

Exploring Edible Cactus Production as a New Specialty Crop in the Midwest

Final report for FNC13-906

Project Type: Farmer/Rancher

Funds awarded in 2013: \$12,848.00

Projected End Date: 12/31/2015

Grant Recipient: Cultivate Kansas City

Region: North Central

State: Kansas

Project Coordinator:

[Katherine Kelly](#)

Two Birds Farm

Co-Coordinators:

[Alicia Ellingsworth](#)

CultivateKC

Project Information

Description of operation:

This project took place at three different operations: 1) Gibbs Road Farm, a 2-acre certified organic vegetable farm with a 6,000 sf greenhouse which was used to grow the cacti in pots, 2) Juniper Gardens Training Farm, an 8-acre farm business incubator/ training farm where the cactus were grown in the ground inside a greenhouse/ high tunnel and outside, and 3) Nopalitos Urban Farm, a start-up farm with about 1/8 acre in production plus an NRCS high tunnel where the cactus were grown. All three operations use organic/ sustainable practices, only Gibbs Road is certified.

Summary:

FINAL REPORT

Abstract: Three urban farmers grew nopales (edible cactus) to determine their viability as a crop for urban food production and sales. The cacti were grown in the ground and in pots; outside and in a greenhouse and high tunnel. Three varieties were trialed, taste tests were held. After two years of production, the conclusion was that, for now, nopales are suitable for home-scale production in the Kansas City area, but not for commercial production because of the challenges of our midwestern weather extremes, where winter freezes set back the plants to the degree that pad production never hits a high enough level to justify the space the plants require.

PROJECT SUMMARY

1. A. Problem addressed: Local interest in fresh nopales (edible cacti) pads and fruit for eating/ juicing; abundance of urban lots with poor quality soil; increasing temperatures and less reliable rains.
B. Solution pursued: Testing varieties and production methods for growing nopales locally; testing market interest.
2. A. Project's research approach: We grew 3 varieties of cacti (opuntia compressa- East Coast, opuntia gilvescens-OK Pancake, opuntia ficus indica-Mexican) in the field, in the ground in a greenhouse/ high tunnel, in the ground in an unheated high tunnel, and in a greenhouse in pots. We got an extension on our grant because because the growth rate was so slow and over the winter of 2014 significant winter freezes and sustained low temperatures killed off all the Ficus Indica-Mexican plants at Nopalitos Urban Farm and at Juniper Gardens Training Farm in spite of hay and straw mulches.
B. Project's educational approach: As the project developed, we shared the learning via Face Book and farmer-to-farmer interactions, and through farm tours that reached more than 700 people. We held one "Tasting Session" that was attended by the farmers and by consumers where we compared varieties against each other and against store-bought cactus pads.
C. Farmer learning outcomes:
 - The three varieties performed very differently, the Ficus Indica- Mexican plants succumbed to winter freezes. We came to agree with conventional wisdom that it was due to their upright growth habit. Because of this habit, Ficus Indica plants were exposed on all sides to the environment with very little of the ground warmth supporting them from below. The other two varieties, Compressa and OK Pancake grow on and along the ground and we found were less affected by cold temperatures. They also died back, but did not fall over. They remained intact and alive. Our analysis was that the high tunnels, the additional poly low tunnels within them and the mulch increased humidity levels and made all varieties more susceptible to freezing. The hardier varieties- Compressa and OK Pancake- were able to survive nonetheless except for plants that were exposed to the highest levels of humidity where low tunnels were employed within the the high tunnels. In the years since the project, the two hardier varieties have continued to grow; they have become more stable and established, at Juniper both inside the high tunnel and in the field.
 - The plants tend to die back in the winter, which means that they are often regrowing from the main pad, or second generation pads and consequently new pad production is very slow, which makes them difficult to consider an economically viable crop given the amount of space each plant takes up. They are very low labor, but very difficult to keep weeded! Gerardo Martinez, Nopalito Urban Farm, has continued to grow and harvest the pads just for his own household because the supply from his 20+ plants is about right for one family.
 - Timing on harvest was something we didn't understand when we first harvested them. (The planned consulting by Dr. Rigoberto at Monterrey Nuevo Leon Mexico University didn't happen, and, because of a new position that Gerardo took he wasn't able to consult as extensively with other Mexican growers as he had hoped, so we were really doing trial and error.) We waited until the pads were big and thick, not realizing that this meant that they would also be extremely tough! We learned that the ideal time was when the pads were thin, brighter green, and before significant thorns have grown, so a sort of "juvenile" stage of pad development.
 - Of the white Americans who tried the cacti at our tasting, the predominant response was "mmm, slimy" in response to the mucilaginous quality, even after

