

*Capacity Building on IPM in Urban Agriculture in Bay Area
Public Schools and Surrounding Low-Income Communities
Final Report*

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Contract Title: Capacity Building on IPM in Urban Agriculture in Bay Area Public
Schools and Surrounding Low-Income Communities

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SUMMARY

The objective of the project was to initiate a training, demonstration and outreach project on IPM in urban agriculture at various East Bay public schools and neighboring low-income communities. Activities included lectures and practical activities in the schools related to agroecology and IPM including setting up biocontrol experiments in established school gardens and development of ecologically-based pest management lesson plans for teachers. These lesson plans feature principles of IPM and sustainable agriculture. Four students were selected for summer urban agriculture internships at the University of California's Gill Tract facility in Albany where they participated in training and research activities on biocontrol and agroecology. Research and demonstration plots established and maintained by the students were featured in a field day open to the community conducted on August 7, 1999 at Gill Tract in order to expose them to production and crop health impacts of agroecological management such as intercropping, use of flowers as beneficial insect habitats, composting, mulching, etc.

In addition, we assisted community members in the establishment of community gardens in West Oakland and in Berkeley in collaboration with the Strong Roots Youth Group. These gardens served as vegetable production sites for food self-sufficiency, but also as demonstration areas for school children and community members on general principles of sustainable and diversified urban agriculture.

BODY OF REPORT

Introduction:

The main goal of this project was to establish gardens at various school and surrounding neighborhoods in low-income areas, featuring vegetable cropping systems that produce salad vegetables and some staple crops. The assumption was that such activities would not only enhance capacity building on IPM and sustainable agriculture among school children and community members, but produce from gardens would contribute to enrich the nutritional offerings in school cafeterias and to enhance general food security in poor households. The idea was for students to participate in all aspects of garden development including the use of cultural and biological methods of pest management, and that gardens would serve as a pedagogic mechanism for integrating agriculture, food systems ecologically-based pest management (EBPM) issues into the classroom curriculum. Established demonstration plots would then serve to promote field days and cross-visits to enhance outreach of project benefits to many school children and the community at large.

Materials and Methods:

The realization of this demonstration and training project included several steps and activities:

1. Contact with principals from Columbus, Hoover and Vista Elementary Schools, and from Willard and Albany Middle Schools to gain access to teachers, students and vacant areas for garden establishment and implementation of curricular activities.
2. Conduction of classroom activities at Willard Middle School featuring instruction on insect ecology and biological control, as well as establishment, monitoring and analysis of an experiment on the effects of intercropping on pest populations.
3. Continuous maintenance of garden at Willard Middle School, and the establishment of new gardens at Hoover Elementary School and the M.R. Baker YMCA and in two vacant lots for community gardens in West Oakland.
4. Coordination of summer internship and involvement of selected students in all practical aspects of garden development including garden design, planting, composting, irrigation, weeding, etc., as well as in the research dimensions of the project such as identifying and diagnosing pest problems, recognition of beneficial insects, monitoring and sampling pest populations and associated natural enemies in various intercropping plots, estimating pest damage and yield losses, garden productivity, etc.
5. Outreach activities through field days conducted at Gill Tract and cross-visits of students from different project gardens to exchange experiences and teach EBPM practices.

Results:

Period April-August 1999

Classroom Activities:

As the project started in April and with the school year ending in June classroom activities have so far been limited. We initiated classroom curricular activities at Willard Middle School in Berkeley as a pilot for the type of activities that will be taking place more extensively in the coming Fall 1999. Willard Middle School has an extremely well-developed school garden, however, we found that the integration of science curriculum with the garden was limited. In order to correct this we worked with two sixth grade classes. Three lessons were completed with each class on separate days.

The first lesson consisted of in-class instruction. Students were taught the principles of ecology, focusing more specifically on insect ecology. Through this ecological instruction students were introduced to the basics of ecologically-based pest management. This introduction touched on the role of predators and parasitic insects in the garden, as well as methods for increasing their abundance and effectiveness.

