

FY 2014 Specialty Crop Block Grant Program – Farm Bill

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Final Report

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Project 1: Expanding Herbicide Options for Chile Pepper Production in New Mexico

Project Summary

Chile pepper (herein “chile”) production is challenged by prolonged periods in which weeds must be controlled and few herbicide options. The chemical control catalogue for chile production is particularly lacking in residual herbicides that can be applied after crop emergence. Flumioxazin is an effective herbicide for pre-emergent, and some post-emergent, control of broadleaf and grass weeds that are common in chile. Flumioxazin is registered for use in transplanted bell and non-bell peppers in Oklahoma, Delaware, Georgia and Florida. However, prior to this project, data on flumioxazin applied to chile under New Mexico conditions was insufficient for registration. The overall objective of this project was to determine the potential for crop injury from post-direct, hooded applications (applied after crop emergence, directed to the bases of chile plants) of flumioxazin in direct-seeded chile. To accomplish this objective, field studies were conducted in 2015, 2016 and 2017 at New Mexico State University (NMSU) research farms near Las Cruces, NM and Los Lunas, NM. Study sites differed in soil texture, with the Las Cruces site featuring silty-clay soils and the Los Lunas site featuring sandy-clay loam to sandy loam soils. For each site-year, six chile cultivars were grown using flood-furrow irrigation and soil and pest management practices typical for the specific region. Results indicated that registration for post-direct applications of flumioxazin in New Mexico chile will need to be conditioned by soil type. On fine-textured soils (Las Cruces study site), flumioxazin applied to raised beds at 0.107 kg ai ha⁻¹ at 4 weeks after crop thinning and flumioxazin applied to raised beds at 0.07 kg ai ha⁻¹ at 4 and 6 weeks after crop thinning did not cause crop injury that reduced chile yield. On coarse-textured soils (Los Lunas study site), flumioxazin applied to raised beds at 0.107 kg ai ha⁻¹ at 4 weeks after crop thinning caused crop injury and reductions in chile yield as great as 40% of the untreated control. Flumioxazin injury to chile on coarse-textured soil was mitigated by increased soil organic matter and prevented by placing flumioxazin in the furrows between raised beds rather than on the surfaces of raised beds. Although the potential for flumioxazin-induced crop injury may limit flumioxazin applications to the spaces between rows, this project is anticipated to provide New Mexico’s chile farmers opportunities to use an herbicide in place of costly hand hoeing. Such methods are now especially important as costs and availability of labor are primary constraints on chile production in New Mexico.

Project Approach

The approved project proposal called for a field study to be conducted in 2015, and repeated in 2016, at two university research farms. The approved plan also called for evaluations of chile plant responses to flumioxazin applied to the surface of raised beds. Unexpected discoveries during the first year of this project led to additional assessments of flumioxazin applied to the furrows between raised beds. Unanticipated findings also compelled an additional site-year. In total, the field study was conducted in 2015 and 2016 at a university research farm near Las Cruces, NM, and a university research farm near Los Lunas, NM during 2015, 2016 and 2017.

Study sites differed in soil characteristics. Soil at the Las Cruces site was fine-textured, and soil at the Los Lunas site was coarse-textured (**Table 1**). At each site, chile was grown with flood-furrow irrigation and soil management practices typical for the specific region. Weeds were controlled with combinations of cultivation, hand weeding and herbicides (clethodim at 0.14 kg ai ha⁻¹, napropamide at 1.1 kg ai ha⁻¹,

post-direct herbicides described below). This weed control program enabled weed-free conditions throughout chile growing seasons. Dominant weed species across the five site-years were Palmer amaranth (*Amaranthus palmeri*), tumble pigweed (*Amaranthus albus*), spurred anoda (*Anoda cristata*), junglerice (*Echinochloa colona*), stinkgrass (*Eragrostis cilianensis*), ground spurge (*Chamaesyce prostrata*), kochia (*Kochia scoparia*), tall morningglory (*Ipomoea purpurea*), Wright groundcherry (*Physalis acutifolia*), yellow foxtail (*Setaria pumila*) and puncturevine (*Tribulus terrestris*).

Table 1. Site-year soil characteristics for field studies conducted at two New Mexico State University (NMSU) research farms: NMSU Leyendecker Plant Science Center near Las Cruces, NM; and NMSU Los Lunas Agricultural Science Center at Los Lunas, NM.

Site-year	Sand	Silt	Clay	Organic matter
		%		%
Las Cruces 2015	6	48	46	1.1
Las Cruces 2016	27	22	51	1.2
Los Lunas 2015	67	10	23	0.7
Los Lunas 2016	73	8	19	1.6
Los Lunas 2017	77	6	17	0.9

For each site-year, six chile cultivars were arranged in contiguous field sections (1 cultivar section⁻¹). Within each cultivar section, treatments were arranged in a randomized complete block design with four replications. Herbicide treatments were applied using a CO₂-powered backpack sprayer equipped with a boom with a hooded nozzle. Herbicide treatments were implemented at times relative to crop thinning, which occurred none to ten weeks after crop seeding.

Treatments at Las Cruces included an untreated control and the following four post-direct herbicides: (1) flumioxazin at 0.107 kg ai ha⁻¹ applied to raised beds 4 weeks after crop thinning, (2) carfentrazone at 0.035 kg ai ha⁻¹ applied to raised beds 4 weeks after crop thinning, (3) flumioxazin at 0.07 kg ai ha⁻¹ applied to raised beds 4 and 6 weeks after crop thinning and (4) carfentrazone at 0.035 kg ai ha⁻¹ applied to raised beds 4 and 6 weeks after crop thinning. The project included carfentrazone treatments because this herbicide is registered for use in chile and features the same site of action as flumioxazin (inhibition of Protoporphyrinogen Oxidase [PPO]). Thus, carfentrazone treatments provided a reference to a conventional practice.

Although chile production activities and schedules were generally consistent between years, chile plants were larger in 2015 compared to 2016 at times of post-direct herbicide application (**Table 2**).

Treatments at Los Lunas in 2015 included an untreated control and the following two post-direct herbicides: (1) flumioxazin at 0.107 kg ai ha⁻¹ applied to raised beds 4 weeks after crop thinning and (2) carfentrazone at 0.035 kg ai ha⁻¹ applied to raised beds 4 weeks after crop thinning. During 2016 and

2017 at Los Lunas, treatments included an untreated control and the following three post-direct herbicides: (1) flumioxazin at 0.107 kg ai ha⁻¹ applied to raised beds 4 weeks after crop thinning, (2) flumioxazin at 0.107 kg ai ha⁻¹ applied to furrows 4 weeks after crop thinning and (3) carfentrazone at 0.035 kg ai ha⁻¹ applied to raised beds 4 weeks after crop thinning. Chile plant size at times of herbicide application differed among years, with 2015 featuring relatively large chile plants and 2017 featuring relatively small chile plants (**Table 3**).

Data collected included visual estimates of herbicide injury at 14 days after spraying (DAS) and fresh weight of marketable chile peppers, which is herein referred to as “chile yield”. For each cultivar grown at a specific site-year, herbicide treatment effects on chile yield were assessed with analyses of variance followed by Tukey's HSD (honest significant difference) tests.

Table 2. Chile plant sizes at the times of first herbicide treatment (4 weeks after crop thinning) and second herbicide treatment (6 weeks after crop thinning) for the Las Cruces study site in 2015 and 2016. Data for cultivars are means ± standard error of four replicates. Replicates were subsampled (subsample N = 3) and subsample data were averaged. Annual means are averages across cultivar replicates, N = 28.

Year	Cultivar	Chile plant size at first herbicide application			Chile plant size at second herbicide application		
		Plant height	Leaves	Above-ground dry biomass	Plant height	Leaves	Above-ground dry biomass
		cm	number	g	cm	number	g
2015	AZ 1904	40.6 ± 0.85	87 ± 16	9.5 ± 0.75	61.3 ± 3.74	91 ± 9	22.7 ± 1.92
	Big Jim	40.0 ± 0.48	93 ± 12	11.4 ± 1.48	64.9 ± 2.02	151 ± 7	34.3 ± 3.29
	Jalapeño	40.8 ± 1.07	65 ± 7	5.2 ± 0.47	66.8 ± 1.72	138 ± 13	22.9 ± 2.63
	NM 6-4	43.8 ± 1.06	75 ± 6	7.8 ± 0.61	75.8 ± 6.65	114 ± 9	24.1 ± 2.54
	Paprika	40.9 ± 0.64	66 ± 4	7.4 ± 0.65	66.3 ± 2.37	156 ± 19	38.4 ± 6.55
	Sandia	43.4 ± 0.64	86 ± 6	8.0 ± 0.44	67.3 ± 3.68	184 ± 26	29.2 ± 2.93
Annual mean		41.4 ± 0.49	80 ± 7	8.4 ± 0.53	67.1 ± 1.63	139 ± 8	28.6 ± 1.82
2016	AZ 88	34.3 ± 1.07	53 ± 4	5.25 ± 0.29	50.0 ± 2.33	80 ± 9	13.2 ± 2.53
	Big Jim	32.9 ± 0.77	61 ± 4	8.2 ± 0.29	44.4 ± 0.32	104 ± 22	16.9 ± 4.19
	Jalapeño	38.6 ± 1.67	47 ± 5	5.3 ± 0.74	58.2 ± 3.19	98 ± 22	14.0 ± 3.65
	NM 6-4	42.8 ± 1.06	56 ± 6	8.5 ± 0.91	59.9 ± 4.04	109 ± 12	18.5 ± 2.63
	Paprika	37.3 ± 1.49	39 ± 4	3.9 ± 0.61	52.8 ± 1.40	61 ± 6	9.0 ± 1.37
	Sandia	46.0 ± 0.73	66 ± 8	7.8 ± 0.86	55.0 ± 0.95	101 ± 9	17.1 ± 8.59
Annual mean		38.6 ± 1.04	54 ± 3	6.5 ± 0.44	53.4 ± 1.39	92 ± 6	14.8 ± 1.23

Table 3. Chile plant sizes at times of herbicide treatment (4 weeks after crop thinning) for the Los Lunas study site in 2015, 2016 and 2017. Data for cultivars are means \pm standard error of four replicates. Replicates were subsampled (subsample N = 3) and subsample data were averaged. Annual means are averages across cultivar replicates, N = 28.

Year	Cultivar	Chile plant size at herbicide application		
		Plant height	Leaves	Above-ground dry biomass
		cm	number	g
2015	AZ 1904	35.1 \pm 1.31	74 \pm 4	10.2 \pm 0.87
	Big Jim	43.0 \pm 3.90	91 \pm 5	14.9 \pm 0.80
	Jalapeño	47.3 \pm 1.66	67 \pm 5	7.0 \pm 0.26
	NM 6-4	42.5 \pm 1.97	55 \pm 3	6.9 \pm 0.45
	Paprika	46.2 \pm 0.78	78 \pm 11	9.8 \pm 1.46
	Sandia	47.9 \pm 2.01	98 \pm 2	12.0 \pm 0.50
Annual mean		43.7 \pm 1.20	77 \pm 4	10.1 \pm 0.65
2016	AZ 88	40.8 \pm 2.35	55 \pm 3	6.1 \pm 0.91
	Big Jim	27.3 \pm 1.86	40 \pm 6	5.7 \pm 1.04
	Jalapeño	48.2 \pm 2.46	62 \pm 11	8.4 \pm 1.33
	NM 6-4	36.3 \pm 1.98	38 \pm 5	5.9 \pm 0.54
	Paprika	42.4 \pm 1.19	38 \pm 6	7.2 \pm 1.34
	Sandia	38.3 \pm 1.94	45 \pm 8	6.6 \pm 1.59
Annual mean		38.9 \pm 1.51	46 \pm 3	6.7 \pm 0.47
2017	AZ 88	37.9 \pm 1.18	47 \pm 8	4.4 \pm 0.70
	Big Jim	32.8 \pm 2.53	35 \pm 3	6.1 \pm 2.30
	Jalapeño	42.8 \pm 2.55	53 \pm 7	5.4 \pm 1.15
	NM 6-4	36.2 \pm 2.78	33 \pm 5	3.2 \pm 0.63
	Paprika	44.4 \pm 4.64	42 \pm 6	4.3 \pm 1.02
	Sandia	47.1 \pm 2.77	51 \pm 8	6.4 \pm 1.29
Annual mean		40.2 \pm 1.47	54 \pm 3	4.9 \pm 1.47

Goals and Outcomes Achieved

The goal for this project was to produce the information needed for Special Local Needs (SLN) registration of an effective and efficient weed control tool that is not currently available to chile farmers in New Mexico. The performance measure related to this goal was to determine crop injury to post-direct, hooded applications of flumioxazin in direct-seeded chile. Specific measurements originally proposed included weed community assessments and flumioxazin effects on visual ratings of crop injury and total number of marketable chile fruits for six chile pepper cultivars. Please note that the original proposal called for a cayenne cultivar; however, based on the recommendations of Dr. Stephanie Walker (Vegetable Specialist, NMSU Department of Extension Plant Sciences), the cayenne cultivar was omitted and replaced with chile cultivars more commonly grown in New Mexico (AZ 1904 and AZ 88). Results for weed community assessments are provided in the *Project Approach* section. Results for chile plant responses to post-direct herbicides are provided below.