grilling, that the pads have. The Mexican attendees universally liked the grocery-store purchased pads (which were harvested at the right stage!), but ours were almost all too tough to enjoy. The taste was also better on the purchased nopales, presumably because of the stage they were harvested at. -Originally, Gerardo had planned on buying a machine that would clean the cacti of their thorns, but, given the relative paucity of harvestable product, it didn't make sense to spend so much money; instead we relied on hand clean-up using knives.

3. Statement of research conclusions: After two years of production, the conclusion was that, for now, nopales are suitable for home-scale production in the Kansas City area, but not for commercial production because of the challenges of our midwestern weather extremes, where winter freezes set back the plants to the degree that pad production never hits a high enough level to justify the space the plants require.
4. Farmer adoption actions: Because of the luke-warm results, no farmers adopted cactus growing, however, several home scale gardeners did through personal networks, sourcing pads and knowledge in particular from Gerardo Martinez.

INTERIM REPORT

[Editor's Note: To see the accompanying photos, open the PDF version of this report.]

WORK ACTIVITIES

According to plan, we visited with regional expert, Kelly Grummons, of Timberline Nursery in Arvada, Colorado. We gathered much information and learned his growing methods and plans for further experimentation. From Mr. Grummons' recommendations we gathered three pad specimens: *Opuntia ficus-indica* because of its large pads and upright growth patterns; *Opuntia compressa* for its native region of cooler and more humid eastern North America; and finally, *Opuntia gilvescens* 'Oklahoma Pancake' for its high production and yellow fruit. [Editor's Note: Common names for these cacti include nopales, prickly-pear, pancake cactus, and paddle cactus.]

Upon returning to Kansas City, we hardened-off the pads in greenhouse shade at Gibbs Road Farm. After a month, we placed the pads onto flats of Gibbs Road Farm soil mix. (See Photo 1) The pads in flats were distributed to the other two farms: Juniper Gardens Training Farm and Nopalitos Urban Farm.

From there, each farmer is caring for the nopales according to Mr. Grummons' recommendations. We maintained telephone contact with each other, photographed progress, and recorded monthly changes.

RESULTS

From the start, the *O. ficus-indica* performed very well putting on new pads and some fruit by July 2013. (See Photo 2) Growth of these pads continued through the summer and fall. Each original pad produced approximately five new pads. (See Photo 3) The *O. compressa* showed little change throughout this time period. The 'Oklahoma Pancake' produced more slowly with some pads putting on fruit and some pads producing second generation pads.

In August, at Gibbs Road Farm, the pads were transplanted into pots of soil mix,

compost, wood chips and pea gravel in equal amounts. (See Photo 4) The pads were transplanted from the transition flats to in-ground plots at Juniper Gardens and Nopalitos Farm. At Juniper Gardens half the pads were planted in a high tunnel, and half in a field plot. At Nopalitos all were planted in a high tunnel. At Nopalitos some pads that had not rooted in the transition flats were planted upright. Watering continued. Growth continued.

We stopped watering the nopales in October according to Mr. Grummons' recommendation. *O. ficus-indica* continued to grow putting on more pads. Some of the pads grew to ten inches in length. Some second generation pads began to produce new pads. (See Photo 5)

The original pads continued to look healthy through cooler temperatures in October, November, and December. The low temperature for those months inside the unheated greenhouse was 9 degrees in late December. Low tunnels were installed at Juniper Gardens for the field plot and in the high tunnel. Nopalitos were left as is in the high tunnel. At Juniper, we believe condensation in the double tunnel due to humidity and fluctuation of the temperatures over the course of the winter affected overall plant health. The same degradation of *O. ficus-indica* was observed to a greater extent.