The second lesson involved establishing an intercropping experiment in the school garden. Each class was given a row in which to plant. Students planted cabbage throughout the row, with half of the row intercropped with a variety of flowering plants. Students placed yellow sticky traps within the row to monitor insect populations in both treatments. The goal of the experiment was to determine whether the presence of flowers affected aphid populations through enhanced biological control.

Four weeks after the experiment was established students returned to the garden to collect samples. Students collected young cabbage plants from each treatment in order to count the number of nymph, adult and parasitized aphids on each plant. After the examination was completed, the data was analyzed, and the students were taught how to obtain the percent parasitism rate and then make comparisons between treatments.

A similar set of lessons were conducted involving a seventh grade class at Albany Middle School.

Summer Internship Program:

The project sponsored a summer internship for four students ranging from nine years to fourteen years old. The ethnic make-up, gender and economic background of the group were diverse. Two of the students attend Hoover Elementary School in West Oakland, one of the students attends Willard Middle School in Berkeley, and one student attended Albany Middle School in Albany. The six-week internship took place at Gill Tract, an agricultural research facility owned and operated by the University of California at Berkeley. Students participated three days a week for three and one-half hours each day. Over the course of the internship, students were introduced to the principles of urban agricultural production, and took part in hands-on experimentation both in the field and in the greenhouse.

During the first week of the internship, the students set up their own experiments in a greenhouse. Two of the students tested the effects of three different soil amendments, chicken compost, worm compost and city generated compost on the growth of potted corn. Another student tested the

effect of three different water regimes on the growth of potted corn. The final student tested competition effects of corn and marigold mixtures.

The students also took on the role of collecting and summarizing data from a cabbage intercrop experiment that was set up by a community group prior to the commencement of the internship. The students quantified adult aphid, thrips and flea beetles populations on sticky traps placed in the field. The students then calculated the average populations for each insect, and established a lower and upper range for each insect in each treatment using an average deviation from the mean. The students then presented the results in a tabular form. The results showed a statistically significant reduction, by nearly 50%, of adult aphid populations in areas where cabbage was intercropped with the purple flower Phacelia, and where cabbage was intercropped with pole beans, as compared to a cabbage monoculture (see tables 1-3).

Finally, the students established an experiment of their own. Six hundred cauliflower seedlings were planted in the field and amended with four different treatments: chicken compost, worm compost, city-derived compost, and chemical fertilizer. In half of the rows over each of the treatments, the students intercropped the cauliflower with wild mustard to test it as a trap-crop for flea beetles. The students monitored aphid populations and conducted a similar analysis to that done in the cabbage intercrop experiment, mid-way through the experiment. The students found a statistically significant higher population of aphids in the plot amended with chemical fertilizer as compared with the other amendments. One hypothesis is that those plants had a higher concentration of free nitrogen in the leaves, thus rendering chemically fertilized plants more attractive to aphids (see table 4).

The summer internship concluded with a garden day open to the public. Two dozen people from around the community came, and the students had the opportunity to formally present their experimental results and share their experience with others.

Garden Construction and Maintenance:

Project participants helped to maintain, diversify and construct a number of school gardens during the summer months of 1999. The participating schools included Willard Middle School in Berkeley, Columbus Elementary School in Berkeley, and Ocean View School in Albany. Our work at Willard Elementary consisted of mostly maintenance work during the months of July and August. The usual staff for the garden was gone for the summer. Because of our working relationship with the garden through our curricular activities, we offered our services to help preserve the garden and set up special plots for our curricular activities in the Fall '99. Columbus Elementary School is located in West Berkeley. When we first contacted them, they were already far along in their efforts to start a school garden. We advised them as to some planting strategies to minimize pest damage using agroecological principles. We also helped in the garden construction efforts. Ocean View School, formerly Albany Middle School, will be the site for an elementary school and small extension high school in the Fall 1999. The Albany Middle School already had a garden, but it was not well managed. We helped advise the new garden team, consisting of teachers and administrators, as to how to best design and coordinate the garden efforts to prepare for curricular activities in the Fall 1999. We also provided plants and labor to help the garden achieve its full potential.

