

46. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
47. Crop Profile for Sweet potatoes in North Carolina, 2005. http://www.ipmcenters.org/cropprofiles/GetCropProfiles.cfm
48. Anonymous. 2016. Diseases and Disorders of Sweetpotatoes. North Carolina Sweetpotato Commission. http://www.ncsweetpotatoes.com/sweet-potato-industry/growing-sweet-potatoes-in-north-carolina/diseases-disorders/.

49. Clark, C.A., Ferrin, D.M., Smith, T.P., and Holmes, G.J. 2015. Diseases of Sweetpotato. Common Names of Plant Diseases. American Phytopathological Society Press. http://www.apsnet.org/publications/commonnames/Pages/Sweetpotato.aspx.

50. Clark, C.A. and Moyer, J.W. 1988. Compendium of Sweet Potato Diseases. American Phytopathological Society Press, 74 pp.

51. CDMS Label Search. 2016. Sweetpotato, United States, Fungicides. http://www.cdms.net.

14.0 Justification for Fluopicolide Minor Use on Onion, bulb

14.1 Acreage, Production and Major Disease Problems

Onions are widely grown in the United States and rank in the top 5 in terms of vegetables produced in the country. Bulb onions are grown for fresh markets and also for storage, as well as for dehyrdration (52). The 2012 Crop Acreage Data report (53) indicates that approximately 150,000 acres of dry onions were produced, while roughly 5,600 acres of green onions were harvested. The major onion-growing states are California (all onion types), New Mexico (fresh market), and Washington (storage). Georgia is the leading producer of spring onions, and other leading producers of storage onions include Idaho, New York, Michigan, and Utah. Onions are affected by a wide range of soilborne and foliar diseases, including downy mildew (caused by the Oomycete pathogen *Peronospora destructor*). Downy mildew is extremely destructive when present during disease-favorable conditions and can cause losses of between 25 and 50% (54). Foliage affected by downy mildew becomes severely blighted resulting in reduced photosynthetic area and reduced bulb size; systemic infections cause disintegration of bulbs below ground (54).

14.2 Justification to meet Criteria

(III) The minor use pesticide plays or will play a significant part in managing pest resistance;

Downy mildew is a major, destructive disease of onions. A number of fungicides are registered for control of downy mildew (56), and include biofungicides (Actinovate, Double Nickel, Rhapsody, Serenade). Conventional protectants include fixed copper, chlorothalonil, and mancozeb. Single-site inhibitors include azoxystrobin (Quadris and generic products, FRAC Group 11), pyraclostrobin (Carbrio, FRAC Group 11), fenamidone (Reason, FRAC Group 11), mefenoxam (Ridomil Gold and generic products, FRAC Group 4), cyazofamid (Ranman, FRAC Group 21), dimethomorph (Forum, FRAC Group 40), zoxamide (Gavel, Zing; FRAC Group 22), oxatihiapiprolin (Orondis, FRAC Group U15), and mandipropamid (Revus, FRAC Group 40). In general, fungicides with a single-site mode of action are at a medium-to-high level of resistance risk and users are required to follow resistance management guidelines such as tank-mixing or alternation with a different mode of action (56). Biofungicides also require a tank-mix or alternation with another registered product when disease pressure is high. Fluopicolide is the only fungicide in FRAC group 43 that is labeled for downy mildew of onion and is an efficacious choice for alternations or tank-mixes to manage resistance.

(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Management of onion downy mildew is based on the integration of cultural practices (disease-free planting stock, plant spacing, destruction of volunteer onions), resistant varieties (red onion only), and fungicides (54, 55). Integrated management practices reduce reliance on fungicides and thus help to slow the onset of resistance. The unique mode of action and strong performance of fluopicolide make it a suitable partner in an integrated management system for downy mildew of onion.

14.3 References

52. Onions. 2015. Agricultural Marketing Resource Center. http://www.agmrc.org/commodities-products/vegetables/onions/.
53. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
54. Schwartz, H.F. 2011. Botrytis, Downy Mildew, and Purple Blotch of Onion. Colorado State University Extension Service Fact Sheet No. 2.941.
55. Nunez, J., Davis, R.M., and Turini, T.A. UC Pest Management Guidelines – Onion and Garlic. 2016. http://ipm.ucanr.edu/PMG/r584100111.html.
56. CDMS Label Search. 2016. Onion, United States, Fungicides. http://www.cdms.net.

15.0 Justification for Fluopicolide Minor Use on Garlic

Garlic was produced on 24,162 acres in the U.S. in 2012 (57). The bulk of harvested garlic is dehydrated and the remainder is cured for fresh market sale (58). California is the largest garlic-producing state (approximately 20,000 acres), followed by Oregon and Washington (57). Like onions, garlic production is negatively impacted by several soilborne and foliar diseases, including downy mildew (caused by the Oomycete pathogen *Peronospora destructor*). Downy mildew can cause losses when conditions are cool and damp (59). Foliar blighting results in smaller bulb size and reduced overall yield.