In January at Gibbs Farm, the temperature dropped to a sustained 9 degrees for approximately two weeks. Heat was turned on inside the greenhouse in mid-January and humidity increased. No watering was done. The *O. ficus-indica* began showing signs of decay. No change was noticed in the *O. compressa* and 'Oklahoma Pancake.' No growth occurred during this time.

During February, the greenhouse at Gibbs Farm was kept at a nighttime temperature of 40 degrees. *O. ficus-indica* continued to decay, no change in *O. Compressa* and 'Oklahoma Pancake.' In March, the nighttime temperature was maintained at 50 degrees. No change in pads in the greenhouse. Pads at Nopalito in the high tunnel and at Juniper in the field plot remained dormant until March. *O. compressa* and *O. gilvescens* showed signs of greening in February at Juniper in the double tunnel.

At Gibbs Farm, watering the pads began again in April. Before watering, *O. compressa* started to put on pads. OK Pancake followed with pads. *O. ficus-indica* continued to decay. Interesting enough, the *O. ficus-indica* that were not transplanted into pots decayed less quickly than ones that were in the pot and soil mix. At Juniper the low tunnel covers were removed in March. It was observed that *O. ficus-indica* was a 100% crop failure.

In summary, we learned much from the Nopales project last year. We were a bit optimistic that we could get new and unfamiliar plant materials established on 3 farms in time to harvest and do the tastings and market testing we set out to do. Because of soil amending and the "new crop" learning curve, we got a late start getting the plants established at each of the farms. Learning from the first season and having already established plant material we will be able to be more aggressive with the other parts of the project in 2014. We expect to have a healthy harvest in 2014 to fully test the market.

WORK PLAN FOR 2014

Our goal is to accomplish all of the tasks set forth in 2013 that we did not complete during 2014. And to have even more accurate data we will be requesting to extend our grant through December of 2015. This gives the project two full growing seasons to fully test the varieties and educate, test, and grow the market. We would like to shift the first year expenditures in the marketing categories to the current year, 2014. There are some design tweaks we would like to make to the low tunnels to make it easier to access the plants for maintenance and monitoring during the winter.

Gibbs Road Farm

Learning from our first year, we plan to change two things:

1. We will harvest all new growth of pads and fruit in May for sale to local restaurants.
2. We will harvest the new generation *O. ficus-indica* pads in mid-October and store them in a dry, dark, cool place to be used as new 'mother' plants in 2015. In this way, the *O. ficus-indica* will be treated as an annual that produces once and produces its start for the next year.

Juniper

1. Adjust low tunnel design to allow for easier venting in the low tunnel to lessen humidity build up.
2. Same adjustments as Gibbs.

Nopalitos

1. Plant the pad on end rather than flat on the ground. Establishing the transplanted pads was faster when planted this way at this site. Another detail to observe.
2. Same Adjustments as Gibbs.

OUTREACH

We shared the nopales project with visitors who came through the farm on the Urban Grown Farm Tour 2013 (attendance at Gibbs Road 200 people), visitors throughout the year to the farm (approximately 1500) and through Facebook site: Nopales Kansas City. Juniper training farm hosts tours and has 17 farmers in training on site who are able to observe and learn as the project progresses.

Depending on harvest, Gibbs Farm hopes to take nopales to the Brookside Farmers Market this year or next, to provide recipes from local chefs and to do a tasting event to close the grant. The Nopales project is part of the apprenticeship program at Gibbs Road Farm. The Growing Growers apprentices participate in the growing and care of the plants. Juniper will be experimenting with marketing to their CSA

customers and at the Kansas City Green Market where the farmers in training sell their produce. Nopalito is planning on focusing on developing the local ethnic market emphasizing the benefits of having a local source for nopales (edible cactus), a staple in the community's diet.

Recipes and other resource information is being researched and developed to support the marketing outreach. Recipes and one-to-one conversations at markets and with chefs and other customers are effective ways to give consumers confidence to try a new and fresher product. We will also be reporting our findings and progress in the Cultivate KC newsletter.