Post-direct applications of flumioxazin showed characteristic PPO inhibitor damage (speckling followed by chlorosis then necrosis) to some lower leaves on chile plants at 14 DAS (**Figure 1**). The damage was slight and similar across all chile cultivars (**Figure 2**). The severity of damage at 14 DAS did not differ between flumioxazin and carfentrazone.

Post-direct applications of flumioxazin did not reduce yield of chile grown on fine-textured soil (Las Cruces study site; **Table 4**).

At a site with coarse-textured soil (Los Lunas study site), flumioxazin applications directed to the raised beds reduced yield of some cultivars in 2015 and 2017 (**Table 4**). However, flumioxazin-induced reductions in chile yield were not observed in 2016.

Across the 3-year project, flumioxazin-induced reductions in chile yield occurred in 9% (5 out of 54) of flumioxazin treatments. These reductions in chile yield occurred on coarse-textured soil when flumioxazin was applied at $0.107 \text{ kg ai ha}^{-1}$ to raised beds 4 weeks after crop thinning (**Figure 3**).



Figure 1. Characteristic PPO inhibitor damage (speckling followed by chlorosis then necrosis) on lower leaves of a chile pepper plant at 14 days after spraying.



Figure 2. Characteristic PPO inhibitor damage (speckling followed by chlorosis then necrosis) on lower leaves from six chili pepper cultivars. Leaves were collected 21 days after spraying. Please note that rips in leaves were caused by hail.

Table 4. Significance in variation for chile yield between untreated and flumioxazin-treated plots. Flumioxazin applications were directed to raised beds at 4 or 6 weeks after crop thinning. An asterisk indicates that yield differed between untreated and flumioxazin plots at $\alpha = 0.05$. “ns” indicates that yield did not differ between untreated and flumioxazin plots. Dashed lines indicate that the cultivar was not evaluated at the specific site-year.

Cultivar	Las Cruces ^a		Los Lunas ^b		
	2015	2016	2015	2016	2017
AZ 88	--	ns	--	ns	*
AZ 1904	ns	--	ns	--	--
Big Jim	ns	ns	*	ns	ns
Jalapeño	ns	--	ns	--	ns
Jalapeño ‘Romero’	--	ns	--	ns	--
NM 6-4	ns	ns	*	ns	ns
Paprika ‘LB-65’	ns	ns	*	ns	ns
Sandia	ns	ns	*	ns	ns

^a Las Cruces results pertain to two post-direct herbicide treatments: (1) flumioxazin at 0.107 kg ai ha⁻¹ applied to raised beds 4 weeks after crop thinning, and (2) flumioxazin at 0.07 kg ai ha⁻¹ applied to raised beds 4 and 6 weeks after crop thinning.

^b Los Lunas results pertain to flumioxazin at 0.107 kg ai ha⁻¹ applied to raised beds 4 weeks after crop thinning.

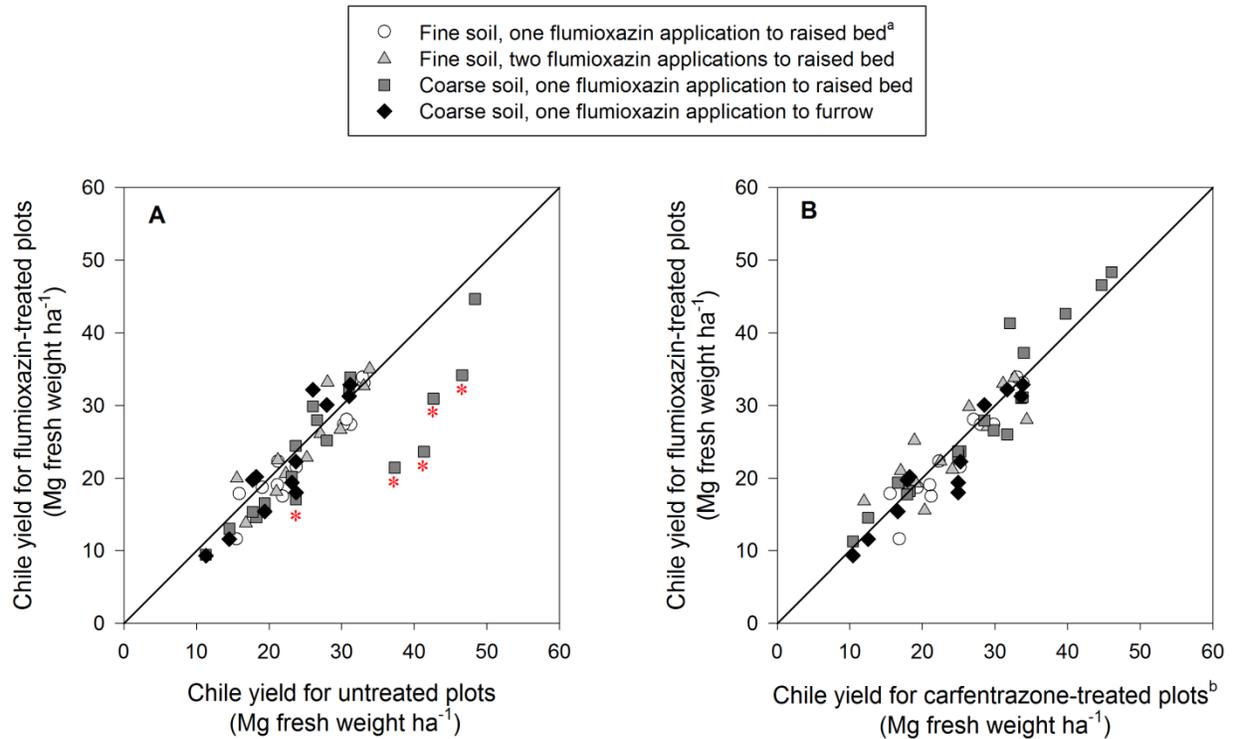


Figure 3. Chile yield comparisons between **(A)** flumioxazin-treated plots and untreated control plots, and **(B)** flumioxazin treated plots and carfentrazone-treated plots. A data point represents the mean yield for a cultivar-site-year, which refers to a chile cultivar grown at particular site (Las Cruces or Los Lunas) during a specific year (2015, 2016 or 2017). Data points above the diagonal lines indicate cultivar-site-years for which yields in flumioxazin-treated tended to be greater than yields in untreated control or carfentrazone-treated plots. Data points below the diagonal lines indicate cultivar-site-years for which yields in flumioxazin-treated plots tended to be less than yields in untreated control or carfentrazone-treated plots. Red asterisks immediately beneath data points signify cultivar site-years for which yields in flumioxazin-treated plots were significantly less than yields in untreated control or carfentrazone-treated plots.

^a Abbreviations for flumioxazin treatments: *Fine soil, one flumioxazin application to raised bed*, chile grown on fine-textured soil with flumioxazin applied to raised beds at 0.107 kg ai ha⁻¹ at 4 weeks after crop thinning; *Fine soil, two flumioxazin applications to raised bed*, chile grown on fine-textured soil with flumioxazin applied to raised beds at 0.07 kg ai ha⁻¹ at 4 and 6 weeks after crop thinning; *Coarse soil, one flumioxazin application to raised bed*, chile grown on coarse-textured soil with flumioxazin applied to raised beds at 0.107 kg ai ha⁻¹ at 4 weeks after crop thinning; *Coarse soil, one flumioxazin application to furrow*, chile grown on coarse-textured soil with flumioxazin applied to furrows between raised beds at 0.107 kg ai ha⁻¹ at 4 weeks after crop thinning.

^b Carfentrazone was applied to raised beds at 0.035 kg ai ha⁻¹ either 4 weeks after crop thinning, or 4 and 6 weeks after crop thinning.

Results from this project were shared with farmers and agricultural professionals at the 2015, 2016 and 2017 New Mexico Chile Conferences and the 2016 Annual Conference of the New Mexico Crop Production Association. Attendance for each of these conferences was approximately 200-220 people. Results from this project were also shared with farmers and stakeholders at the 2015 Chile Pepper Field Day held at the NMSU Leyendecker Plant Science Research Center, the 2016 Chile Pepper Field Day held at the NMSU Agricultural Science Center at Los Lunas, as well as the 2015 and 2017 NMSU Agricultural Science Center at Los Lunas Field Days. Each field day event at the Agricultural Science Center at Los Lunas attracted approximately 240-265 people. The USDA Specialty Crop Block Grant Program and the New Mexico Department of Agriculture were acknowledged in all presentations. Through these outreach events, I met chile farmers, crop consultants, and professional organizations who supported the studies related to SLN registration for post-direct applications of flumioxazin in chile. The New Mexico Chile Commission indicated that they would be willing to sponsor a third party SLN registration, should such a registration be supported by research results.

Beneficiaries

This project produced information needed for SLN registration for post-direct, hooded applications of flumioxazin in direct-seeded chile. Post-direct applications flumioxazin can effectively control weeds that emerge during the middle-to-late period of the chile production season. If not controlled, mid-to-late season weeds can cause 76% reductions in chile yield and potentially cost New Mexico's agricultural economy over 31 million dollars. Recognizing the threats from mid-to-late season weeds, chile farmers repeatedly pay individuals \$7.50 to \$9.50 hr⁻¹, plus taxes, for hand-hoeing. A hand-hoeing intervention typically cost \$80.00 acre⁻¹, but can be as high as \$350 acre⁻¹ for severe infestations. Flumioxazin applications cost approximately \$29.60 acre⁻¹. Thus, pending registration, flumioxazin will provide chile farmers a new opportunity to reduce production expenses.

The most recent USDA NASS Census of Agriculture (2012) reported 503 operations producing chile in New Mexico. A survey by the NMSU Agricultural Experiment Station indicated that 62% of New Mexico chile farmers use herbicides to control weeds. Based on these reports, approximately 311 (62% of 503) agricultural operations in New Mexico are potential beneficiaries from the SLN registration that will arise from the results of this project. In the long-term, the results of this project will benefit New Mexico's chile processing industry that requires reliable sources of chile.

Lessons Learned

The results from this project indicate that a Special Local Needs (SLN) registration for post-direct, hooded applications of flumioxazin in direct-seeded chile will need to be conditioned by soil type. On fine-textured soil, post-direct flumioxazin at rates used in this study appear appropriate because (1) these herbicide applications did not cause injury that reduced yield, and (2) these applications were as injurious to chile as applications of carfentrazone — an herbicide currently registered and used in chile. However, on coarse-textured soil, significant reductions in chile yield can occur if post-direct flumioxazin at 0.107 kg ai ha⁻¹ is directed to the surface of a raised bed. To develop a strategy for post-direct flumioxazin on coarse-textured soil, subsequent research should investigate chile plant responses to flumioxazin applied at a rate less than 0.107 kg ai ha⁻¹ and directed to furrows between raised beds.