15.1 Acreage, Production and Major Disease Problems

15.2 Justification to meet Criteria

(III) The minor use pesticide plays or will play a significant part in managing pest resistance; or
Downy mildew can be a serious disease of garlic under favorable conditions. Numerous fungicides are registered for control of garlic downy mildew (60). Biofungicides include Actinovate, Double Nickel, Rhapsody, Serenade, while conventional protectants include fixed copper, chlorothalonil, and mancozeb. Single-site inhibitors include azoxystrobin (Quadris and generic products, FRAC Group 11), pyraclostrobin (Carbrio, FRAC Group 11), fenamidone (Reason, FRAC Group 11), mefenoxam (Ridomil Gold and generic

products, FRAC Group 4), cyazofamid (Ranman, FRAC Group 21), dimethomorph (Forum, FRAC Group 40), zoxamide (Gavel, Zing; FRAC Group 22), oxatihiapiprolin (Orondis, FRAC Group U15), and mandipropamid (Revus, FRAC Group 40). In general, fungicides with a single-site mode of action are at a medium-to-high level of resistance risk and users are required to follow resistance management guidelines such as tank-mixing or alternation with a different mode of action (60). Biofungicides also require a tank-mix or alternation with another registered product when disease pressure is high. Fluopicolide is the only fungicide in FRAC group 43 that is labeled for downy mildew of garlic and can be effectively used in alternations or tank-mixes to manage resistance.

(IV) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Garlic downy mildew is best managed with a combination of cultural practices (disease-free planting stock, plant spacing, destruction of volunteer garlic) fungicides (59). Integrated management practices reduce reliance on fungicides and thus help to slow the onset of resistance. The unique mode of action and high degree of efficacy for fluopicolide make it a good choice for use an integrated management system for downy mildew of garlic.

15.3 References

57. 2012 Census of Agriculture. 2014. United States Department of Agriculture publication AC-12-A-51. 695 pp.
58. Onions. 2015. Agricultural Marketing Resource Center. http://www.agmrc.org/commodities-products/vegetables/garlic-profile/
59. Nunez, J., Davis, R.M., and Turini, T.A. UC Pest Management Guidelines – Onion and Garlic. 2016. http://ipm.ucanr.edu/PMG/r584100111.html.
60. CDMS Label Search. 2016. Garlic, United States, Fungicides. http://www.cdms.net.

16.0 Qualification for Extension of Exclusive Data Use

FIFRA Section 3(c) (1) (F) (ii) allows for the extension of the period of exclusive data use by one additional year for each three minor uses registered within seven years of the initial registration up to a total of three additional years provided that:

(I) there are insufficient efficacious alternative registered pesticides available for the use;
(II) the alternatives to the minor use pesticide pose greater risks to the environment or human health;
(III) the minor use pesticide plays or will play a significant part in managing pest resistance; or
(IV) the minor use pesticide plays or will play a significant part in an integrated pest management program.

Table 1 summarizes the minor crops on which fluopicolide was registered during the first seven years after initial registration. Table 2 shows and the above text explains how each of the minor crops meets one or more of the above criteria.

(I) There are insufficient efficacious alternative registered pesticides available for the use.

There are 18 minor crops that qualify for the extension of fluopicolide exclusive data use and we have discussed 13 of them in this document and identified how fluopicolide has a unique fit in controlling oomycete diseases. Despite a number of fungicides already registered for controlling oomycete diseases, fluopicolide, sold as Presidio® in the vegetable market has established itself as an important part of many disease control programs. This success is due to fluopicolide's high level of activity on important diseases and low use rates. In particular, fluopicolide is unique in that it is the only member of FRAC group 43, therefore has a unique mode of action, and is the only conventional product currently registered for control of the three Oomycete diseases (downy mildew, Pythium root rot, and Phytophthora root rot) that affect many of the important vegetable crops. As such, fluopicolide fits well as a tank-mix or alternation partner for the biofungicides, conventional pesticides, and potassium phosphites.

(II) The minor use pesticide plays or will play a significant part in managing pest resistance.

Key products for managing Oomycete diseases of vegetable crops belong to a relatively limited range of FRAC groups with the most common being FRAC group 11, FRAC group 4, and FRAC group 40, or biologicals which have a single-site mode of action and are therefore at risk for development of resistance. These products require users to adhere to resistance management tactics that include tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Fluopicolide has a unique mode of action (FRAC group 43) among the fungicides registered for oomycete control and is therefore ideally-suited for inclusion in resistance management programs.

Many uses of fluopicolide result in better management of fungicide resistance. For example, many fungicides come pre-mixed as two active ingredients. Often, one of the active ingredients is ineffective against the target disease, either due to resistance or inherent inactivity. Use of multiple active ingredients in a premixed product often unintentionally promotes or maintains resistance in the fungal population. Fluopicolide is sold as a single active ingredient in Presidio® Fungicide, allowing growers to use it strategically when and where it is needed rather than automatically being applied along with another active ingredient in a premixed product. Fluopicolide, as the only FRAC Group 43 fungicide continues to be an important part of effective disease and resistance management programs in vegetables.