Aside from schools, we worked with community organizations as well, specifically The Strong Roots program in Berkeley, the Berkeley Youth Alternatives Program, and the M.R. Baker YMCA in Oakland. The Strong Roots program is a program in West Berkeley that employs "at-risk" youth in community gardens. The Strong Roots workers maintain two gardens in West

Berkeley during the summer. We taught the youth about ecologically-based pest management, and worked along side planting the gardens. The Berkeley Youth Alternatives Program is similar to Strong Roots in that it provides employment for Berkeley Youth in a large urban garden that provides weekly baskets to subscribers and sells fresh produce at the local farmers market. We instructed the youth on the principles of ecologically-based pest management and on pest monitoring.

The M.R. Baker YMCA approached us in April to see if we could help them establish a garden that could be integrated into their summer camp program. We helped construct a small garden at the YMCA site, which was used throughout the summer as a teaching tool.

Fall 1999

Curricular Activities:

We are in the process of expanding upon and refining the curriculum that was used in the Spring of 1999. The curriculum will include five lessons plans consisting of the following lessons: General Ecology, Introduction to Insects, Insect Ecology, Ecologically-Based Pest Management, and basic experiments on insect ecology and EBPM. These lesson plans will be packaged together as separate plans which include illustrations, class exercises and activities. The entire package will have an appendix which describes more in depth experiments that students can perform in their school gardens, focusing on ecologically-based pest management.

We will start teaching in five schools beginning in October '99. These schools include Willard Middle School and Columbus Elementary School in Berkeley, Ocean View Elementary School and MacGregor High School Extension in Albany, and Hoover Elementary School in Oakland. Two classes will be taught at each school once a week. Whenever possible, lessons will be taught in classes that contain summer internship participants. The curriculum will be supplemented with slide presentations and overheads. The East Bay Conservation Corp will work at Hoover Elementary School, supplementing the curriculum with practical gardening activities.

After School Programs:

Our group has helped initiate two youth-led gardening teams. The first team was started by two of the summer internship participants from Hoover Elementary School. The students plan to start an after-school club that will provide maintenance work in their school garden and in other gardens within the community surrounding the school. The group will also coordinate garden days during the weekends when members of the community can come learn about organic gardening and ecologically-based pest management. The second team consists of youth from the North Oakland Missionary Baptist Church (NOMBC), but the club will expand to include youth from the community of West Oakland. This youth group will work primarily during the weekends to help maintain the NOMBC Community Garden, organize events to involve the youth and community of West Oakland in the community garden. These events will include guest presenters, music and food.

Members of our group will serve as mentors to both of these youth groups. We believe that these groups not only provide worthwhile activities for youth otherwise lacking in after-school programs, but they can become a good group of gardening and educational extension workers. These groups are a vital part of educating the community on how to manage pests without using chemical pesticides. In addition, we will work closely with the garden coordinator at the M.R. Baker YMCA to help develop meaningful after-school activities in their garden.

Garden Construction:

We are currently in the process of constructing two gardens in West Oakland, one at Hoover Elementary School and another at the NOMBC. These two gardens are key components of the West Oakland Collaborative Project (see below). To obtain funding for these gardens, we have worked with two separate groups of youth to create a proposal for a youth-initiated grant available in Oakland.

Construction of the Hoover Elementary School garden will begin in late September. Once the garden is built, beds will be planted with the help of the students, and curricular activities will begin.

The NOMBC garden will be built by members of the Oakland community. The first community meeting has been held. Future meetings will take place weekly. Garden construction consists of design, lot clean-up, bed construction, irrigation installation, and meeting kiosk construction. Local artists will also provide sculpture as decorations. Once the garden is constructed, educational activities pertaining to garden pest management will be held, along with general gardening instruction.

West Oakland Garden Collaborative:

The West Oakland Garden Collaborative is a collaborative initiative of both garden and community groups. Three gardens are participating in the program, Hoover Elementary School, the M.R. Baker YMCA and the NOMBC. All three of the gardens are located within ten square blocks of each other. Two youth groups, the Youth Gardeners of Hoover and the No-Limit Green Gardeners, will also play vital roles in the process. In collaboration with the East Bay Conservation Corp, we are also in the process of setting up a Cal Works welfare recipient Hoover Elementary School parent to work as the garden coordinator for the project.