At a site with coarse-textured soil, post-direct applications of flumioxazin reduced yield in 2015 and 2017, but not in 2016. The coarse-textured soil site featured low levels of soil organic matter in 2015 (0.7% organic matter) and 2017 (0.9% organic matter) compared to 2016 (1.6% organic matter). Annual variation in soil organic matter was likely caused, in part, by differences in crop rotation because the 2016 study immediately followed perennial alfalfa, whereas the 2015 and 2017 studies occurred in fields that were fallow during the previous season. Although flumioxazin injury on chile was unexpected, the results from this project were generally consistent with literature reports of flumioxazin root uptake and crop injury under conditions with potentially low soil adsorptive properties (Boyd 2014; Price et al. 2004; Saladin et al. 2003a; Saladin et al. 2003b; Shaner et al. 2014). Further, previous studies indicated that (1) flumioxazin adsorption to soil is negatively correlated with sand content and positively correlated with soil organic matter, (2) flumioxazin preferentially adsorbs to organic matter, and (3) flumioxazin readily desorbs and enters soil solution following an increase in soil water content (Alister et al. 2008; Ferrell et al. 2005). To my knowledge, the results in this project represent the first report of flumioxazin injury on chile.

Although the potential for flumioxazin-induced crop injury may limit applications of this herbicide to the spaces between rows, this project is anticipated to provide New Mexico's chile farmers opportunities to reduce production expenses by using a herbicide in place of hand hoeing.

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Additional Information

The results from this project were shared with the scientific community at the 2017 Annual Meeting of the Weed Science Society of America and the 2016 Annual Meeting of the Western Society of Weed Science. The USDA Specialty Crop Block Grant Program and the New Mexico Department of Agriculture were acknowledged in both publications. A manuscript for submission to *Weed Technology* is currently in development. Citations for existing publications are as follows:

Schutte, B. J., E. Morris. 2017. Field assessments of flumioxazin for postemergence-directed applications in chile pepper. Proceedings of the 57th Annual Meeting of the Weed Science Society of America 57:70

Schutte, B. J., E. Morris. 2016. Evaluating postemergence-directed applications of flumioxazin in chile pepper. Proceedings of the 69th Annual Meeting of the Western Society of Weed Science 69:28

Additional research that was not supported by this grant and conducted by the NMSU Weed Science Laboratory indicated that flumioxazin at 0.07 kg ai ha⁻¹ provided high levels of weed control for 28 days

on coarse-textured soil. Accordingly, subsequent studies that investigate post-direct herbicides for chile on coarse-textured soil should include flumioxazin at 0.07 kg ai ha⁻¹.

A greenhouse research project that was not supported by this grant and conducted by the NMSU Weed Science Laboratory indicated that increased soil organic matter decreased chile plant injury from post-direct applications of flumioxazin on coarse-textured soil. These greenhouse study results were consistent with the findings from this field project.

References Cited in Report

- Alister C, Rojas S, Gomez P, Kogan M (2008) Dissipation and movement of flumioxazin in soil at four field sites in Chile. *Pest Manag Sci* 64: 579-583
- Boyd NS (2014) Pepper and tomato root uptake of paraquat and flumioxazin. *Weed Technol* 28: 626-632
- Ferrell JA, Vencill WK, Xia K, Grey TL (2005) Sorption and desorption of flumioxazin to soil, clay minerals and ion-exchange resin. *Pest Manag Sci* 61: 40-46
- Price AJ, Wilcut JW, Cranmer JR (2004) Physiological behavior of root-absorbed flumioxazin in peanut, ivyleaf morningglory (*Ipomoea hederacea*), and sicklepod (*Senna obtusifolia*). *Weed Sci* 52: 718-724
- Saladin G, Magne C, Clement C (2003a) Stress reactions in *Vitis vinifera* L. following soil application of the herbicide flumioxazin. *Chemosphere* 53: 199-206
- Saladin GL, Magne C, Clement C (2003b) Effects of flumioxazin herbicide on carbon nutrition of *Vitis vinifera* L. *J Agr Food Chem* 51: 4017-4022
- Shaner D, Jachetta J, Senseman S, Burke I, Hanson B, Jugulam M, Tan S, Glenn B, Turner P (2014) *Herbicide Handbook*. 10th ed. Lawrence, KS USA: Weed Science Society of America



Additional Figure 1. Field set-up. Six chile cultivars were grown in six contiguous field sections. Within a cultivar section, herbicide treatments were arranged in randomized complete block design with 4 replications. Experimental units were 6-m length and comprised 1 treatment row flanked with border rows on each side. Fronts and backs of treatment rows were marked with bamboo poles. The above image was taken 39 days after application of post-direct herbicide treatments at the Los Lunas study site in 2017.



Additional Figure 2. Stunting and yellowing of chile plants in flumioxazin-treated plot next to untreated control plot. The above image was taken 39 days after application of post-direct herbicide treatments at the Los Lunas study site in 2017.

Project 2: Organic Apple High Density Planting in New Mexico

Project Summary

There is a long tradition of growing apples in Northern New Mexico. Most of these producers are small acreage farmers (2 to 5 acres) and come from socially disadvantaged backgrounds. Weather changes in recent years have led to increasingly severe late frosts that are destroying the reliability of fruit. Without reliable crops annually to generate income, many growers have become discouraged and are abandoning the effort. To ensure these small farmers stay in business, good alternative crops or new cultural practices are needed. Trees in high density planting systems come to production earlier and produce higher yield than the conventional system and could generate higher and earlier revenue for growers. In New Mexico, high density planting is not popular yet as in Washington, New York and Michigan, and information about rootstocks and high density training systems are lacking. But organic production in New Mexico is increasing. Together with the NC140 rootstock trial, an organic apple rootstock trial was established in 2015 with 11 rootstocks and trees planted at 1.0 x 3.5 m in tall spindle training system. The cultivar was Modi, a selection from Italy, and the ten rootstocks are: G.11, G.16, G.202, G.214, G.222, G.30, G.41, G690, G.935, G.969, and M9-337 (control). The cultivar Liberty on G.935 was used as pollinizer.

Planting was in certified organic plots and it was managed organically and irrigated through drip irrigation. Organic chicken manure was applied twice per year at rate of 0.2lb N/tree each year. Trees were trained to tall spindle system following the protocols from the NC140 group each year. Trees started to produce a light crop in the second year after planting (2016) but production varied by rootstock. In 2017, trees all bloomed heavily, but the crop was very light due to the severe late frosts. Without a reliable crop each year, it is difficult to manage tree vigor, especially for those vigorous rootstocks like G.890 and G.202 which had grown wider than their allowed spacing. We installed over canopy sprinkler systems for this organic apple rootstock trial in Sept 2017. Hopefully, we can evaluate rootstock better with the tall spindle system with a reliable annual crop. We introduced this organic apple rootstock high density planting system to growers through the Field Day at Alcalde, fruit growers' conference and pruning workshops each year. But this is a long term trial (10 years), and more time is needed to fully evaluate the rootstocks, their yield potential, and the high density planting/tall spindle system in New Mexico. We will recommend rootstocks suitable for organic planting in tall spindle systems in New Mexico after 8-10 years data collection on their productivity, adaption to high pH soil, and fitness for tall spindle systems.

Project Approach

Trees were ordered through the NC140 rootstock group and planted in April 2015 at a spacing of 1.0x3.5m. Drip irrigation was installed after planting and the plot was irrigated weekly or as needed during growing season. Organic chicken manure fertilizer was applied at 0.2lb N per year with split applications in April and May each year. Trellis systems (10ft in height) with four tiers of wire were installed within 4 weeks after planting with one 8ft metal conduit per tree. Trees were tied to the wires with tree ties. Tree trunk diameters at 30 cm above graft union were measured right after planting and in October each year. New growth and branch numbers were measured in October 2015. Due to the

high pH soils in New Mexico, we rated the rootstock adaption/leaf chlorosis each year. Leaf analyses were conducted in July 2016 and 2017. Fruit number and total weight were collected in mid-September in 2016 and 2017. Trees were trained to tall spindle systems from planting. After planting, buds #2 to #5 on the central leader were removed to eliminate competition. All branches >10mm in diameter were tied below the horizontal to wires or pins on the ground with grafting tape. Pruning was minimal in year 2 and year 3 after planting, there is no heading cut for the central leaders but competition branches with diameters bigger than half of the trunk were eliminated with bevel cuts to stimulate weak branches next season. During the growing season, clothes pins were used to keep the new shoots in horizontal position.

Each year, the study was introduced to the fruit growers through the annual fruit growers' workshop, the pruning workshop and the Field Day at Alcalde in 2016.

The project progressed well in the past three seasons as planned, but the severe late frosts did interfere with the rootstock performance and the tall spindle system in New Mexico. The basic concept of tall spindle system is using the early crop to slow down the vegetative growth. While in New Mexico, the early crop is not reliable due to late frost, which stimulates excessive vegetative growth and complicates rootstock selection/recommendation.

In general, fruit production systems and rootstock evaluations need 8-10 years. With the new over-canopy sprinkler systems installation, we will work hard to maintain reliable crops and then compare the rootstocks and the productivity of the tall spindle system and its economic analysis.

Goals and Outcomes Achieved

The original goals and outcomes were: evaluate rootstocks and recommend rootstocks for organic apple production in New Mexico, employ tall spindle system and examine the challenges in NM, and disseminate the results to fruit growers. We are evaluating 10 apple rootstocks in high density plantings with tall spindle systems. We have collected data on their tree vigor and productivity. We do have the challenge of late frosts and we have installed over-canopy sprinkler system to manage that. We did observe differences in tree vigor and their tolerance to high pH soil. We are on the right track to evaluate these rootstocks and the tall spindle system. We have introduced this rootstock trial in high density planting to growers and informed them the new progresses in this study through field days, annual growers' workshops, and pruning workshops. But it does take 8-10 years to compare and recommend rootstocks and examine the productivity of the tall spindle system.

An Extension publication about tall spindle system was also defined as an outcome in the original proposal. The publication was written half-way in summer 2017 but could not be finished since the trees did not produce. Also, without an early crop, it was hard to manage the vigorous rootstocks. An overhead sprinkler system was installed and researchers are hopeful to get a crop in 2018. Once yield data is available, the publication will be finished.

Beneficiaries

Apple growers who are interested in high density planting in New Mexico. This tall spindle system can also be modified for pear growers.

It takes 8-10 years total to evaluate the rootstocks and the productivity/economic analysis of the tall spindle system.

Lessons Learned

The late frost issue is always challenging fruit growers in New Mexico and it also affects this rootstock/high density planting study. The basic concept of tall spindle system is using the early crops to slow the tree down and produce reliable crops. The late frosts make the early crop non-reliable and stimulate the vegetative growth which make those trees on vigorous rootstocks growth exceed the space allocated to them. We noticed this problem and installed over canopy sprinkler system in September 2017. We will manage the late frost issue carefully in the following years and compare the full potential of rootstocks and tall spindle system in organic apple production in New Mexico.

Contact Person

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Additional Information

Tree growth and yield data

	Trunk circumference at 30 cm (mm)				2016		2017		Leaf
	4/30/15	10/19/15	10/13/16	10/19/17	Fruit #	Yield (g)	Fruit #	Yield (g)	Chlorosis*
G.11	42.3	56.0 de	69.9 e	80.5 ef	1.4 b	149.3 b	1.2 bc	71.6 c	0.5 cd
G.16	13.6	28.3 g	48.2 g	63.8 g	0.5 b	55.4 b	0 c	0.0 c	1.1 abc
G.202	48.0	66.0 a	84.2 b	95.2 b	1.1 b	87.8 b	1.8 bc	99.6 c	0.6 bcd
G.214	32.0	45.2 f	62.8 f	74.9 f	0.7 b	65.1 b	1.7 bc	116 c	1.0 abc
G.222	12.5	28.5 g	48.6 g	64.3 g	0.3 b	45.0 b	0.0 c	6.4 c	0.8 abc
G.30	36.7	53.3 e	75.2 cd	94.8 b	1.3 b	161.2 b	2.3 bc	180.6 bc	1.2 ab
G.41	43.6	61.7 bc	78.2 c	93.5 bc	0.4 b	41.3 b	0.7 c	54.1 c	1.4 a
G.890	43.3	65.2 ab	93.4 a	116.0 a	1.3 b	153.4 b	3.2 b	285.2 b	0.6 bcd
G.935	44.5	60.9 c	79.9 bc	93.2 bc	3.8 a	427.4 a	6.6 a	497 a	1.0 abc
G.969	39.9	54.8 de	71.9 de	84.6 de	1.9 b	197.6 b	6.8 a	468.4 a	0.7 bc
M.9T337	40.9	61.2 bc	76.5 cd	87.3 cd	4.8 a	539.7 a	1.3 bc	113.0 c	0 d

*0-normal green color; 1-some yellowing in young leaves; 2-severe yellowing in young leaves.