(III) The minor use pesticide plays or will play a significant part in an integrated pest management program.

Key products for managing Oomycete diseases such as azoxystrobin (FRAC group 11), pyraclostrobin (FRAC group 11), mefenoxam (FRAC group 4), cyazoxfamid (FRAC group 21), dimethomorph (FRAC group 40), mandipropamid (FRAC group 40), and dimethomorph plus ametoctradin (FRAC groups 40 and 45) have a single-site mode of action and are therefore at risk for development of resistance. These products require users to adhere to resistance management tactics that include tank-mixing or alternation with a different mode of action (designated by FRAC grouping). Fluopicolide has a unique mode of action (FRAC group 43) among the fungicides registered for use on mustard greens and is therefore ideally-suited for inclusion in resistance management programs.

17.0 Conclusions

The registration of fluopicolide on 13 minor crops meets and exceeds the criteria for granting a three-year extension of the exclusive data use period. This qualifies to extend the exclusive use period from January 28, 2018 to January 28, 2021. Fluopicolide controls many economically important diseases in minor vegetable crops. Fluopicolide is a unique tool in vegetable crops because it has a unique mode of action (FRAC 43), is sold as a single active ingredient mixture (Presidio®) and is, therefore an important tank mix and rotation partner. In addition, in many vegetables crops, it is the only conventional fungicide registered on the major oomycete diseases affecting the crop. The labeled rate for Presidio® is 3-4 ounces per acre. Many alternative protectant fungicides are used at much higher rates and, by virtue of their rates, pose risks to the environment and potentially worker safety. Presidio®'s single mode of action allows for strategic placement in disease control programs without unnecessarily applying a second active ingredient when not necessary (as in premix products). An important disease spectrum and low use rates, compared its alternatives, makes fluopicolide an important tool for disease control, resistance management and environmental stewardship.

18.0 Appendix 1
Brand Names of Fungicides with Active Ingredient and FRAC Code

azoxystrobin	Quadris	11
Bacillus subtilis (QST713 strain)	Serenade/Cease/Rhapsody	
Bacillus amyloliquefaciens strain D747	Double Nickel	
Fixed copper	Coside and others	M1
chlorothalonil	Bravo	M5
cyazoxfamid	Ranman	21
dimethomorph	Forum	40
dimethomorph plus ametoctradin	Zampro	40 45
fenamidone	Reason	11
fluopicolide	Presidio	43
fosetyl-AL	Aliette	33
Gliocladium virens strain GL-21	SoilGuard	
mancozeb	Dithane	M3
mandipropamid	Revus	40
mefenoxam	Ridomil Gold	4
metalaxyl	Ridomil	4
oxathiapiprolin	Orondis	U15
Polyoxin-D	PH-D	19
potassium phosphite	Phostrol and others	
propamocarb	Previcur	28
pyraclostrobin	Cabrio	11
Streptomyces lydicus	Actinovate	
(*Trichoderma asperellum* and *Trichoderma gamsii*)	Tenet/Bio-Tam	
Trichoderma harzianum Rifai strain KRL-AG2	Rootshield	
Zoxamide/mancozeb	Gavel	22+M3
Zoxamide/chlorothalonil	Zing	22+M5

19.0 Appendix 2 2012 Census of Agriculture Table 38

Table 38. **Vegetables, Potatoes, and Melons Harvested for Sale: 2012 and 2007**

[Totals may not add due to rounding. For meaning of abbreviatons and symbols, see introductory text.]

