The Julian Samora Research Institute
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Urban Agriculture in Spanish: A Way to Increase Urban Hispanic Residents' Knowledge in Food Production

German Cutz
Ana Legrand

RESEARCH REPORT NO. 57

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ABSTRACT

From November 2013 to November 2014 UConn Extension in collaboration with Candlelight Farms in New Milford, Connecticut implemented a year-round urban agriculture program in Spanish. Fifteen urban, Hispanic immigrant residents from Danbury, Connecticut started, and 11 finished the year-round training. Most participants were adults between 30 and 45 years of age. The urban agriculture program included three components: classroom instruction, hands-on vegetable production, and entrepreneurship. Classroom instruction as well as field activities were delivered in Spanish. Three modules from the Connecticut's Master Gardeners curriculum were translated into Spanish. Participants completed botany, entomology, and vegetable production. To measure knowledge gain, participants were administered pre and post-tests at the beginning and end of each module. Average knowledge gain from each module was as follows: botany 72.4%, vegetable production 70.1%, and entomology 69.6%. In addition, participants were given a cumulative final exam, where 10 out of 11 scored 70% or higher. The urban agriculture program showed the need to develop and deliver Extension programming in Spanish to help Hispanics understand the importance of agriculture literacy in urban cities.

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Introduction

In the United States, urban agriculture has become an important source of locally produced fresh food and it often complements rural and foreign food supply to urban cities. Due to farmland access in urban cities, urban agriculture usually involves small scale operations compared to traditional (rural) agriculture. Urban agriculture includes both urban and peri-urban agriculture (Oberholtzer et.al., 2014; Hoornweg & Munro-Faure, 2008). While urban agriculture takes place within the cities, peri-urban agriculture happens on the fringe area or suburbs (Oberholtzer et.al., 2014; Bailkey & Nasr, 2000 in Raes et. al. 2013; Hoornweg & Munro-Faure, 2008), and in many cases, it may resemble rural agriculture in terms of activities and size of farms. Peri-urban agriculture has been defined as: "farming areas that produce cereals, vegetables and root crops, grazing land for goats, and sheep, dairy farms, and intensive livestock production units" (FAO 2014).

Although no globally accepted definition of agriculture exists to date, one that seems to capture both urban and peri-urban activities may be as follows: Urban agriculture occurs within or on the fringe of a town, city, or metropolis and involves growing and raising (production), processing and distributing food and non-food plant (ornamental flowers, trees and fertilizer) and animal products using urban residents' labor, land, water resources, and services found within and around urban areas (Oberholtzer et.al., 2014; Coleman-Jensen, et.al., 2013; Hodgson, 2012; Hoornweg and Munro-Faure 2008).

Urban agriculture may include community gardens, front and backyard gardens, community supported agriculture (CSA) or farmers markets (Golden, 2013; Blaine et.al., 2010). However, one distinctive characteristic of urban agriculture is that production should be more than just for home consumption or educational purposes (Coleman-Jensen, et.al., 2013; Golden, 2013). Therefore, urban agriculture is not only the production, but also processing and distribution of food and non-food (ornamentals or trees) products.

A study from the United States Department of Agriculture (USDA), reported that 14.5% or about 52 million people in the United States were food insecure (Coleman-Jensen, et. al., 2013). One way urban cities are supplying food deserts with fresh, healthy and affordable food and reducing food insecurity is through urban agriculture. However, urban agriculture faces challenges in areas such as access to farmland, capital or credit, zoning, building codes, city plans, lack of municipal support for composting, environmental contamination, and limited access to water (Shaw, et.al., 2015; Oberholtzer et.al., 2014). Furthermore, one aspect that negatively impacts the environment and the way urban agriculture is practiced is the significant knowledge gap urban farmers have (Oberholtzer et.al., 2014; Golden, 2013), especially when it comes to engaging minority populations such as Hispanics (Baker & Chappelle, 2012). Agriculture literacy (knowledge about agriculture) is important to the future of agriculture (Luckey, et.al., 2013), especially among urban residents who are almost completely detached from agriculture in their daily lives.

The principal objective of this study was to measure how much knowledge urban Hispanic adults from Connecticut would gain by participating in a year-round urban agriculture program taught in Spanish.

Description of the Program

The UConn Extension Urban Agriculture Program was developed because two events occurred almost simultaneously: 1) a conversation with a group of Hispanic adults about the need of producing food locally while at the same time generating extra income and 2) an invitation to UConn Extension by a local farmer from New Milford, CT to use ½ acre of his farm to teach agriculture. However, after a nationwide search for an urban agriculture curriculum and a review of UConn Extension teaching materials available in Spanish, it was determined that neither curriculum nor teaching materials were available. Therefore, the curriculum in Spanish was developed and relevant teaching materials were translated into Spanish.