Juniper High Tunnel

Juniper Ground Plot

- [2013 Progress Report, Alicia Ellingsworth, FNC13-906](#)

Project Objectives:

The proposal format from 2013 did not include formally presented Project Objectives, however, here are objectives implicit in the proposal:

- Trial 2-3 varieties of edible cactus
- Track production, weather, and overall growth
- Test market locally-grown nopales in Kansas City's Latino communities; test market with white customers and chefs
- Share project results with other farmers

We trialed 3 varieties, tracked growing conditions, growth rates, and production practices such as soil amendments, mulching, etc.

Because we never got sufficient production, we did not sell any of the cactus pads at market, nor did we develop marketing materials and we only did one taste-test/focus group.

We disseminated project results with other farmers informally, we did not present a workshop or poster as planned, because the results were not encouraging for commercial urban farmers. We did educate consumers who toured the farms, as well as visiting farmers and extension agents, about the project, with an estimated 700 people reached.

Research

Materials and methods:

We identified an opportunity while looking at yet another vacant urban lot with low organic matter and a fair amount of gravel, the question that occurred to us was "What the heck would be happy growing here?" and the idea of edible cactus emerged. We approached a farmer/ food leader, Gerardo Martinez, with this idea, and he responded enthusiastically; his family both juice and cook with nopales and

had a long-standing interest in them, he has a high tunnel that he wanted to use differently, and so we began a conversation.

The other factor driving our interest was the recent droughts we had experienced, making us begin to pay closer attention to the climate change predictions for our region; we were already aware that we had changed growing zones and that southern pests and weather patterns were shifting northward.

One of our staff had a connection with a cactus expert in Colorado, Kelly Grummons at Timberline Gardens, Gerardo had already connected with another nopales expert, Dr. Rigoberto at Monterrey Nuevo Leon Mexico University, and with their help we fleshed out the proposal.

We set up simple tracking forms, and put one person in charge of reminding the farmers to do data collection and to write their observations down. Getting farmers to step out of their regular routines and shift gears into research was definitely a challenge. We also had challenges following protocol, for example, making hot beds using horse manure didn't happen because at the end of the season, there simply wasn't time to track down and pick up horse manure.

The biggest challenge was ongoing communication and follow-through, given varied time and attention stresses on the part of the farmers, so developing a plan, setting a schedule, and assigning someone to "farmer-herding" was important.

Research results and discussion:

Impacts

In growing cactus, the practices we would recommend include: Plant the pads upright on the ground rather than flat for fastest growth. Grow Ficus Indica (the upright variety) as an annual, rather than as a perennial by harvesting pads in the fall and planting in the spring. Harvest the pads earlier for taste and texture quality.

The results were measured in terms of pad production by variety, taste, and consumer response.

Accomplishments

We learned that cactus that sprawl along the ground do better than upright varieties, we learned that pad production given our highly variable weather was slow and arguably not commercially viable, we learned that timing on harvest was extremely important.

Participation Summary

3 Farmers participating in research

Educational & Outreach Activities

1 On-farm demonstrations

1 Published press articles, newsletters

5 Tours

PARTICIPATION SUMMARY:

42 Farmers

3 Ag professionals participated

Education/outreach description:

We held a number of tours that included the cactus research, we also, because of the locations of the research project, exposed approximately 42 farmers to the process at the Gibbs Road Farm Community Greenhouse (where 22 farmers rent bench space), plus 20 participants in our Juniper Gardens Training Farm. At both sites, the Farm Manager and the Site Manager (who led on the project at Juniper), talked to the other farmers about the project and showed them the growing systems. We also had tours, including our Urban Grown Farms & Gardens Tour that had approximately 700 people visit the two sites where they learned about the nopales project.

We did not get media coverage for the project.

Learning Outcomes

3 Farmers reported changes in knowledge, attitudes, skills and/or awareness as a result of their participation

Lessons Learned:

We've addressed the key lessons learned above.

We somewhat addressed the "barrier" in finding that particular varieties of cactus can be successfully grown and harvested, but we learned from a farm sustainability perspective that it probably, at this point in climate change, isn't a financially viable crop.

In making recommendations to other farmers, we would share that perspective, with the additional comment that if a farmer has sufficient land, the economics of it might change, since, as urban growers, land is at more of a premium than land for rural farmers.

Project Outcomes

2 Farmers changed or adopted a practice

Information Products

- [Growing Edible Cactus in Kansas with Katherine Kelly](#) (Multimedia)

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