Crop	2012						2007	
	Total harvested		Harvested for processing		Harvested for fresh market		Total harvested	
	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres
Vegetables harvested for sale (see text)	72,045	4,492,086	13,072	1,977,490	65,814	2,514,596	69,172	4,682,588
0.1 to 0.9 acres	17,176	7,511	1,574	442	16,517	7,069	13,426	5,755
1.0 to 4.9 acres	29,618	59,177	3,283	2,548	29,056	56,629	27,752	57,780
5.0 to 14.9 acres	10,400	82,059	1,289	4,234	10,178	77,825	11,069	87,168
15.0 to 24.9 acres	2,684	49,934	518	6,530	2,415	43,403	2,990	55,646
25.0 to 49.9 acres	3,023	105,550	1,139	34,368	2,157	71,183	3,573	124,414
50.0 to 99.9 acres	2,648	184,296	1,378	87,257	1,506	97,039	3,093	212,379
100.0 to 249.9 acres	2,933	461,154	1,664	230,869	1,651	230,285	3,451	536,569
250.0 to 499.9 acres	1,637	569,544	1,003	283,366	975	286,178	1,791	615,956
500.0 to 749.9 acres	660	396,500	433	198,490	418	198,011	720	430,775
750.0 to 999.9 acres	356	307,078	209	132,041	258	175,038	360	309,554
1,000.0 acres or more	910	2,269,282	582	997,346	684	1,271,935	947	2,246,591
1,000.0 to 1,999.9 acres	552	753,903	347	332,968	418	420,935	591	814,667
2,000.0 to 2,999.9 acres	157	377,207	102	171,275	110	205,932	159	386,087
3,000.0 to 4,999.9 acres	109	409,945	72	171,801	82	238,145	123	458,158
5,000.0 acres or more	92	728,226	61	321,302	74	406,923	74	587,679
Artichokes (excluding Jerusalem)	167	7,339	11	21	168	7,318	118	9,687
Asparagus, bearing age	2,691	28,306	224	8,091	2,580	20,216	2,605	43,010
0.1 to 0.9 acres	1,648	435	70	11	1,615	424	1,408	388
1.0 to 4.9 acres	693	1,260	30	39	686	1,222	733	1,311
5.0 to 14.9 acres	139	1,139	23	141	129	998	158	1,368
15.0 to 24.9 acres	34	642	15	287	19	355	56	1,041
25.0 to 49.9 acres	49	1,739	24	744	30	996	65	2,343
50.0 to 99.9 acres	61	4,127	36	1,916	41	2,211	67	4,568
100.0 acres or more	67	18,964	26	4,954	60	14,011	118	31,991
Beans, green limas	909	45,096	321	38,824	612	6,273	1,020	42,529
Beans, snap (bush and pole)	22,289	266,114	2,615	172,530	20,524	93,584	17,300	303,997
0.1 to 0.9 acres	17,305	3,854	1,260	211	16,630	3,643	12,347	2,907
1.0 to 4.9 acres	3,070	4,966	225	229	3,000	4,737	2,829	4,627
5.0 to 14.9 acres	476	3,636	65	478	432	3,158	434	3,345
15.0 to 24.9 acres	143	2,757	74	1,215	93	1,542	167	3,239
25.0 to 49.9 acres	329	11,698	228	8,165	110	3,533	369	12,949
50.0 to 99.9 acres	298	20,938	249	17,440	60	3,498	392	27,114
100.0 to 249.9 acres	407	63,329	327	49,798	98	13,530	479	72,095
250.0 to 499.9 acres	164	55,702	124	39,517	54	16,185	165	55,103
500.0 acres or more	97	99,235	63	55,477	47	43,757	118	122,618
Beets	3,719	12,933	186	7,288	3,592	5,644	2,744	8,412
Broccoli	3,636	128,938	113	11,442	3,580	117,496	3,087	130,603