The urban agriculture program went from November 2013 to November 2014. Its main purpose was to train urban adult residents to locally produce organic fresh food to supply food desert areas in Connecticut. Food deserts, defined as areas where fresh fruit, vegetables, and other healthful whole foods are scarce or very limited, are commonly found in urban and low-income neighborhoods (USDA, n.d.). The registration fee was $200 plus $100 for farm materials and supplies.

The urban agriculture's three components: classroom instruction, vegetable production and entrepreneurship were organized in a way that classroom instruction lasted one year, while vegetable production and entrepreneurship were scheduled based on the production season. Vegetable production went from April to October and entrepreneurship started at the end of June and finished at the end of October, 2014. After checking program participants' availability, it was decided that classes would start in the fall, when most participants reduced their work hours, and in the evening from 7:00 to 10:00 p.m.

CLASSROOM INSTRUCTION

Classroom instruction focused on four modules: Botany, Entomology, Vegetable Production, and Integrated Pest Management (IPM). Each module lasted 30-40 hours for a total of 150 hours of instruction. In addition, there were three short workshops (2-3 hours each) about farm risk management, business planning and entrepreneurship, and family nutrition. All modules had supplemental field activities. For example, when the entomology module was taught, participants had field activities including: insect identification and classification. All field activities used the UConn Extension urban farm in New Milford.

VEGETABLE PRODUCTION

Vegetable production was a hands-on experience, where participants applied their newly acquired knowledge on organic vegetable production, including herbs. Participants were responsible for all farming activities from beginning to end of the season, including: preparing and maintaining the farm, building in-ground beds, planning and selecting vegetables they wanted to grow, monitoring insects and diseases, planting and transplanting, using low-risk IPM methods, and harvesting produce. Vegetables selected included: beets, carrots, cabbages, eggplants, radishes, zucchini, lettuce, tomatoes; and culinary herbs including: cilantro, dill, and basil.

ENTREPRENEURSHIP

To make the entrepreneurial experience as real as possible, the group of participants was enrolled in the Danbury Farmer's Market program. This was possible by coordinating efforts with the Connecticut Department of Agriculture (CT DoAG) and the City Center Danbury Farmer's Market Program. CT DoAG through its Farmer's Market Nutrition Programs (FMNP) visited the farm in New Milford and certified the group as food vendors. As such, they were enrolled in the Danbury Farmer's Market Program. As farmer's market vendors, participants sold their produce and received cash or vouchers distributed to FMNP's eligible participants. Danbury Farmer's Market took place every Friday from June to October, 2014.

Group Characteristics

Most, if not all, participants worked fulltime and not necessarily in Danbury. Of the 15 who began the program, 11 completed it. This report is based on the 11 participants who finished the year-round training. All participants were from Danbury, Connecticut, and all were immigrants to this country. Table 1 presents the age distribution for participants.

Table 1. Urban agriculture program participants by age

Age group	Participants	
	#	%
30-35	4	36%
36-40	1	9%
41-45	5	46%
46-50	1	9%
Totals	11	100%

Participants' ages ranged from 30 to 50 years, but most participants (91%) were in the range of 30-45 years old. Within that range, the group of 41-45 years old (46%) and the 30-35 years old represented 82% of all participants. Table 2 presents the gender and marital status of participants.

Table 2. Urban agriculture participants by gender and marital status

Gender			Marital Status		
	#	%		#	%
Male	6	55%	Married	9	82%
Female	5	45%	Single	2	18%
Totals	11	100%		11	100%

There were slightly more men (55%) than women (45%) in the group and most participants were married (82%). When looking at gender distribution by numbers the group was almost even, with men exceeding the number of women by one. Table 3 presents the occupational distribution of the participants.

Table 3. Urban agriculture participants by occupation

Occupation	#	%
Business manager	2	18%
Services (cleaning, painting, building maintenance, pool maintenance, party and decoration services)	5	46%
Factory worker	1	9%
Homemaker	1	9%
Construction	2	18%
Total	11	100%

None of the participants were working in agriculture or related field. Their three main occupation categories were services (53%), business management (18%), and construction (18%) jobs. Table 4 presents the educational levels of the participants.

Table 4. Urban agriculture participants by level of formal education

Level of Education	#	%
Finished primary school	1	9%
Unfinished high school	5	46%
Finished high school	2	18%
Some college	3	27%
Total	11	100%

Most participants had completed primary education, but not high school (46%). Only 18% of them had completed high school and 27% had taken some college classes.