Project 3: Conducting Promotional Activities for New Mexico Specialty Crops throughout the Food and Beverage Industry

Project Summary

The goal of this project was to support and assist at least 40 New Mexico specialty crops companies through tradeshows and food, beverage, and agritourism events. More specifically, assistance included cost sharing tradeshow expenses and/or actual support at events/shows, product demo/sampling, and providing collateral material support. By participating in these events, with the help of SCBGP funds, each company was expected to gain 10-18 new customers per promotional activity and 2-5 new markets. The responsibility of monitoring and measuring the successes of these 40+ companies rested on the NMDA marketing specialists and their record keeping of sales leads and market penetration.

Additional SCBGP funding allowed NMDA to extend their reach to companies that have not previously benefited from this funding, especially small retail-ready growers and processors and farmers' market vendors. The shift toward being more event-focused as opposed to primarily tradeshow-focused allowed for NMDA to better support these smaller specialty crop companies while still attaining the same level of success in terms of gaining new customer and entering new markets as in past SCBGP funded projects.

Project Approach

This project was inspired by industry requests from New Mexico Specialty Crop growers and processors for help in entering into new markets. NMDA marketing specialists evaluated which options and avenues would best help these companies enter new markets and decided to conduct a series of varying promotional activities that would benefit multiple specialty crop industries in New Mexico. These activities included distributor shows, natural product shows, food and beverage service shows, restaurant association shows, and others. They also included special promotional activities with smaller events, chains, distributors, and associations. Advertisements and promotions were used to increase traffic and awareness of the specialty crops at the different shows.

Through the project, NMDA conducted promotional activities for NM Specialty Crops at thirteen (13) tradeshows:

- Shamrock Food Service- Distributor Shows- NM, AZ, CA, and CO
- Produce Marketing Association (PMA) at two Food Service shows in CA
- PMA- Fresh Summit- all industry sectors- FL
- International Baking Ingredient Expo (IBIE)- NV
- Multi-Unit Food Service Operators (MUFSO)- US Chain Restaurants
- International Pizza Expo- NV
- Winter Fancy Food Show- CA
- Ben B Keith- Distributor Shows- TX, NM, OK
- Expo West- CA and Expo East- MD Natural Product Shows
- Institute of Food Technologist (IFT) Ingredient Show- NV
- Southwest Expo- Texas Restaurant Association

The activities for the shows included assisting NM processors and growers of specialty crops with exhibit expenses, promotional materials, and customer contacts. NMDA staff attended the shows to help the NM processors and growers with show activities, networking, and more.

This project also focused on many smaller promotional activities and events to help boost market access for NM specialty crop growers and processors. Through the project, NMDA conducted many promotional activities at:

- Sprouts Grocer Festival- AZ
- International Chile Society- NM
- Frieda's Specialty Produce Distributor- CA
- Ralph's Groceries- CA
- Gelson's Markets- CA
- Market Fresh Super Market- VA
- University of New Mexico Chile Roasting Event- NM
- New Mexico State Fair- NM
- NM School Nutrition Association- NM
- Santa Fe Farmer's Market
- Chef's Taste Challenge- LA
- Fiery Foods Show- NM
- Farm and Ranch Heritage Museum/NMDA's HomeGrown Food Show and Gift Market- NM
- Double Up Food Bucks Trailer Promotions- NM

The activities performed at the events and venues involved cooking demos, samplings, chile roastings, culinary competitions, customer contact and interaction, and retail store promotions. These activities all highlighted the breadth and quality of New Mexico grown and made specialty crop products.

Many of these activities particularly helped companies that have not benefitted from such activities with NMDA previously. These companies in particular included different growers and companies at the Santa Fe Farmer's Market and promotional activities with the New Mexico Farmers' Market Association highlighting their Double Up Food Bucks program. This included promotional events using NMDA's concession trailer and was held in conjunction with several Lowe's Supermarket stores around the state.

Goals and Outcomes Achieved

Through the project's promotions, NMDA has been helpful in getting NM specialty crop retail and food service products into new distribution and markets. At least forty six (46) NM companies have been introduced into new markets with increased consumer awareness. Through the project NMDA has assisted the companies and distributor partners introduce sixteen (16) new products with NM specialty crops products.

Goal

The goal of the project was to support and assist at least 40 New Mexico specialty crop companies through tradeshow, and food, beverage and agritourism events in order to help them gain new customers and new markets (increase exposure and awareness of specialty crops).

Outcome

46 NM companies were introduced to new markets and sales possibilities through the activities of the grant.

Through the promotional activities the NM companies involved gained at least ten (10) or more new customers per activity.

A minimum of 2-5 new markets have been opened for the participating companies.

Beneficiaries

The beneficiaries were the growers, processors, and distributors of NM specialty crops. These companies varied from specialty onion growers to vintners, chile packagers and shippers to pecan growers. The food service operators in attendance and their customers were also beneficiaries of the promotional activities.

Over 40 NM companies benefited from the project activities, additionally countless customers and consumers that were exposed to NM specialty crops.

The companies growing, producing, and distributing NM specialty crop products will continue to provide their services to the new customers and markets gained through the project.

Lessons Learned

Through the project the lessons learned were that:

- It was necessary to adjust the work plan of activities to accommodate the readiness of some companies to promote.
- There were fewer agritourism opportunities overall than we originally expected.

Contact Person

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Additional Information

See Appendix

Project 4: Promoting New Mexico Onions and other Specialty Crops at the Produce Marketing Association Fresh Summit

Project Summary

New Mexico onion growers/shippers, as well as other specialty crop growers/shippers, contacted the New Mexico Department of Agriculture (NMDA) and the New Mexico Dry Onion Commission (NMDOC) in 2014 requesting additional financial support for the marketing and promotion of their onions and other specialty crops at a major national and international tradeshow. The cost of these shows can be prohibitive if some type of coordinated effort and support, especially for newer exhibitors, is not sought after and secured.

Although SCBGP funds were not requested for shows in 2012 and 2013, industry reevaluated their need and ability to continue exhibiting in the Produce Marketing Association's (PMA) Fresh Summit. The consensus of past exhibitors, as well as new exhibitors, was that funds were needed in order to continue exhibiting, and that exhibiting at this show in particular is vital to maintaining and expanding market share. Many feel it is critical that they maintain a presence at the show in order to meet with existing customers.

Efficiency in marketing and promotional efforts were, and still are, a priority as genetics, ideal growing conditions and refined growing practices are not sufficient in keeping a competitive edge over the competition.

It is the opinion of these same NM specialty crop industry members that the PMA Fresh Summit continues to be *the* produce tradeshow in the United States with all the major players (buyers) in attendance. The buyers go to the show with the expectation of seeing new products, visiting with current suppliers, and finding new suppliers. If a grower/shipper that they do business with is not there, future sales can easily be lost. The fact that the show rotates from east to west is also thought to be beneficial.

Project Approach

With the help of NMDA, the NMDOC secured pavilion space at the 2014 and 2015 PMA shows in Anaheim and Atlanta respectively. As reported in the annual report submitted in 2016, downscaling of the booths in 2014 and 2015 meant that approximately \$60,000 remained after the 2015 show. The remaining funds were then stretched to include the 2016 PMA show in Orlando.

2014

Seven NM specialty crop growers/shippers exhibited in the 2014 show in Anaheim. The post-show survey results revealed that:

- Average number of new customers they reported talking to was 12
- Average number of return customers they reported talking to was 13
- Average out-of-pocket expenses reported was \$5,625
- Greatest benefit for their participation was reported as maintaining and building relationships with customers, (company) exposure and product exposure

2015

Seven exhibitors participated in the 2015 show in Atlanta. Their survey results were as follows:

- Average number of new customers they reported talking to was 15
- Average number of return customers they reported talking to was 16
- Average out-of-pocket expenses was \$8,375
- Greatest benefits of participating can be summarized as face-to-face time with current and new customers as well as general exposure

2016

Five companies exhibited in Orlando. A similar post-show survey was conducted in 2017 for the 2016 show, however, several questions were eliminated in efforts to increase the number of responses. The return on investment (ROI) figures for all years can be found in the Goals and Outcomes Achieved section.

2017

After the 2016 show, \$18,883 in SCBGP funds remained. NMDA and the Commission called a meeting with past and potential exhibitors and it was agreed upon to once more utilize the funds for the 2017 PMA show in New Orleans with each company committing to injecting additional funds of their own into the project.

Ultimately, five companies exhibited. Three of these companies were of the previous group, one was a company that hadn't exhibited in several years due to changes in management and priorities, and the final exhibitor was a first-timer within the New Mexico pavilion.

These companies have all been surveyed to determine an average number of leads gained at the show. An ROI for the New Orleans show cannot be calculated at this time as sales tied to exhibiting at this show can still materialize before the upcoming season in 2018.

All funds were expended after the 2017 show.

Please note that all NM growers/shippers sell exclusively specialty crops, therefore, the benefits of this project did not extend past these specialty crops and businesses.

Return on Investment = sales gained as a direct result of participating in the show/total cost of exhibiting in the show, excluding travel

Goals and Outcomes Achieved

Success for years 2014-2016 was measured in terms of ROI as approved in the proposal. 2014's ROI served as the benchmark at \$13.25 conservatively. The ROI for 2015 declined to \$9.71 mainly due to the increased cost of the floor space. ROI for 2016 was \$27.48 (\$1,087,500/\$32,982.18); a 183% increase over the previous year and a 107% increase over 2014's ROI (goal was a 5% increase in ROI each year). Minimizing expenses along with a dramatic increase in the average sales per exhibitor contributed to the increased ROI.

The recent survey of the five 2017 PMA exhibitors yielded an average of 8 solid leads per company gained as a direct result of exhibiting in the show. While this may seem small, each lead may materialize into thousands of dollars in sales per company. This could be especially beneficial for the new grower/shipper that exhibited at this show for the first time.

Beneficiaries

The immediate beneficiaries of this project are the 9 New Mexico specialty crop growers/shippers and the many other New Mexico growers that they purchase specialty crops from in order to fill their orders. Secondary beneficiaries include the distributors and retailers throughout the country and beyond.

Lessons Learned

The landscape of New Mexico specialty crop growers/shippers continues to change slightly from year to year. These growers/shippers try their best to be proactive in their respective markets by using the PMA Fresh Summit as a way to observe market trends as well as other changes within the retail (grocery) sector.

Our growers/shippers are always looking for ways to add value to their product(s) and capture more income for themselves as well as their respective growers.

International interest varies year-to-year depending on the market and the NM exhibitors are more prepared to handle these types of inquiries on the show floor as well as after the show.

Contact Person

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Project 5: Exploring New Strategies in Green Chile Market Development and Promotion

Project Summary

The initial purpose for this project was to increase market share of New Mexico Green Chile and ultimately create a new demand for chile with consumers seeking new tastes and culinary applications. The incorporation of new and different marketing strategies was critical to capture new markets which was highly needed. The project was a continuation of the 2013 SCBGP New Mexico Green Chile Promotion. It was an extension of continued market development into targeted markets and expansion directed at gourmet food purveyors. With the addition of a social media specialist, it allowed for an improved and updated presence on the World Wide Web. Updating our Facebook, Instagram, Twitter and Pinterest pages about the presence of green chile made an immediate impact on the project and caused a lot of excitement.

Project Approach

Technical assistance and educational seminars were provided in efforts to maximize targeted markets effectively. Chile Boot Camps 101 provided historical data, common misconceptions of green chile, event planning ideas, roasting and preparation strategies, cross merchandising, collateral materials, and education outreach for consumers. Proper training and education of store personnel conducting demonstrations was an integral component in establishing a one-on-one connection with the consumer and retailer. A total of 10 Chile Boot Camp 101 trainings were performed as a result. Instore promotions occurred at:

- Las Vegas, NV
- Atlanta, GA
- Los Angeles, CA
- Austin, TX
- Salt Lake City, UT
- Boise, ID
- Ft. Worth, TX
- Denver, CO
- Orlando, FL
- Sacramento, CA

The promotions were conducted at HEB, Macy's, Albertson's, Kroger, Smith's, Fareway, Wakefern, Fresh Market, Whole Foods Grocer, and Frieda's distribution center. These chain stores represented at least 90 stores.