0.1 to 0.9 acres	2,635	592	43	5	2,617	587	2,227	497
1.0 to 4.9 acres	601	1,081	10	6	599	1,075	471	863
5.0 to 14.9 acres	120	939	3	18	119	921	71	550
15.0 to 24.9 acres	24	454	5	(D)	19	(D)	37	685
25.0 to 49.9 acres	27	912	7	217	20	695	33	1,131
50.0 to 99.9 acres	45	3,098	8	470	37	2,628	40	2,994
100.0 to 249.9 acres	54	8,593	13	1,697	43	6,895	81	12,781
250.0 to 499.9 acres	55	18,872	7	1,329	52	17,543	52	17,950
500.0 to 749.9 acres	24	13,723	3	(D)	24	(D)	29	16,922
750.0 to 999.9 acres	14	11,985	3	1,969	13	10,016	8	6,981
1,000.0 acres or more	37	68,692	11	5,218	37	63,474	38	69,250
Brussels sprouts	658	7,569	23	2,107	656	5,462	483	3,874
Cabbage, Chinese	748	7,999	54	90	736	7,909	620	11,480
Cabbage, head	4,126	66,035	174	11,733	4,035	54,302	4,086	80,619
0.1 to 0.9 acres	2,681	618	65	10	2,642	608	2,480	603
1.0 to 4.9 acres	824	1,498	18	22	819	1,476	843	1,542
5.0 to 14.9 acres	224	1,785	18	81	220	1,704	238	1,806
15.0 to 24.9 acres	63	1,128	5	90	59	1,038	97	1,776
25.0 to 49.9 acres	81	2,774	15	436	73	2,337	116	3,937
50.0 to 99.9 acres	87	5,644	17	799	76	4,845	114	7,534
100.0 to 249.9 acres	87	13,217	17	2,191	74	11,026	101	15,304
250.0 to 499.9 acres	52	18,193	10	2,541	47	15,652	64	21,516
500.0 acres or more	27	21,179	9	5,563	28	15,616	33	26,601
Cabbage, mustard	42	155	(X)	(X)	42	155	53	66
Cantaloupes and muskmelons	9,684	71,911	31	456	9,675	71,455	9,148	84,290
0.1 to 0.9 acres	6,305	1,672	(NA)	(NA)	(NA)	(NA)	5,542	1,543
1.0 to 4.9 acres	2,502	4,583	(NA)	(NA)	(NA)	(NA)	2,637	4,784
5.0 to 14.9 acres	521	3,723	(NA)	(NA)	(NA)	(NA)	563	4,164
15.0 to 24.9 acres	87	1,504	(NA)	(NA)	(NA)	(NA)	102	1,843
25.0 to 49.9 acres	62	2,223	(NA)	(NA)	(NA)	(NA)	84	2,861
50.0 to 99.9 acres	57	3,874	(NA)	(NA)	(NA)	(NA)	63	4,165
100.0 to 249.9 acres	82	12,431	(NA)	(NA)	(NA)	(NA)	93	14,353
250.0 to 499.9 acres	41	14,355	(NA)	(NA)	(NA)	(NA)	34	11,235
500.0 acres or more	27	27,547	(NA)	(NA)	(NA)	(NA)	30	39,343
Carrots	4,468	99,293	304	29,050	4,266	70,244	2,543	90,292
0.1 to 0.9 acres	3,728	713	135	25	3,644	689	1,929	379
1.0 to 4.9 acres	400	651	16	11	397	640	245	377
5.0 to 14.9 acres	61	481	7	71	56	411	55	424
15.0 to 24.9 acres	21	391	12	228	9	164	35	660
25.0 to 49.9 acres	32	1,089	17	498	15	591	43	1,506
50.0 to 99.9 acres	60	4,202	33	2,152	33	2,050	56	3,930
100.0 to 249.9 acres	83	13,035	48	6,614	48	6,421	86	13,412
250.0 to 499.9 acres	36	13,139	20	5,848	22	7,292	57	20,163
500.0 acres or more	47	65,592	16	13,604	38	51,987	37	49,440
Cauliflower	1,330	42,081	72	3,368	1,296	38,713	1,136	39,515
0.1 to 0.9 acres	845	212	16	3	837	209	660	168
1.0 to 4.9 acres	260	472	6	4	258	468	257	463
5.0 to 14.9 acres	53	385	2	(D)	51	(D)	47	414
15.0 to 24.9 acres	16	299	4	60	13	239	19	360