Urban Agriculture Process

Implementation of the year-round training program in urban agriculture, involved, among many other activities, three main processes: participant recruitment, program delivery, and the customization of the curriculum.

RECRUITMENT

The recruitment of urban agriculture program's participants took several approaches and months of preparation. It involved a series of information meetings, site visits, and registration meetings. There were information meetings from August to October, 2013. In addition, bilingual flyers were developed and distributed through different outlets including: local public library, local restaurants, laundromats, personal contacts, e-mails, and local newspapers in Spanish.

The recruitment process went from creating a list of interested people to potential participants to enrolled participants. First, a list of interested people was created. This list included names and contact information for more than 30 people who attended information meetings. Then, after contacting these interested people to invite them to come to register for the program, the list was shortened to 23 potential participants. These were people who had indicated their willingness and commitment to enroll in the program. Finally, when registration was open (September, 2013), the list of potential participants became the list of enrolled

participants. The first urban agriculture program in 2013 started with 15 and ended up with 11 Hispanic adults.

PROGRAM DELIVERY

Consistent with recommendations from previous studies (Bauske et.al., 2013; Baker & Chappelle, 2012; Aubrecht & Eames-Sheavly, 2012; Bauske, et.al., 2008; Martinez-Espinoza & Chance, 2003) the UConn Extension Urban Agriculture Program was taught in Spanish. It was taught by two UConn bilingual (English/Spanish) faculty. Three of four modules were pre and post-tested: botany, vegetable production, and entomology. Each test took one to one and a half hours to complete. Each required short and/or extended answers. Each test was graded based on a scale from 0 to 100 points. Classroom instruction combined PowerPoint presentations, group activities, participatory activities such as group discussions, small group assignments, and individual classroom presentations. Classes were scheduled once a week from 7:00 p.m. to 10:00 p.m. They were based on modules, which were arranged in a way that when production season started, participants would have the basic knowledge of botany and vegetable production. At the first class, participants were handed out a reading packet, which was the base of each module. Handouts came from sections of the Connecticut Master Gardener's curriculum, which were translated into Spanish. Additional content for each module came from various sources but to ensure reliability of sources, websites from higher education institutions from United States, Mexico and Spain were searched. However, none of these materials were printed or distributed to participants; they were used to supplement teaching materials.

At the beginning of each module, participants were administered a pre-test. The same day, a reading packet in Spanish (a translation from Master Gardeners' curriculum) was also handed out to each participant. Most participants took the pre and post-test at the same time and date. However, when a participant was not able to take either test, arrangements were made to ensure that both tests were completed. Post-tests were announced at least three weeks in advance.

To formalize the delivery of the program, participants were told that there were certain requirements they would need to fulfill: 1) participants would need to pass all modules with grades 70% or higher, 2) those participants who passed all modules and finished the year-round program would receive a certificate of completion, 3) participants would need to attend at least 80% of classes, 5) they would volunteer 60 or more hours of fieldwork (producing vegetables) and at least 20 hours selling vegetables.

URBAN AGRICULTURE'S CURRICULUM

Each module followed the content translated from the UConn Master Gardeners' curriculum. Botany included: classification of the plant kingdom, nomenclature – plant names, binomial nomenclature, the higher plants, parts of a plant, stems, modified stems, life cycles of higher plants, etc. Vegetable production included: choosing a garden site, garden plans, soil preparation, seeding and planting, insects and diseases and other pests, notes for individual crops such as tomatoes, cabbages, radishes, beets, carrots, cucumbers, peppers, spinach, peas, eggplants, and onions. All these vegetables were grown as part of their fieldwork. Entomology included: introduction to insects, growth and development, classification and identification of insects, benefits from insects, and insect injury to plants, etc.

Knowledge Gains

The principal objective of this study was to measure how much knowledge a small sample of urban Hispanic adults from Connecticut would gain by participating in a year-round urban agriculture program taught in Spanish. Table 5 presents test results for the cohort.