Alumni Events were performed in:

- Annapolis, MD
- Alexandria, VA
- Houston, TX
- San Diego, CA
- Phoenix, AZ
- Austin, TX
- Orlando, FL
- Las Cruces, NM
- Albuquerque, NM

The addition of a Social Media Specialist has been a great asset to the marketing and promotional efforts. Great excitement has been generated with updating Facebook, Instagram, Twitter, and Pinterest pages. Recipe videos were a tremendous hit, generating thousands of likes, shares, and comments. One recipe video in particular, Green Chile Breakfast Quesadilla, reached 143,000 people with over 2,000 shares and over 55,000 views and counting. Green chile in social media has helped in market development in targeted markets and expansion directed at gourmet food purveyors. The baseline goal of 12 recipes was surpassed. We posted 5 popular cooking videos and shared numerous recipes provided by industry members.

NMDA also provided support to New Mexico shippers with materials that included "Get Your Fix" (GYF) caps and aprons. These caps were worn by store personnel during the chile season. GYF aprons and pennants were also provided. The aprons were worn by personnel during the chile roasting. The GYF pennants served a dual purpose as safety barriers and marketing banners. GYF alumni tote bags were provided to alumni who purchased chile at various sites and locations but were not purchased with SCGBP funds.

Goals and Outcomes Achieved

The Green Chile promotion had the desired impact on industry. With an increase in market expansion and an increase in the number of stores, processors and producers were positively impacted. The ten new regional markets created were well beyond the target mark of five. Ultimately over 90 stores throughout various regions invested and participated in the Green Chile Promotions surpassing our target of 24 stores. Through marketing strategies taught by NMDA via Chile Boot Camp 101, the new markets will ultimately increase demand and future sales for seasons to come.

The establishment of alumni events proved to be very successful. The nine alumni events surpassed the target mark of six and continues to be a high demand event. The alumni events allow ex-New Mexicans the opportunity to feel at home and purchase chile for year round use. Reuniting with former classmates and roasting chile makes for a popular event that attracts not only former New Mexicans, but new, interested buyers. These popular events are greatly appreciated by alumni and prospective customers throughout the United States.

A strong marketing and promotional campaign on social media has strengthened and helped capture new markets. New recipe cooking videos, exciting green chile promotional contests, and overall green chile information has replaced the green chile recipe DVDs. Going online has generated excitement and allowed for new followers that will continue to like, share, comment and subscribe to our social media outlets.

Beneficiaries

The rise of new markets and higher demand has resulted in a substantial growth of annual retail sales, positively impacting the chile producer, processor and retailer.

The retailer in particular has benefitted, as alumni events have created direct avenues for ex-pats to purchase chile. These events have created a win/win situation, where New Mexico alumni offices can direct their alumni to a source of green chile, the store has an immediate impact on sales of green chile, and the alumni chapters have a location to bring their membership together for an event. The social media platforms have enhanced our presence throughout the United States. By working with shippers,

retailers, and distributors, we can promote chile roastings scheduled throughout the United States. This will allow for green chile fanatics to know when and where they can get their green chile.

Lessons Learned

The project had positive results. As expected, green chile is a gourmet product that grows business. As a result of our boot camp trainings, committed retail stores took advantage of the opportunity and increased storewide profits tremendously.

The primary lead for the project retired in 2014 resulting in a few constraints that led to a couple of cancellations. Several trainings and promotions that had been scheduled due to short notice and personnel resources were cancelled and rescheduled for 2015. NMDA staff regrouped and added a new marketing specialist to become the new lead for this project.

The evolution of technology and the emergence of social media has changed the game. By hiring a social media specialist, it has put us ahead of the game and allowed for a new, updated way of promotion and marketing.

Contact Person

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Project 6: It's A SNAP: Increasing Specialty Crop Sales through Improved SNAP Usage at New Mexico Farmers' Markets and Farm Stands

Project Summary

The New Mexico Farmers' Marketing Association engages a systems-level approach to increase revenues for local specialty crop farmers. Creating awareness of and preference for specialty crops among low-income individuals requires a multi-faceted health communications approach aimed at behavior change. The proposed two-year project seeks to enhance the competitiveness of specialty crops by accomplishing three objectives:

1: To increase sales of specialty crops among low-income SNAP users in four low-income/low-access counties (Rio Arriba, San Miguel, Dona Ana and Hidalgo), by assisting Federally Qualified Health Clinics, independent community health workers, farmers markets, and other community organizations to effectively deliver specialty crop nutrition education.

2: To increase the number of farmers' market customers who purchase specialty crops by training and assisting farmers' market managers statewide to make their markets multi-purpose gathering spaces that cultivate community health.

3: To increase statewide sales of specialty crops by increasing awareness of, and preference for using SNAP at farmers' markets and farm stands by using mobile messaging, radio, targeted mailings, and community outreach.

We believe the project will enhance the competitiveness of specialty crops, by a conservative estimate of \$451,000 increase in specialty crop sales at farmers' market sales during the project, of which most would be Supplemental Nutrition Assistance Program sales. Increased specialty crop sales will directly benefit approximately 550 farmers and 4,200 low-income consumers (at minimum). There are extensive plans for evaluating the program that include primary research surveys with SNAP customers, low-income groups, farmers and market managers, as well as the collection and analysis of market sales and customer data. There are also detailed plans for project information dissemination.

Need: As of March 2014, more than 422,000 individuals in New Mexico were enrolled in SNAP, or just over 20% of the state's population. These individuals received a total of more than \$50 million to supplement their monthly food budget, yet only \$70,000 of those benefits were spent on locally grown fruits and vegetables at farmers' markets during 2012 & 2013. Most SNAP food dollars are spent at grocery stores or, in rural areas where fresh food access is scarce, at convenience stores. Although 30+farmers' markets around the state accept SNAP, generating awareness about the availability of this program for use on specialty crops, and changing people's shopping and eating habits is difficult.

Dedicated outreach and promotion targeted to low-income households is needed to assist NM specialty crop farmers convert federal SNAP funding into specialty crop sales. By shifting even a small percentage of SNAP food dollars currently being spent in the prepared and processed food categories to specialty crop sales, this program will successfully enhance the competitiveness of specialty crops in New Mexico.

These behavioral spending changes could be significant not only for the three-year life-cycle of the grant, but well beyond.

Timeliness

“If you build it they will come,” (i.e, just having EBT machines at farmers’ markets and farm stands) has clearly proven to be an insufficient marketing strategy for creating strong SNAP sales for NM-grown specialty crops. The New Mexico Farmers’ Marketing Association has found that a more comprehensive education/outreach program is essential to making markets more accessible to SNAP recipients and to promoting the sales of specialty crops. As part of the follow- up to this project, the NMFMA has begun to work closely with a number of Federally Qualified Health Clinics and independently employed community health workers (CHWs), whose patients are low-income individuals, many of whom are concerned with their health and the health of their children. These clinics and CHWs have a strong interest in promoting health through increased consumption of fruits and vegetables, most already do some form of nutrition education related to obesity and diabetes prevention. Currently, little of this nutrition education directs participants to shop for specialty crops at farmers’ markets, yet there is an important opportunity to link these two.

The proposed project seeks to increase farmers’ market specialty crop sales by building on this opportunity to use existing health and nutrition programs, along with established health provider relationships across the state. Additionally, a strong outreach program will work well alongside a SNAP incentive program (Double Value Coupon Program, DVCP), which is currently being funded in five low-income counties by a local health provider, and in another county through extensive fundraising. Even with incentives, SNAP sales for specialty crops were still only a small fraction of what they could be, showing that outreach and promotion is still needed to help maximize the “double bucks” program potential. And without outreach and promotion, all of the farmers’ markets that have invested administrative time, money and energy into offering SNAP in their community, find themselves lacking specialty crop sales.

Given that 20% of NM’s population is enrolled in SNAP, generating sales among this target segment is an important long-term strategy for increasing direct market specialty crop sales in New Mexico.

Furthermore, about 80% of SNAP-ready farmers’ markets are located in communities suffering from higher than average rates of food insecurity, obesity, and/or limited access to healthy food. **These factors can actually help drive specialty crop sales at farmers’ market**, especially with the help of community partners such as Federally Qualified Health Clinics and local community health workers who are eager to promote healthy food opportunities to their patients.

Approach

The project’s purpose is to increase sales of specialty crops among SNAP users at New Mexico farmers’ markets and farm stands. Project outreach will promote SNAP usage SOLELY for specialty crops: Unintended sales of non-specialty crop items will be covered through project matching funds (see “objectives” section for further details). **Federal SNAP funds represent significant specialty crop sales potential in New Mexico, and driving new specialty crop customers to farmers’ markets is key to**

growing the long-term customer base for specialty crop farmers who rely on farmers markets for much of their annual revenue.

Objectives

Objective 1: *To increase sales of specialty crops among low-income SNAP users in four low-income/low-access counties (Rio Arriba, San Miguel, Dona Ana and Hidalgo), by assisting Federally Qualified Health Clinics, independent community health workers, farmers markets, and other community organizations to effectively deliver specialty crop nutrition education.*

TASKS from Work Plan, & Results/Accomplishments/Conclusions/Recommendations

1. Develop curriculum and training materials for COCINA. This curriculum will focus on using specialty crops in cooking classes, combined with farmers' market tours, recipe guides, and nutrition education related to specialty crops. It will be targeted at SNAP-eligible families to improve specialty crop sales at farmers' markets and farm stands.

Results: The training materials and toolkit were developed with comprehensive feedback from health clinics and community health workers. It includes information on: nutrition, farmers' market incentive programs for specialty crops (WIC/SNAP and Double Up), and how to conduct tastings and food demos. It is targeted to SNAP-eligible families.

Accomplishments: We developed a very professional training curriculum that meets the needs of health educators to inform their clients about the benefits of eating specialty crops. More than 130 health educators in target counties (and beyond) were trained with the materials. Trainee evaluations were extremely positive. Trainers told us they were using the information in their regular work with approximately 1,000 clients per year. Requests for training continue. It is available on the NMFMA's website and continues to be used.

Conclusions: Health educators are hungry for tools to teach nutrition education about specialty crops to their low-income clients. Demand for training across the state continues.

Recommendations: Additional grant funding is needed to make this a regular part of the NMFMA's programming.

2. Host two in-person COCINA meetings to train trainers from the four target areas, plus quarterly conference calls to share best practices, strategize outreach, and troubleshoot problems. Meeting attendance by community health workers and other clinic personnel is essential because they are the human links to creating new specialty crop customers among SNAP users. They work directly in the field with underserved populations on a daily basis, and as health advocates, they have the trust and relationships needed to encourage behavior change, including increasing the purchase of specialty crops. They will educate, promote, and will help develop lists of SNAP users who want to be contacted by mobile messaging for seasonal specialty crop promotional reminders. They will also be integral to the evaluation phase.

Results: Trainers were trained and told us they were using the information in their regular work with approximately 1,000 clients per year. Requests for training continue.

Accomplishments: Same as above.

Conclusions: Demand outstrips staff time and resources.

Recommendations: Identify new sources of funding to make this a regular part of the NMFMA's programming.

3. Implement COCINA program in Las Vegas, Espanola, Las Cruces & Hidalgo County

Results: More than 130 health educators were trained.

Accomplishments: Same as above.

Conclusions: Same as above.

Recommendations: Same as above.

4. Identify and work with a minimum of 3 COCINA participants per site to serve as market advocates who take friends/family on tours of the market the following season.

Results: Some clinic educators provided market tours and others did not. It depended on the time and enthusiasm individual educators had for this activity.

Accomplishments: Some educators worked with County Extension personnel to continue tour activities.

Conclusions: In general, this is a function better served by ICAN educators with NMSU Extension service.

Recommendations: Expand partnership with NMSU ICAN Extension personnel to create market tours.

5. Evaluate effectiveness of COCINA program, modify curriculum for future use based on feedback from participants and trainers.