--continued

Table 38. **Vegetables, Potatoes, and Melons Harvested for Sale: 2012 and 2007** (continued)

[Totals may not add due to rounding. For meaning of abbreviations and symbols, see introductory text.]

Crop	2012						2007	
	Total harvested		Harvested for processing		Harvested for fresh market		total harvested	
	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres
Cauliflower - Con.								
25.0 to 49.9 acres	30	994	13	336	22	659	18	653
50.0 to 99.9 acres	34	2,274	11	623	26	1,651	39	2,702
100.0 to 249.9 acres	35	5,817	10	1,080	30	4,737	45	7,422
250.0 to 499.9 acres	37	12,558	6	812	37	11,746	31	10,413
500.0 acres or more	20	19,071	4	(D)	20	(D)	20	16,920
Celery	488	32,577	31	2,192	475	30,385	326	29,907
Chicory	48	1,377	(X)	(X)	48	1,377	46	2,118
Collards	1,407	12,542	61	2,538	1,376	10,005	1,374	11,223
Cucumbers and pickles	14,183	111,900	894	65,957	13,571	45,943	11,202	151,759
0.1 to 0.9 acres	11,550	2,499	518	91	11,216	2,408	8,474	1,918
1.0 to 4.9 acres	1,814	2,881	71	78	1,791	2,803	1,721	2,754
5.0 to 14.9 acres	265	2,027	22	188	251	1,838	287	2,218
15.0 to 24.9 acres	108	2,043	33	574	81	1,469	118	2,235
25.0 to 49.9 acres	106	3,588	39	1,296	67	2,292	147	5,033
50.0 to 99.9 acres	122	8,263	74	4,651	58	3,611	151	10,328
100.0 to 249.9 acres	113	17,150	63	8,899	51	8,252	157	23,676
250.0 to 499.9 acres	60	20,446	41	13,425	23	7,022	80	26,790
500.0 acres or more	45	53,004	33	36,755	23	16,249	67	76,808
Daikon	207	852	1	(D)	206	(D)	139	624
Eggplant	3,473	5,004	101	169	3,446	4,835	2,904	6,038
Escarole and endive	109	2,030	(X)	(X)	109	2,030	133	3,627
Garlic	3,408	24,162	220	12,135	3,306	12,027	2,277	26,172
Ginseng	140	373	83	(D)	66	(D)	225	674
Herbs, fresh cut	2,255	9,045	(X)	(X)	2,255	9,045	2,053	13,573
Honeydew melons	534	11,180	(X)	(X)	534	11,180	396	17,344
Horseradish	124	3,195	26	3,028	103	167	112	3,691
Kale	2,500	6,256	78	721	2,449	5,535	954	3,994
Lettuce, all	5,757	323,359	(X)	(X)	5,757	323,358	3,839	313,036
0.1 to 0.9 acres	4,401	1,064	(X)	(X)	(NA)	(NA)	2,737	663
1.0 to 4.9 acres	799	1,508	(X)	(X)	(NA)	(NA)	505	908
5.0 to 14.9 acres	142	1,156	(X)	(X)	(NA)	(NA)	131	1,110
15.0 to 24.9 acres	48	887	(X)	(X)	(NA)	(NA)	38	731
25.0 to 49.9 acres	46	1,621	(X)	(X)	(NA)	(NA)	75	2,503
50.0 to 99.9 acres	51	3,560	(X)	(X)	(NA)	(NA)	51	3,619
100.0 to 249.9 acres	64	10,096	(X)	(X)	(NA)	(NA)	82	13,321
250.0 to 499.9 acres	55	19,758	(X)	(X)	(NA)	(NA)	52	18,190
500.0 to 749.9 acres	37	21,821	(X)	(X)	(NA)	(NA)	53	31,698
750.0 to 999.9 acres	23	20,052	(X)	(X)	(NA)	(NA)	27	22,909
1,000.0 acres or more	91	241,838	(X)	(X)	(NA)	(NA)	88	217,384
Lettuce, head	2,175	154,968	(X)	(X)	2,175	154,968	1,158	166,838
0.1 to 0.9 acres	1,594	351	(X)	(X)	(NA)	(NA)	707	162
1.0 to 4.9 acres	286	481	(X)	(X)	(NA)	(NA)	116	192
5.0 to 14.9 acres	41	320	(X)	(X)	(NA)	(NA)	30	225
15.0 to 24.9 acres	25	442	(X)	(X)	(NA)	(NA)	15	284
25.0 to 49.9 acres	15	518	(X)	(X)	(NA)	(NA)	34	1,107
50.0 to 99.9 acres	32	2,175	(X)	(X)	(NA)	(NA)	36	2,454
100.0 to 249.9 acres	43	7,071	(X)	(X)	(NA)	(NA)	61	9,440
250.0 to 499.9 acres	34	12,180	(X)	(X)	(NA)	(NA)	53	18,336
500.0 to 749.9 acres	28	16,310	(X)	(X)	(NA)	(NA)	32	19,087
750.0 to 999.9 acres	23	19,560	(X)	(X)	(NA)	(NA)	15	12,695
1,000.0 acres or more	54	55,561	(X)	(X)	(NA)	(NA)	59	102,856
Lettuce, leaf	4,055	69,973	(X)	(X)	4,055	69,971	2,891	58,860
Lettuce, romaine	1,537	98,418	(X)	(X)	1,537	98,418	1,057	87,337
Mustard greens	1,095	6,925	50	1,221	1,073	5,705	871	8,323
Okra	2,487	2,377	106	(D)	2,445	(D)	2,555	2,444
Onions, dry	6,192	149,960	410	42,497	5,937	107,463	4,249	166,484
0.1 to 0.9 acres	4,623	1,001	144	18	4,529	983	2,720	609
1.0 to 4.9 acres	656	1,047	23	42	643	1,005	490	781
5.0 to 14.9 acres	110	875	16	117	97	758	137	1,087
15.0 to 24.9 acres	70	1,296	17	246	59	1,049	93	1,717
25.0 to 49.9 acres	146	5,001	26	808	130	4,193	175	6,119
50.0 to 99.9 acres	198	13,934	41	2,292	176	11,642	177	12,314
100.0 to 249.9 acres	243	37,457	80	10,383	189	27,074	276	43,728
250.0 to 499.9 acres	88	30,347	39	10,245	66	20,102	119	40,085
500.0 acres or more	58	59,003	24	18,346	48	40,657	62	60,045
Onions, green	1,829	5,624	73	940	1,806	4,683	1,558	5,703
Parsley	482	4,661	23	705	470	3,956	370	4,240
Peas, Chinese (sugar, snow)	991	9,311	86	6,031	919	3,280	863	8,859
Peas, green (excluding southern)	4,931	192,632	1,723	186,316	3,282	6,317	4,532	214,057
0.1 to 0.9 acres	2,719	553	101	22	2,649	531	1,818	431
1.0 to 4.9 acres	470	886	29	31	460	855	579	1,051
5.0 to 14.9 acres	127	1,037	33	328	97	709	131	1,085
15.0 to 24.9 acres	124	2,396	105	(D)	21	(D)	212	4,224
25.0 to 49.9 acres	484	17,561	472	17,128	17	434	705	25,453

--continued

Table 38. **Vegetables, Potatoes, and Melons Harvested for Sale: 2012 and 2007** (continued)

[Totals may not add due to rounding. For meaning of abbreviations and symbols, see introductory text.]