Table 5. Urban Agriculture Pre and Post Test Results by Module

	Botany		Vegetable Production		Entomology	
Participant	Pre-Test %	Post-test %	Pre-Test %	Post-test %	Pre-Test %	Post-test %
1.	7	98	19	97	0	79
2.	0	78	12	91	0	76
3.	14	78	20	90	0	73
4.	7	85	17	83	6	79
5.	14	64	10	70	9	59
6.	14	77	17	80	27	79
7.	0	73	14	83	0	79
8.	7	80	11	94	4	79
9.	0	77	13	70	7	76
10.	0	71	12	83	0	72
11.	7	86	16	91	4	72
Mean (x)	6.4	78.8	14.6	84.7	5.2	74.8
(SD)	5.8	8.8	3.4	9.0	7.9	6.0
Hypothesized mean difference	0		0		0	
df	10		10		10	
t Stat	-22.54		-28.30		-23.42	
p(T<=t) one tail	3.32602E-10		3.53191E-11		2.28206E-10	
t Critical one-tail	1.81		1.81		1.81	
P(T<=t) two tail	6.65205E-10		7.06381E-11		4.56412E-10	
t Critical two-tail	2.23		2.23		2.23	

Descriptive statistical analyses (mean, standard deviation, range, etc.) were used to measure knowledge gain. Gain was determined by the difference between the mean (*x*) of pre-test and post-test scores. All participants who completed a year-round urban agriculture program increased their knowledge in botany, vegetable production, and entomology. Based on pre-test and post-test scores, all participants knew less at the beginning of each module compared to what they knew at the end of each module. The average *(x)* knowledge increase by module was: botany 72.4% (78.8%-6.4%), vegetable production 70.1% (84.7-14.6), and entomology 69.6% (74.8-5.2).

To determine if knowledge increase was statistically significant a t-test: paired two sample for means was used. Statistical tests of hypotheses are conducted to determine whether sufficient evidence exists to reject the null hypothesis in favor of the alternative hypothesis (Rumsey, 2011; Young, 2006). This study was conducted under the assumption (hypothesis) that training would increase participants' knowledge in different subject matter areas (botany, vegetable production, and entomology). In this small sample (N=11) the means changed from 6.4 (SD=5.8) to 78.8 (SD=8.8) in botany, 14.6 (SD=3.4) to 84.7 (SD=9.0) in vegetable production and 5.2 (SD=7.9) to 74.8 (SD=6.0) in entomology. These changes proved to be significant in each of the subject matters tested: botany $t(10)$= -22.54, p=3.32602E-10; vegetable production t (10) =-28.30, p= 3.53191E-11; and entomology $t(10)$ =-23.42, p=2.28206E-10.

PRE-TEST RESULTS

Analyzing the pre-test scores, participants knew more about vegetable production (14.6%) than botany (6.4%) and entomology (5.2%). Nonetheless, standard deviation (*SD*) analyses revealed that most participants had similar level of knowledge of each module. Most pre-test scores were within one standard deviation. For example, pre-test scores of the vegetable production module were between 11.2 and 17.4 ($x=14 \pm S$ =3.4). It seemed that all participants had some knowledge about vegetables because it was the only module where no participant scored 0. However, 54% of the participants scored 0 in the entomology pre-test and 36% also scored 0 in botany. When looking at the differences between the lowest and highest pre-test scores, they were highest in entomology 27% (0%-27%), then botany 14% (0%-14%) and vegetable production 9% (11%-20%).

POST-TEST RESULTS

When analyzing post-test scores to determine knowledge gain, the vegetable production module showed the highest post-test mean (x =84.7%) followed by botany (x= 78.8%) and entomology (x=74.8%). However, knowledge gain was the difference between post-test and pre-test scores. Although vegetable production reported the highest mean (84.7%), the highest knowledge gain occurred in botany (72.4%) followed by vegetable production (70.1%) and entomology (69.6%). Like standard deviation analysis for pre-test scores, most post-test scores in each of the three modules were within one standard deviation ($x \pm SD$). For example, most entomology scores were between 68.8 and 80.8 ($x=74.8 \pm SD=6.0$). Although both mean and standard deviation analyses showed that at the end of the program all participants had similar levels of knowledge; knowledge gain varied among participants across the modules.

FINAL EXAM

At the end of the year (November 2014), participants were administered a cumulative final exam. All participants, but one, scored above 70%, which was the requirement to obtain a certificate of completion. The standard deviation (*SD*) also showed that most participants had similar levels of knowledge and that their scores would fall within one standard deviation or between 74.4 and 91.8 ($x \pm S$). Table 6 presents the results from the final exam. Non-passing participants were not allowed to re-take the final exam, but they were able to re-take all or some of the modules they missed.

Table 6. Urban agriculture final exam results

Participant	Final Exam
1.	96
2.	96
3.	83
4.	77
5.	78
6.	86
7.	87
8.	80
9.	88
10.	76
11.	67
Mean (x)	83.1
S	8.7

Discussions of Findings

The objective of this study was to measure how much knowledge a small sample of urban Hispanic adults from Connecticut would gain by participating in a year-round urban agriculture program taught in Spanish. The study was conducted with a group of 11 Hispanic urban residents from Connecticut who completed a year-round training from November 2013 to November 2014.