Results: Evaluations point to general success of the program. The need for Spanish language translation and Navajo-focused materials would be useful.

Accomplishments: Clinics continue to request future trainings.

Conclusions: All demographic groups can benefit from this curriculum.

Recommendations: The NMFMA will work to create Spanish language translations and Navajo-focused materials when future funding allows.

6. Develop funding strategy to continue COCINA for future seasons and expand COCINA program to other FQHC/market areas.

Results: The NMFMA has several proposals in the works for future funding.

Accomplishments: The NMFMA is working to make this a regular part of its programming by creating the New Mexico Good Food and Health Eating Center.

Conclusions: The opportunities for successful partnerships are enormous.

Recommendations: Partners participate in future opportunities with the NMFMA.

Objective 2: To increase the number of farmers' market customers who purchase specialty crops by training and assisting farmers' market managers statewide to make their markets multi-purpose gathering spaces that cultivate community health.

TASKS from Work Plan, & Results/Accomplishments/Conclusions/Recommendations

1. Provide administrative stipends to up to 15 markets (in low-moderate income communities) to create promotional family activities (such as cooking demonstrations, kid tastings, kid contests, kid-led market tours) that encourage the purchase of specialty crops. Managers will be required to document their activities and evaluate increased attendance.

Results: 15 markets were funded for a total of \$13,857 and 15 were successfully implemented.

Accomplishments: Mini-grants were very successful and project results varied by market.

Feedback was extremely positive. Projects included: Book exchanges, recipes, cooking demonstrations, Children's Corner events, "Bike Day", "Swap Days", Facebook and Instagram campaigns, "Zuke Fest," "Get Moving at the Market Days," partnership with 4-H, Boys Scouts, Radio ads, 5K races, and lots of events. Whatever the feature of the event, all events promoted specialty crops, tasting, and recipes (or some combination).

Conclusions: All market managers submitted reports (written) and confirmed the effectiveness of the mini-grants. They said planning for such events helped them execute them during the season, and having the funding was critical. Attendance figures at markets increased and SNAP sales rose significantly (from \$124,000 in 2015 to more than \$770,000 in 2016). Health clinic relationships were also developed and strengthened: 10 clinics in 6 communities were integrated into market events and outreach activities. Market managers said more families attended markets, and new customers were observed.

Recommendations: Future funding for similar projects would be very welcomed by farmers' markets.

2. Provide half-day seminar at annual NM Farmer's Market Manager meeting about best practices for making markets into community/health gathering spaces.

Results: 60+ market managers were given information about the mini-grants and asked to apply for funds to execute projects that would support the goals. 15 markets were funded for a total of \$13,857 and 15 were successfully implemented.

Accomplishments: See above.

Conclusions: See above.

Recommendations: See above.

3. Foster connections between FQHC and community health clinics and market managers.

Results: This was very successful in the 10 communities where clinics had an active interest in getting to know their farmers' market.

Accomplishments: New customers for specialty crops were developed by expanding upon trusted relationships with health clinic providers.

Conclusions: Health clinics continue to be important partners for farmers' markets across the state.

Recommendations: Continue training health care workers and fostering relationships between market managers and health clinic workers and their patients.

4. Market managers host market tours for health clinic patients.

Results: 10 markets provided clinic staff with tours to improve their knowledge of specialty crops. (Some rural markets did not have health clinics with adequate staff to participate.) Many additional tours were held for patients.

Accomplishments: New customers for specialty crops were developed by expanding upon trusted relationships with health clinic providers.

Conclusions: Health clinics continue to be important partners for farmers' markets across the state.

Recommendations: Continue training health care workers and fostering relationships between market managers and health clinic workers and their patients.

5. Create a specialty crop loyalty program where shoppers are incentivized with specialty crop "market bucks" to return to market with friends/family and purchase specialty crops.

Results: The Loyalty Program did not happen. However, we know that 30% of all SNAP specialty crop shoppers said they learned about the program from friends and family.

Accomplishments: There was tremendous increase in SNAP sales for specialty crops. Total sales went from \$124,000 in 2014 (before the SCBG grant) to \$300,000 in 2015 and \$770,000 in 2016.

Conclusions: Word of mouth is an invaluable promotional method for promoting specialty crop sales among SNAP participants.

Recommendations: Use social media as an extension of social network marketing and encourage customers to tell their friends and family.

6. Develop social media contests to engage market shoppers as active promoters of specialty crops.

Results: One contest was run in 2015. There were 275 participants who submitted photos of themselves at market and or with locally purchased food, plus a recipe.

Accomplishments: It engaged a targeted audience in a meaningful way and created more awareness.

Conclusions: The contest could be improved by simplifying the participation requirements. This would likely help increase the number of participants.

Recommendations: Try again with more simple rules for engagement.

Objective 3: To increase statewide sales of specialty crops by increasing awareness of, and preference

for, using SNAP at farmers' markets and farm stands by using mobile messaging, radio, targeted mailings, and community outreach.

TASKS from Work Plan, & Results/Accomplishments/Conclusions/Recommendations

1. Send targeted inserts advertising SNAP usage for specialty crops at farmers' markets, including through biannual mailings through Human Services Department.

Results: This did not happen as the NM Human Services Department was not able to get its contractor to make this happen due to technology challenges. Instead, promotion was done through other media channels.

Accomplishments: All other promotion activities contributed to the tremendous increase in SNAP sales for specialty crops. Total sales went from \$124,000 in 2014 (before the SCBG grant) to \$300,000 in 2015 and \$770,000 in 2016.

Conclusions: Creating awareness about nutrition and specialty crops among SNAP customers takes a great deal of program promotional effort by multitudes of community partners and various media working in concert.

Recommendations: Promotions require funding.

2. Create a mobile messaging campaign, reminding participants that the specialty crops that are in season at the market, and also linking them to relevant specialty crop cooking/nutrition information.

Results: Mobile messaging is an excellent way to remind customers about farmers' markets, but the challenges are collecting phone numbers. The rest of the process is easy and cost-efficient.

Accomplishments: A handful of markets and health clinics successfully used mobile messaging for the customers/patients. We did not have as much participation as we expected.

Conclusions: When you have a methodology for collecting customer phone numbers, the rest of the promotion is extremely easy, targeted, and result-oriented.

Recommendations: Continue to offer mobile messaging to health clinics and farmers' market managers. Those who use it are very pleased with the service.

3. Create and run radio ads dedicated to promoting the usage of SNAP at farmers' markets for specialty crops.

Results: A 12-week multi-market radio campaign delivered 2,440 spots and 2,080 internet spots. Market customers across the state said they remembered hearing the ads, although word-of-mouth was the way customers said they remembered hearing about the markets most often.

Accomplishments: Crops were reached through extensive outreach by partners, radio ads, mobile messaging, and more. This is evident by the increase huge increase in EBT specialty crop sales (\$722,000 in 2016 vs. 300,000 in 2015). Current data for 2106 shows nearly 20,000 customers, up from about 12,000 in 2015.

Conclusions: Radio is an effective medium for promoting the sale of specialty crops at farmers' markets and farm stands.

Recommendations: Continue using radio to promote specialty crops.

4. Print posters promoting the benefits of using SNAP for specialty crops. Distribute to health clinics and WIC offices across the state.

Results: 5,000 4-color posters were printed and distributed.

Accomplishments: Posters were distributed across the state and helped promote the program at the grassroots community level.

Conclusions: Posters are an important and versatile way to create program awareness.

Recommendations: Continue printing posters.

5. Create and distribute refrigerator magnets that specifically promote the benefits of using SNAP for specialty crops at farmers markets and farm stands.

Results: We did not create refrigerator magnets as planned. We used the funds for other promotions such as radio and posters.

Accomplishments: N/a

Conclusions: N/a

Recommendations: N/a

Objective 4: To document and evaluate project activities, and to disseminate project findings and resources throughout the state and to community health clinics, farmers' markets and related organizations across the country.

Information was gathered in the following ways:

- For information on making the multipurpose spaces at farmers' markets, written reports were received from all markets.
- For COCINA! health educator trainings: We surveyed the training participants immediately after the trainings as well as 8 weeks after the training.
- Customers Spending: We surveyed market customers, farmers, and market managers.
- Mobile Messaging: We have data from the company supplying the text messaging services and have interviewed participating market managers.
- Radio: Again, in surveys of customers, farmers, and market managers.

Results have been publicized in the following ways:

During both years, SNAP sales of specialty crops have been distributed to the New Mexico legislature because a state appropriation contributes to the food incentive funding. Other programmatic information has been shared with other non-governmental associations in the state as well as potential funders.

Project Partners

The list of project partners is extensive. Key partners who helped spread the word about the availability of programs for SNAP shoppers to buy specialty crops included: Roadrunner Food Bank’s local partners (such as food pantries), senior centers, churches, municipalities, Main Street organizations, health clinics, community health workers, WIC offices, Income Support Division offices, New Mexico State Cooperative Extension cooking and nutrition educators, home economists, agriculture extension agents, and market managers. When it came to the market activities that helped create multi-purpose spaces, community partners ranged from local libraries to hardware stores, and beyond. Also the health clinics and their large networks of community health workers were key partners for delivery of nutrition education. Community partners were deeply engaged in supporting education and outreach efforts. They spread the word through email correspondence, Facebook, poster distribution, and word of mouth. Many partners will continue to do the same work in the future. Whether or not the health clinics can promise cooking demonstrations if they don’t have funds for staff time might be questionable, but if we are able to find funds for them to purchase the local vegetables, they might still continue the work because of the impact they have seen it have in their communities.

Question:

If the overall scope of the project benefitted commodities other than specialty crops, did the grantee indicate how project staff ensured that funds were used to solely enhance the competitiveness of specialty crops?

The project solely promoted specialty crops. All work with the COCINA! health educator training program and market promotions ONLY promoted the consumption of fresh fruits and vegetables. If there was any bump to other food sales at markets that came from specialty crop promotions, we have no way of knowing. Market shoppers who answered surveys did not indicate that they purchased anything other than specialty crops. Sales figures reported are solely for fresh fruits and vegetables.

Goals and Outcomes

All activities were completed and detailed in the Project Approach section. Comparisons of accomplishments with goals and targets are detailed in the charts below.

Performance Measures Goal #1			
Goal	Results Achieved	Target	Results Achieved
1. 80% of participants (approximately 115) report significant increase in awareness of using SNAP at farmers’ markets for specialty crops, and skills in using farmers’ market specialty crops to create healthy meals. Measured through surveys of project participants.	96% of surveyed participants reported increased awareness of their ability to use SNAP for specialty crops at farmers markets. 62% of market vendors surveyed felt they had new,	1. Knowledge about using SNAP for specialty crops increases from minimal or none to some or a great deal.	This can be measured by the tremendous increase in SNAP sales for specialty crops. Total sales went from \$124,000 in 2014 (before the SCBG grant) to \$300,000

	regular customers buying from them.		in 2015 and \$770,000 in 2016.
2. 60% of participants (approx. 86) express an interest in specialty crops and return to farmers' markets at least 5 times over the project period. Measured through surveys of project participants.	The number of repeat specialty customers has increased dramatically, but it is impossible to tell how often they return to market. We know how many new customers each year, but cannot track the frequency of returning customers.	2. Market participation and purchase level of specialty crops increases from minimal or none to at least 5x over 2 years.	The number of repeat specialty crop customers has increased dramatically, but it is impossible to tell how often they return to market. We know how many new customers each year, but cannot track the frequency of returning customers.
3. 20% of participants (approx. 28) join specialty crop loyalty program and recruit friends and families to attend the market. Measured through surveys of project participants.	Loyalty program did not happen but 30% of market SNAP shoppers say they learned about it from friends or family.	3. Specialty crop purchasing by additional friends/family members increases from minimal or none to some or a lot.	30% of market SNAP shoppers say they learned about it from friends or family.
4. Specialty crops sales at farmers markets by customers using SNAP in the target communities increase by \$11,500 (114 new customers x 5 visits per customer x \$20 per visit) in the first year and \$17,000 in the second year (170 new customers x 5 visits per customer x \$20 per visit), benefiting approximately 40 farmers. Measured by SNAP sales reports provided by market managers.	Specialty crop sales by SNAP customers far exceeded the goals in the four target communities. They increased by \$59,000 in 2015 and by \$87,000 in the second year, benefiting more than 120 farmers in these target counties. NOTE: Statewide, specialty crop sales increased from \$124,000 in 2014 to \$770,000 by the end of 2016.	4. SNAP sales data for specialty crops increase measured against current SNAP sales for specialty crops.	Statewide, specialty crop sales increased from \$124,000 in 2014 to \$770,000 by the end of 2016.
5. Within 5 years of project completion, an additional	Within just two years, specialty crop	5. Knowledge about specialty	More than 130 community health