Crop	2012						2007	
	Total harvested		Harvested for processing		Harvested for fresh market		total harvested	
	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres
Peas, green (excluding southern) - Con.								
50.0 to 99.9 acres	472	32403	456	31,304	19	1,098	542	36,427
100.0 to 249.9 acres	387	58098	380	56,632	11	1,466	382	56,722
250.0 to 499.9 acres	101	34105	100	33,245	1	860	107	36,816
500.0 acres or more	47	45594	47	(D)	1	(D)	56	51,849
Peas, green southern (cowpeas) - blackeyed, crowder, etc	3,419	21942	312	10,202	3,264	11,740	3,061	27,089
Peppers, Bell (excluding pimientos)	11,568	49762	476	6,317	11,315	43,445	9,572	62,363
0.1 to 0.9 acres	9,123	1978	338	49	8,942	1,929	7,113	1,628
1.0 to 4.9 acres	1,834	2993	55	66	1,808	2,928	1,780	2,866
5.0 to 14.9 acres	270	2055	20	104	265	1,952	301	2,262
15.0 to 24.9 acres	85	1556	9	149	79	1,407	97	1,774
25.0 to 49.9 acres	88	3071	15	405	78	2,667	81	2,697
50.0 to 99.9 acres	62	4193	14	745	54	3,448	68	4,588
100.0 acres or more	106	33916	25	4,801	89	29,115	132	46,549
Peppers, other than Bell (including chile)	7,951	31854	619	18,690	7,587	13,164	6,124	37,371
0.1 to 0.9 acres	6,372	1338	374	66	6,160	1,272	4,689	1,017
1.0 to 4.9 acres	1,107	1821	91	145	1,072	1,677	895	1,501
5.0 to 14.9 acres	221	1749	34	187	205	1,562	213	1,682
15.0 to 24.9 acres	55	1021	11	176	47	846	89	1,626
25.0 to 49.9 acres	72	2435	28	892	48	1,543	79	2,778
50.0 to 99.9 acres	50	3504	25	1,697	30	1,808	57	4,154
100.0 acres or more	74	19985	56	15,529	25	4,457	102	24,613
Potatoes	21,079	1,168199	2,233	623,611	19,750	544,587	15,014	1,131,963
0.1 to 0.9 acres	14,622	3705	789	148	14,134	3,557	8,877	2,473
1.0 to 4.9 acres	3,698	6255	208	206	3,626	6,049	3,136	5,296
5.0 to 14.9 acres	459	3516	48	297	438	3,219	464	3,444
15.0 to 24.9 acres	125	2322	26	424	107	1,897	148	2,816
25.0 to 49.9 acres	206	7272	77	2,591	146	4,681	214	7,477
50.0 to 99.9 acres	272	19045	120	7,732	177	11,313	325	22,097
100.0 to 249.9 acres	586	94132	284	39,128	392	55,004	714	114,291
250.0 to 499.9 acres	479	170945	249	70,980	322	99,964	525	180,042
500.0 to 749.9 acres	240	144547	153	66,414	167	78,133	221	132,242
750.0 to 999.9 acres	126	108885	75	55,229	79	53,657	116	99,114
1,000.0 acres or more	266	607574	204	380,461	162	227,113	274	562,672
1,000.0 to 1,999.9 acres	165	222560	121	121,982	108	100,578	185	249,205
2,000.0 to 2,999.9 acres	43	100324	35	67,396	21	32,928	43	105,101
3,000.0 acres or more	58	284690	48	191,084	33	93,606	46	208,366
Pumpkins	15,840	90165	794	16,218	15,490	73,947	15,088	92,954
Radishes	1,228	14867	34	790	1,222	14,078	818	14,599
Rhubarb	697	1121	54	149	658	972	574	1,404
Spinach	1,594	46377	106	12,435	1,522	33,941	1,202	44,071
Squash, all	14,090	58486	489	8,387	13,838	50,099	11,821	54,453
0.1 to 0.9 acres	9,248	2630	(NA)	(NA)	(NA)	(NA)	7,443	2,125
1.0 to 4.9 acres	3,455	6265	(NA)	(NA)	(NA)	(NA)	3,085	5,557
5.0 to 14.9 acres	788	6033	(NA)	(NA)	(NA)	(NA)	701	5,320
15.0 to 24.9 acres	170	3233	(NA)	(NA)	(NA)	(NA)	167	3,091
25.0 to 49.9 acres	182	6271	(NA)	(NA)	(NA)	(NA)	190	6,503
50.0 to 99.9 acres	115	7768	(NA)	(NA)	(NA)	(NA)	124	8,238
100.0 acres or more	132	26287	(NA)	(NA)	(NA)	(NA)	111	23,621
Squash, summer	10,693	33190	290	2,984	10,533	30,206	9,170	34,093
Squash, winter	6,517	25296	259	5,403	6,371	19,893	4,798	20,360
Sweet corn	25,632	572068	4,011	342,509	22,883	229,560	28,241	622,946
0.1 to 0.9 acres	11,628	3339	932	196	11,105	3,143	9,970	3,033
1.0 to 4.9 acres	7,513	14719	729	840	7,286	13,879	10,123	20,273
5.0 to 14.9 acres	2,622	20954	228	827	2,585	20,127	3,566	27,710
15.0 to 24.9 acres	738	13527	112	1,593	664	11,934	963	17,754
25.0 to 49.9 acres	1,036	36106	498	17,764	575	18,342	1,299	45,275
50.0 to 99.9 acres	913	63051	633	42,794	317	20,257	1,103	75,627
100.0 acres or more	1,182	420374	879	278,496	351	141,878	1,217	433,274
100.0 to 249.9 acres	735	108650	565	82,911	192	25,739	769	117,173
250.0 to 499.9 acres	263	87967	198	62,730	81	25,238	237	80,365
500.0 to 749.9 acres	79	46402	60	33,270	24	13,132	74	43,619
750.0 to 999.9 acres	42	34750	19	15,041	25	19,709	32	27,069
1,000.0 acres or more	63	142606	37	84,545	29	58,061	85	165,049
Sweet potatoes	2,202	125726	262	30,138	2,080	95,588	1,910	105,284
0.1 to 0.9 acres	1,225	316	30	6	1,211	310	789	225
1.0 to 4.9 acres	409	766	21	17	402	749	474	849
5.0 to 14.9 acres	77	523	10	55	71	467	169	1,330
15.0 to 24.9 acres	51	930	13	209	45	721	60	1,091
25.0 to 49.9 acres	66	2257	28	837	46	1,421	81	2,810
50.0 to 99.9 acres	85	5813	37	1,829	65	3,983	96	6,591
100.0 to 249.9 acres	135	20180	58	6,108	106	14,072	113	17,205
250.0 to 499.9 acres	87	29239	39	8,444	73	20,795	71	25,242
500.0 acres or more	67	65703	26	12,633	61	53,070	57	49,942
Tomatoes in the open	32,383	397656	2,522	277,428	31,047	120,228	25,809	442,224
0.1 to 0.9 acres	24,023	6133	1,507	287	23,246	5,846	17,536	4,721
1.0 to 4.9 acres	6,479	10731	434	427	6,379	10,303	6,251	10,467
5.0 to 14.9 acres	933	6954	74	340	914	6,614	856	6,276
15.0 to 24.9 acres	142	2597	19	277	131	2,320	182	3,304
25.0 to 49.9 acres	133	4449	24	680	117	3,769	170	5,904
50.0 to 99.9 acres	108	7537	43	2,812	69	4,725	133	9,207
100.0 acres or more	565	359255	421	272,604	191	86,651	681	402,346
100.0 to 249.9 acres	198	31255	132	20,701	73	10,554	240	38,738
250.0 to 499.9 acres	171	58180	137	42,962	56	15,219	221	76,591