Pre-test scores in each of the three modules tested showed that the average knowledge among participants before the program ranged from 5.2% correct scores in entomology to 14.6% in vegetable production. These results support the claim (Luckey, Murphrey, Cummins, et.al., 2013) that agriculture literacy among urban residents, in this case Hispanics, is very limited and one of the reasons is that most urban residents are detached from agriculture in their daily lives. In this group, none of the participants had a job related to agriculture; instead they were in services (46%), business management (18%) and construction (18%). Not only were participants working in areas other than agriculture, but their level of formal education also was low. Many participants did not finish high school (46%) while very few (18%) had finished it, and a few (27%) had some college.

It may be a great mistake to assume that low level of formal education among some Hispanics may limit them to learn scientific knowledge through Extension programs. Results of this study reveal that when participants were taught in their primary language (Spanish) and were asked to learn scientific names of plants, classify plants into monocots and dicots, or gymnosperms and angiosperms, identify and classify insects, observe recommended distances and depths at which vegetable seeds should be planted, or were engaged in monitoring insects

and diseases, all participants increased their knowledge by 69% to 72%, responded positively to those challenges, and completed the requested assignments.

This study showed that regardless of gender, marital status, and age, all participants increased their knowledge in all three modules tested. There were similar percentages of males (55%) and females (45%), almost all participants were married (82%), and the group was relatively young; 46% were between 41-45 years old and 35% were between 30-35 years old.

To engage urban Hispanic residents in urban agriculture, the content was taught in Spanish. Post-test scores showed that when a program is taught in one's primary language, participants will increase their knowledge if that is the main purpose of the program. Average post-test scores in each of the modules showed that all participants gained knowledge as demonstrated by scores ranging from 69.6% in entomology to 72.4% in botany. Knowledge gain, however, may not be attributed to usage of one's primary language only. In this case, other factors such as the length of time spent in each module (40-50 hours), exposure to field activities (growing vegetables), which were strongly related to class content, and supplementing classroom activities with real-life experiences (selecting seeds, planting different vegetables, seeing them grow, identifying insects in the field, etc.) surely contributed to gain knowledge.

In conclusion, to better serve Hispanic urban residents and to help them gain knowledge related to agriculture literacy, with programs like the UConn Extension Urban Agriculture, both teaching materials and program delivery should be in their primary language (Spanish). This study showed that although participants' level of education was low, they were not working in areas related to agriculture, they all gained knowledge in botany, vegetable production, and entomology.

Implications for Future Practice

The UConn Extension Urban Agriculture Program showed the need to develop and deliver Extension programming in Spanish if Hispanics, especially those living in urban cities, are to be engaged in urban agriculture and to be helped to understand the importance of agriculture literacy in urban cities. However, developing programs in Spanish may be difficult where non-bilingual (English/Spanish) Extension educators are available. There were many lessons to learn from the UConn Extension Urban Agriculture program. One of the most important to Extension educators is that programs like these require not only language proficiency (Spanish), but professional expertise. In this case, both faculty members not only spoke Spanish, but had agriculture background.

Program development and program delivery are two aspects this study showed as critical factors to successfully reach out to Hispanics. Although the program was taught by bilingual faculty members, it was a team effort. This program suggests that to better serve Hispanics, Extension educators should work as a team. It is almost impossible for a single educator to master all different subject matter (botany, soils, entomology, vegetable production, etc.). By teaming up with other Extension educators, program development and delivery may be easier.

Extension educators should not underestimate Hispanics' ability to learn scientific

knowledge. The content of each module was drawn for the Connecticut Master's Gardener curriculum. The fact that most participants did not complete high school may lead Extension educators to believe that they may not be ready to engage in a very academic process (pre and post-testing, final exams, etc.), but this study showed that most participants accepted the challenge and responded positively to the entire process.

Finally, formalizing program delivery was another factor that may have contributed to the retention of participants for a year-round program. Most, if not all, Extension programming falls into non-formal education (not for credit). However, the Urban Agriculture program formalized the learning process by administering pre and post-tests, having participants study for a final exam, and by setting a minimum score to successfully complete the program. Making participants feel they are attending a higher education institution's program may help them think and behave as if they were college students. Therefore, participants may have thought they needed to pass the class. If they were taking these classes for credit, their final scores would allow them to pass each class.

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