<p>\$59,000 in SNAP sales of specialty crops will occur due to the COCINA curriculum that is adopted by an additional 10 health clinics or CHWs, benefitting approximately 360 participants per year and resulting in a long-term benefit of an increase in benefiting approximately 140 farmers. This will be measured by ongoing relationships with health clinics, by participant and farmers' market surveys and through SNAP sales reporting.</p>	<p>sales have surpassed these projections. They increased from \$124,000 in 2014 to \$770,000 by the end of 2016. They benefit more than 800 farmers across the state.</p>	<p>crop cooking curriculum of clinic staff and increases from minimal to significant within project time period.</p>	<p>workers and public health educators have been trained about the benefits of their clients purchasing specialty crops. These health educators tell us they touch, on average, 1,000 clients per year, indicating 130,000 low-income individuals have received this information each year.</p>
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Performance Measures Goal #2			
Goal	Results Achieved	Target	Results Achieved
<p>1. 15 markets implement specialty crop demonstration activities geared for families such as kid cooking demos, family-friendly tastings, contests for kids, etc.</p>	<p>15 markets implemented activities geared for families including tastings, face painting, libraries, bike days, and more.</p>	<p>Specialty crop demonstration activities geared toward families increases from low or none to some or a fair amount.</p>	<p>Yes, all activities included specialty crop demonstrations (even when the promotion centered on bikes or books, for example).</p>
<p>2. 100 farmers see an increase in specialty crop sales based on their observations of interest in demonstration activities and/or related coupons at markets.</p>	<p>300+ farmers saw an increase in specialty crops at the markets that added these promotional activities.</p>	<p>Market manager knowledge about how to improve specialty crop sales through market events increases from low or some to a greater amount.</p>	<p>More than 60 market managers received training in how to promote specialty crops through special events and marketing planning.</p>
<p>3. 45 farmers' market conference attendees increase understanding of importance of ways to make markets multipurpose to increase customer attendance and improve specialty crop sales.</p>	<p>More than 60 market managers received training in how to promote specialty crops by making their markets multi-use spaces.</p>	<p>Participation with local health clinics about specialty crops increases from low or none, to some or moderate.</p>	<p>Local health clinics participated in events that featured specialty crops at the local farmers' markets.</p>

4. At least 20 market managers meet w/clinic staff to improve understanding of local specialty crops.	10 market managers met with clinic staff to help them improve their knowledge of specialty crops. (Some rural markets did not have health clinics with adequate staff to participate.)	Health clinic staff knowledge about specialty crops available at markets increases from low or none to some, moderate or greater.	100% of health clinic staff who participated in events and activities (more than 130 individuals) increased their knowledge about specialty crops available at markets.
5. At least 15 markets provide tours for health clinic professionals, educating them about local specialty crops.	10 markets provided clinic staff with tours to improve their knowledge of specialty crops. (Some rural markets did not have health clinics with adequate staff to participate.)	Participation among target market social circles to promote specialty crops increases from low or none to a greater amount	Clinic staff and their social circles promoted specialty crops, increasing awareness and knowledge.
6. At least 150 tours are provided by 50-100 specialty crop loyalty program participants who bring friends and family to farmers markets.	The Loyalty Program did not happen. But friends and family were instrumental in the promotion of the SNAP incentive program for creating customers.	Knowledge about specialty crops at farmers' markets increases from low or none to some or greater.	Evidence of increased knowledge can be seen in statewide specialty crop sales that increased from \$124,000 in 2014 to \$770,000 by the end of 2016.
7. 300 people participate in social media contests that promote specialty crops, reaching 50 people each in their social networks.	275 people participated in a social media contest that promoted specialty crops in 2015.	--	

Performance Measures Goal #3			
Goal	Results Achieved	Target	Results Achieved
1. Targeted mailings about specialty crops will be sent to SNAP participants via NM Human Services Department mailings (A minimum of 200,000 2x per year).	This did not happen as the NM Human Services Department was not able to get its contractor to make this happen due to	Awareness of specialty crops available at farmers' markets among target population will	Evidence of increased knowledge can be seen in statewide specialty crop sales that

	technology challenges. Instead, promotion was done through other media channels.	become moderate or greater.	increased from \$124,000 in 2014 to \$770,000 by the end of 2016.
2. A mobile messaging campaign about specialty crops available at farmers markets will begin with collection of target population phone numbers. By 9/2015, 2,500 numbers will be collected; by 9/2016, 5,000 numbers.	More than 130 health educators were provided with mobile messaging tools. The program only had minimal success as most providers did not follow through; however, those that used it found it very useful and continue to use the service.	Ability for markets to launch a mobile messaging campaign to promote specialty crops will become fair to very good.	More than 60 market managers were provided with mobile messaging tools, but many did not use it. However, those that used it found it very useful and continue to use the service.
3. A flight of at least 3 radio campaign ads about how to use SNAP to purchase specialty crops will run per season, with reach of at least 200,000 listeners.	Radio ads promoting specialty crops were run across the state for 12 weeks, total number of spots 2,440 plus 2080 internet spots.	Awareness of farmers markets as food hubs that accept SNAP for specialty crops will increase from low to moderate or greater.	Evidence of increased knowledge can be seen in statewide specialty crop sales that increased from \$124,000 in 2014 to \$770,000 by the end of 2016.
4. 2,000 posters to promote the availability of SNAP for the purchase of specialty crops at farmers markets will be distributed each year.	5,000 posters were printed and delivered to market managers and their communities to promote the availability of SNAP for the purchase of specialty crops at farmers markets.	SNAP sales for specialty crops across all markets in the state will increase from low to moderate to moderate or greater.	Evidence of increased knowledge can be seen in statewide specialty crop sales that increased from \$124,000 in 2014 to \$770,000 by the end of 2016.
5. 3,000 refrigerator magnets to promote specialty crops available at farmers markets will be distributed each year.	Magnets were not created; the funds were used for other promotions.	Awareness about cooking techniques with specialty crops among target audience across the state will increase from low or moderate to moderate or greater.	Evidence of increased knowledge can be seen in statewide specialty crop sales that increased from \$124,000 in 2014 to \$770,000 by the end of 2016.
6. 300 farmers will see an increase in specialty crop sales based on their observations of an increase in customers, many of whom are using SNAP tokens.	86% of farmers (688) said they saw an increase in specialty crop sales based on their observations of	--	

	an increase in customers.		
7. 5,000 DVDs with cooking classes that feature specialty crops (detailed in Objective #1 COCINA classes) will be distributed across the state at farm stands, through farmers, through clinics, CHW, etc.	5,000 instructional DVDs that featured how to shop for and cook with specialty crops were distributed across the state. They were very popular!	--	

Lessons Learned

1. Community health workers, Head Start educators, and other public health educators desire nutrition education tools that promote specialty crops geared for their low-income clients, and they are eager to incorporate these materials into their daily clinical practices.
2. When creating nutrition education material and tools for health workers, it was important to start with asking this audience what they needed and desired in order to better promote specialty crops to their patients and clients.
3. New market customers can be created through the trusted relationships clients have with their health clinics, so educating this health workforce about the benefits of locally grown food, and how to teach their clients how to incorporate it into their diets, is an important strategy for growing the specialty crop customer base in New Mexico.
4. More resources are required to continue this important training and education of New Mexico's health workers. Relationships are key.
5. Nutrition incentives (such as the Double Up Food Bucks program) are important in reducing barriers for low-income shoppers to purchase more fruits and vegetables and to try new foods.
6. Farmers' market managers need funding to provide engaging activities to attract families and create multi-purpose market spaces that help their vendors sell more specialty crops.
7. In order to promote healthy eating behaviors of more fresh fruits and vegetables, particularly among low-income customers who experience multiple barriers in accessing fresh produce, regular funding resources are required to create multi-layered media exposure for potential market customers. Radio, posters, brochures, mobile messaging, and social media all play an important and connective role in creating awareness of the availability of local specialty crops, as well as how to prepare them.
8. Word-of-mouth is still one of the best ways to create new specialty crop customers at farmers' markets, but new customers must also be acquired through repeat messaging in a variety of channels.
9. Education, education, education is what is needed to create healthy eaters who desire and know what to do with specialty crops.

Contact Person

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Project 7: Taos Veterans Farmers Project

Project Summary

The Not Forgotten Outreach Farmers Project provides veterans and Gold Star Families, survivors of fallen Heroes', with horticulture therapy, business and agriculture education helping them become successful farmers. This creates potential new farmers who will grow specialty crops and gives veterans the tools to be farmers themselves and grow food on their own, and providing food security in the rural home towns. By involving the Taos community, government and non-governmental agencies and by utilizing training specifically designed for cognitively & physically injured Veterans to ensure the success of beginning Veteran farmers both in the short and the long-term.

This project is aimed to:

- Return uncultivated land, by means of MOU with elder land owners, into specialty crop production land
- Utilizing hoop houses and cold cloth to extend growing season of specialty crops
- Develop and teach curricula on basic gardening and horticultural practices for Veteran apprentices
- Inspire four or more veterans to look to farming as a viable means of income
- Formative Evaluation: This will focus on assessing the effectiveness of the educational methods, the program format, and whether the learning objectives have been met

Project Approach

The project is aimed to build on the success of the previous grant of developing and teaching curricula on basic gardening and horticultural practices for Veteran farmers for one year. Classes taught veteran farmers what to plant, how to market their products, and how to make money from farming. Through the collaboration with Taos County Economic Development Center (TCEDC), NFO has acquired 18'x40' greenhouse space at TCEDC. Daily 9-14, participants stop by one of the two farming locations of NFO and participate with experienced farmers creating a train-the-trainer atmosphere.

Veterans worked with local farmers and already experienced veteran farmers to learn how to grow various specialty crops, particularly garlic. They learned what to plant, when, how to grow it, how to market their products, and how to run a successful small farming business. These lessons have helped many local Veterans and their families learn how to reintegrate into society and give back to their community. Added to that, the increased horticultural therapy has helped many of the Veterans themselves. The activities have proven to be family and community building. The demand for these classes has grown and we have seen the Veterans that participated moving on to become successful business owners and farmers in Northern New Mexico.

While there have been small setbacks involving land and theft of produce, overall the project was a huge success in the community. For NFO now has the reputation around the Northern New Mexico region as the "go-to" farming organization.

Goals and Outcomes Achieved

Not Forgotten Outreach (NFO), is proud to report over \$3,000.00 in sales of specialty crops during the period of 21st April 2017 – 29th September 2017, all funds were reinvested into the Taos Veterans

Farming Project. NFO's Military Families, with over 80 community volunteers and two teams of eleven members of AmeriCorps NCCC helped the Taos Veterans' Farmers Project raise over 2,000 lbs. of garlic, fruit trees, fresh greens, onions, corn, squash and beans. Many of the 65 Military Families and most of the community volunteers had zero farming experience, but the desire and wiliness to learn.

NFO is pleased to report that due to the Taos Veterans' Project, a collaboration of three organizations have formed to help the Taos children not only eat healthier, but to also learn to grow their own food. This project's goal is to teach 7-14 year-old children from Non Violence Works and adult clients from Shadow Mountain Drug/Alcohol Recovery Ranch a variety of tasks in crop production and important aspects of nutrition and health.

The collaboration places Veterans in a mentor position, helping the Veterans reintegrate into society. The participants of the project created two new specialty crop ¼ acre plots area over the past year at the NFO Military Family Respite Center. Creating an opportunity for more new Veteran Beginning Farmers to experience the joys of farming.