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Table 38. **Vegetables, Potatoes, and Melons Harvested for Sale: 2012 and 2007** (continued)

[Totals may not add due to rounding. For meaning of abbreviations and symbols, see introductory text.]

Crop	2012						2007	
	Total harvested		Harvested for processing		Harvested for fresh market		Total harvested	
	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres
Tomatoes in the open - Con.								
500.0 to 749.9 acres	87	51,949	60	34,573	31	17,375	88	53,361
750.0 to 999.9 acres	30	25,577	23	18,099	12	7,478	35	29,522
1,000.0 acres or more	79	192,295	69	156,269	19	36,026	97	204,135
Turnip greens	719	7,070	31	2,036	707	5,033	836	9,365
Turnips	1,107	4,285	29	494	1,090	3,790	914	3,632
Watercress	100	733	(X)	(X)	100	733	62	679
Watermelons	12,996	128,208	45	479	12,971	127,730	12,808	142,359
0.1 to 0.9 acres	7,273	2,073	(NA)	(NA)	(NA)	(NA)	6,373	1,892
1.0 to 4.9 acres	3,764	7,079	(NA)	(NA)	(NA)	(NA)	4,087	7,622
5.0 to 14.9 acres	974	7,537	(NA)	(NA)	(NA)	(NA)	1,045	8,024
15.0 to 24.9 acres	231	4,158	(NA)	(NA)	(NA)	(NA)	317	5,779
25.0 to 49.9 acres	221	7,410	(NA)	(NA)	(NA)	(NA)	353	11,758
50.0 to 99.9 acres	212	13,851	(NA)	(NA)	(NA)	(NA)	236	15,921
100.0 to 249.9 acres	203	31,609	(NA)	(NA)	(NA)	(NA)	271	39,424
250.0 to 499.9 acres	91	31,670	(NA)	(NA)	(NA)	(NA)	98	33,171
500.0 acres or more	27	22,821	(NA)	(NA)	(NA)	(NA)	28	18,768
Other vegetables (see text)	8,057	74,455	493	17,774	7,889	56,681	6,846	47,563