The project has produced three Veterans that are now farming and earning income sales in the Taos area and empowered two other NM organizations to teach farming to Military Families. That is a 30% increase of County wide specialty crop sales. Due to the overwhelming amount of garlic being produced by the project, a new garlic drying shed was built to allow the garlic to hang and dry. This allows for sales and seed saving for the following year's crop.

NFO is pleased to announce that after three years of hard work, NMDA's New Mexico-- Taste of Tradition® label was combined with the Farmers Veterans Coalition farming label "HomeGrown by Heroes". This new label for New Mexico Veteran farmers provides an advantage in produce sales.

Lessons Learned

We learned much from the project in the last years:

- 300 lbs. of processed garlic stolen from drying racks.
- lack of value added garlic product's i.e. peeled and bagged garlic.

Solutions

- Install a pair of folding security gates, across garlic drying area. This will still allow for air circulation.
- Add a garlic peeling and bagging equipment into the program

Future Project Plans

- Apply for the BFRDP
- NFO Veteran Farming Project will continue to grow specialty crops, train Military Families, local school children in after-school and summer programs, along with the young men from Shadow Mountain Drug and Alcohol recovery in farming specialty crops.
- Exploring a partnership with Taos Ski Valley to provide fresh vegetables during the winter season.
- To become the largest garlic producer in Northern New Mexico.
- Complete the purchasing, from donations from foundations and not specialty crop funding, of 27.92 acres for the NFO Veteran Farming Project. This includes 24.842 acres of pasture land zoned R-A with 3 natural springs, 2.41 acres of land zoned R-14, and .728 acres of land that is perpetual easement with no water rights. The total land acreage to purchase amounts to 27.98

and the total water rights to purchase is 68.03 acre-feet per year.

Contact Person

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Project 8: Sustainable Native Plant Nurseries in Native Communities

Project Summary

We planned the creation of a native plant nursery, feeling that in this age of environmental awareness it would be a natural venue for Native enterprise. We were late in starting this project and a number of conditions changed that affected the original work planned and the budget. Therefore, some changes were needed to our goals. Our objective was to develop sustainable nurseries at two Pueblos and in Eastern Navajo that would provide local culturally appropriate jobs by growing native plants that can be sold locally and to larger nurseries in Albuquerque, Santa Fe, Farmington, etc. That significantly altered over the course of the project. We had more interest from local farmers in purchasing windbreak trees and from the Forest Service in purchasing native trees to be used in fire restoration than from nurseries.

Therefore, the Rio Puerco Alliance (RPA), a non-profit concerned with the welfare of present and future Rio Puerco watershed inhabitants, worked with community leaders in the Tri-chapter area of the Eastern Navajo Nation (Torreon, Counselor, and Ojo Encino Chapters) to set up the Tri-Chapter Tree Nursery on a two-acre plot on the edge of Torreon and Ojo Encino Chapters. We prepared the plot and began planting in spring 2016. As of fall 2017, we have begun growing and selling trees to local residents and farmers. We produced a catalog of the trees we are growing (see Appendix) and we have put a page on the RPA website (rpalliance.org) about this project. We have continuing interest from the community in the trees and the nursery.

We felt that opportunities like this project could provide for the development of direct employment and secondary jobs for area residents. We are still working to provide economic development in very poor areas in culturally appropriate ways.

Project Approach/Activities

2015

We had some difficulty in getting growers interested in this project. We had three---four growers at Torreon Chapter in the Tri---Chapter Area of Eastern Navajo. We contacted potential growers in Baca/Prewitt Chapter of Eastern Navajo, from Jemez Pueblo, and talked with Ramah and Zia Pueblos and Southwestern Indian Polytechnic Institute (SIPI), but no interest in the project was expressed. Therefore, while we had hoped to be planting in fall 2015, it had to wait until spring 2016.

We found the two-acre plot, but were not able to start working it until 2016. Over the winter, we contracted with a Master Gardener to work with our growers who then researched methods for planting cuttings, using the least amount of water possible. He planted seeds at his greenhouse, so that we might have cuttings to plant in the spring.

2016

In 2016, we determined infrastructure needs, and began constructing beds and shade structures at the site:

- Over the late winter and early spring, we grew selected seeds to seedlings.

- We constructed beds and shade structures at the Torreon site in the early spring. (See attached photos.)
- We planted seedlings and cuttings. Most germinated well, but because we did not plant until April, only some of the seedlings grew to a height of one foot. We built racks to hold tree pots.
- We had wood chips hauled to site for mulch. We also sifted some to make a richer planting soil. We applied the mulch and a mesh cover.
- We set up a drip irrigation system, on a timer, to make sure that the seeds and seedlings got adequate water, even if we could not be there. Using the timer also reduced water waste.
- We discovered that having the larger site actually saved money, as we were able to use just one pump and timer for the irrigation system.
- We planted seeds in the fall.
- We winterized the site around October. Irrigation valves were blown out and the shade structure rolled up. The trees were put into pots and seedlings were covered. We dug a trench for winter placement of the tree pots.
- We continued research, planning, pricing, ordering, and shopping for supplies.

It was hoped that this plot could be a test combining windbreak agroforestry with a functional nursery. They expect to transplant the trees and alley crops after one-year of in-ground growth. They believe that this will appeal to several different markets, such as farmers who want young windbreak trees, folks who are trying to restore their land with stabilizing plants, and other growers who would be interested in the alley crops.

2017

Our Master Gardener moved on to another project, and we hired his assistant as the Nursery Manager. He oversaw all activities in 2017.

We ran into a couple of problems, such as valves going out on the irrigation system and rabbits getting under the fencing and eating our plants! We planted seeds last fall. Most germinated well, but the spring was cold and it took longer for them to begin to grow:

- The seedlings and cuttings we had from last year are growing well. We transplanted many of them into pots:
 - Pea shrub: We have 9 gallon pots and 39 4" pots.
 - S. Sumac: We have 28 gallon pots and 40 4" pots.
 - Wolf Willow: We have 11 gallon pots and 57 4" pots.
 - Osage Orange: We have 6 gallon pots and 51 4" pots.
 - Rocky Mt Mulberry: We have 12 gallon pots and 9 4" pots.
 - Goji Berry: We have 50 4" pots.
- We had set up a drip irrigation system, on a timer, to make sure that the seeds and seedlings got adequate water. Earlier in the summer, the valves broke, and we had to get new ones. Also it was very warm during the summer, so the growers had to go out every other day to water the potted trees and shrubs.
- We completed a catalog so that we could start selling the potted plants. We have been getting a lot of inquiries from the locals, especially farmers who want windbreaks.
- We determined, through research, that we should sell the 4" pots for \$5 and the gallon pots for \$10. The Tri-Community Farmers Market let us sell the pots at their selling locations in addition to selling from the nursery site.
- We completed the new RPA website, with a page on the Tree Nursery.

- We researched other supplies and tools that we needed, such as a small greenhouse to start seedlings, as we had used the Master Gardner's greenhouse before, but he has moved. We purchased needed supplies.
- We had more wood chips delivered.
- We began exploring taking cuttings from our previous riparian projects to grow further cottonwoods and willows for future projects.
- The nursery has been winterized.

Goals and Outcomes Achieved

This project was intended to provide economic development in very poor areas in culturally appropriate ways, allowing local communities to alleviate unemployment while following local traditions. We have succeeded in this, but on a smaller scale than originally planned. Whether the nursery is able to continue will depend on whether we can get further funding. There is certainly interest in the community.

Because of the delay in receiving funding (we originally applied for the 2013 season, but did not receive funding until the 2014 season), several of our partners had moved on. We were able to get a large area (two acres) to grow trees in Torreon, so we concentrated on the Tri-Chapter Area of Ojo Encino, Torreon, and Counselor. We built the shade structures, raised beds, put in an irrigation system, and began planting seeds and seedlings. We grew trees that were eventually transplanted to one-gallon pots and those were sold at the Tri-Community Farmer's Market to local farmers (as wind breaks for their fields) and residents. There was significant interest in the trees. Many people were asking about them and when certain species would be ready to pot and be sold. We created a catalog of available trees and placed that on RPA's re-constructed website. We need more publicity, however, to reach a large audience. There is definitely the potential for a successful business enterprise here, if we can secure funding to continue the market (and expand the number of growers we are working with) until sales can keep the market sustainable. The goal would be to create our own nursery, like the Santa Ana Native Nursery but that will take a few years to grow enough. There is definitely a market for Native trees for restoration and wind breaks.

Beneficiaries

The primary beneficiaries of the project were the 3-4 growers from the Tri-Chapter area of Eastern Navajo. The secondary beneficiaries were those that purchased the trees for wind break or restoration such as area farmers and the U.S. Forest Service. Other residents and Tri-Community Farmer's Market shoppers also benefited from the project.

Lessons Learned

We originally conceived of this project in 2013 and had buy-in from several pueblos as well as Eastern Navajo. However, by the time the project could be implemented in 2014, we discovered that things had changed and some of our former partners had moved on. We tried to interest a number of other pueblos and Navajo Chapters, but were unable to do so. This delayed the start of the project, and required significant alteration in the parameters of the project and the budget.

Even though RPA has worked in the Tri-chapter area for over 12 years, we forgot how long it can take to get things going there! Therefore, RPA is pleased that we have gotten as far as we have and that there is continued interest in the nursery in the Tri-chapter area. Now, all we need is continued funding.

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Appendix for 14-SCBGP-NM-035

Project 3: Conducting Promotional Activities of New Mexico Specialty Crops throughout the Food and Beverage Industry



Picture 1: Special Event in Washington D.C. organized with the NMSU Alumni Association featuring New Mexico green chile and a chile roasting event for Washington locals. All of these dishes were traditional New Mexican dishes made with fresh NM products.



Picture 2: Event organizers and participants at the Washington D.C. event, including Mr. Dennis Hogan, Mr. David Lucero, and Secretary of Agriculture for New Mexico Mr. Jeff Witte.



Picture 3: Los Chileros de Nuevo Mexico displaying at and participating in the Fancy Foods Show this year.



Picture 4: El Pinto displaying at and participating in the Expo West Trade Show.



Picture 5: Bueno Chile display at the Pizza Expo in Las Vegas, Nevada.



Picture 6: Lowes Market produce display during the SNAP Double Up Food Bucks event at Lowe's Market this year.



Picture 7: Young Guns Produce displaying at the National Restaurant Association Trade Show.



Pictures 8 and 9: Mizkan displaying and participating in the Institute of Food Technologist trade show.



Picture 10: New Mexico Wine display in a local grocery store in New Mexico.



Picture 11: Hatch Green Wine and Red Chile Wine display at Gelson's Market.



Picture 12: Display for the SNAP Double Up Food Bucks events at Lowe's stores in Albuquerque and Santa Fe, New Mexico.



Picture 13: Display of New Mexico specialty food products at an Albertson's store.



Picture 14: Display of New Mexico specialty crop product, Tamaya Blue, at the Chef's Taste Challenge in New Orleans, Louisiana.



Picture 15: Green chile in use at the Chef's Taste Challenge in New Orleans, Louisiana.



Picture 16: Samples with New Mexico specialty crop products at the Expo East Tradeshow.



Picture 17: Legacy Pecan display at the Expo East Tradeshow.



Picture 18: Pecan pie empanada samples at the International Baking Ingredient Expo, made with New Mexico grown pecans.



Picture 19: Mr. Dennis Hogan during the Multi Unit Food Service Operator's Trade Show. He attended with New Mexico specialty crops companies to help with the show and networking.



Picture 20: The Bueno Chile Booth composite poster for the Fancy Foods Show.

Project 4: Promoting New Mexico Onions and other Specialty Crops at the Produce Marketing Association (PMA) Fresh Summit





Pictures 1-4: Pictures from PMA Anaheim show in Anaheim, California.



Pictures 5 and 6: Shots taken from this year's Produce Marketing Association Show in New Orleans, Louisiana.



Project 5: Exploring New Strategies in Green Chile Market Development and Promotion



Picture 1: Green Chile Roasting workshop in Pittsburgh for promotional activities that took place in 2015.



Picture 2: Promotional table with roaster set up in the background for a green chile roasting workshop and event in Columbus, Ohio in 2015.



Picture 3: Another green chile roasting workshop in Cleveland in 2015.



Picture 4: Giant Eagle New Mexico Hatch Green Chile merchandising display from a store in the D.C. area.