The Garden Collaborative embodies the type of participation that our project as a whole envisions. Hoover Elementary School will be the center for curricular activities. A full garden curriculum will be taught over the course of the year. We will provide instruction in ecologically-based pest management, and the East Bay Conservation Corp will focus more on general gardening techniques. It is our hope that another group will integrate culinary and nutritional education into the curriculum as well. The curricular activities will be directly integrated into the actual school garden. Over the course of the fall, field days will be held on the weekend to teach the community and parents about organic gardening. The Youth Gardener of Hoover will help maintain the garden after-school, help coordinate field day activities, continue their education and experiments, and become involved in out-reach to the community.

The M.R. Baker YMCA hosts after-school programs. The YMCA will use their garden to continue the activities taking place at Hoover Elementary. The YMCA has hired a garden coordinator. We will ensure that Youth Gardeners of Hoover and the YMCA after-school program are closely linked together.

The NOMBC Community Garden will serve as the center for community activities. The garden has already attracted community support, and a group of youth have already formed a youth gardening team. The community garden will be a place where a larger group of people of all ages can share their gardening experiences and learn from each other. If enough food is grown, donations will be made to different community organizations, and the youth may have the opportunity to sell some of the produce at the local farmers market.

Together, these three centers form a unique collaborative effort around ecologically-based urban agriculture. This collaborative will serve a model for sustainable urban agriculture efforts. By linking schools with the community and children with elders, a multi-faceted experience will be achieved that will benefit the community in many ways.

Discussion:

Based on the achievements discussed above, it can be stated that our training, demonstration and outreach project on EBPM in urban agriculture has been successful in initiating capacity building activities on EBPM in schools and surrounding communities through:

- Implementation of garden activities and training modules
- Integration of garden activities to curricular programs
- Conduction and evaluation of comparative research projects conducted by students
- Coordination of internships of selected students at Gill Tract and in community garden projects
- Outreach activities to the rest of the community through field days at Gill Tract and established gardens

Our project differs from most other initiatives in the Bay Area promoting local sustainable agriculture through community gardens, in that it is based on scientific principles of EBPM, and our efforts are specifically targeted at public schools to train students in urban agriculture and environmentally sound methods of pest control. Through open field days, direct involvement of students through internships in community gardens, etc., urban gardeners will become increasingly aware of EBPM principles which in turn we expect will result in decrease use of pesticides in urban agricultural areas and overall enhanced environmental quality.

APPENDIX A: TABLES

Table 1: Winged-Aphid Infestation Levels in Cabbage Monocrop as Compared with Various Intercropping Schemes

Treatment	# Aphids per Sticky Trap (Lower Range)	# Aphids per Sticky Trap (Mean of Three Samplings)	# Aphids per Sticky Trap (Upper Range)
Cabbage Monoculture	174	234	294
Cabbage- Buckwheat	232	286	340
Cabbage-Fava Bean	162	256	350
Cabbage-Tomato	162	177	192
Cabbage-Phacelia	109	132	155
Cabbage-Pole Bean	95	115	135

Source: Youth Summer Interns, UC Berkeley Gill Tract, 1999

Table 2: Flea Beetle Infestation Levles in Cabbage Monocrop as Compared with Various Intercropping Schemes

Treatment	Beetles per Sticky Trap (Lower Range)	Beetles per Sticky Trap (Mean of Three Samplings)	Beetles per Sticky Trap (Upper Range)
Cabbage Monoculture	6	9	12
Cabbage- Buckwheat	7	13	19
Cabbage-Fava Bean	9	25	41
Cabbage-Tomato	6	12	15
Cabbage-Phacelia	2.5	3	3.5
Cabbage-Pole Bean	2	5	8

Source: Youth Summer Interns, UC Berkeley Gill Tract, 1999

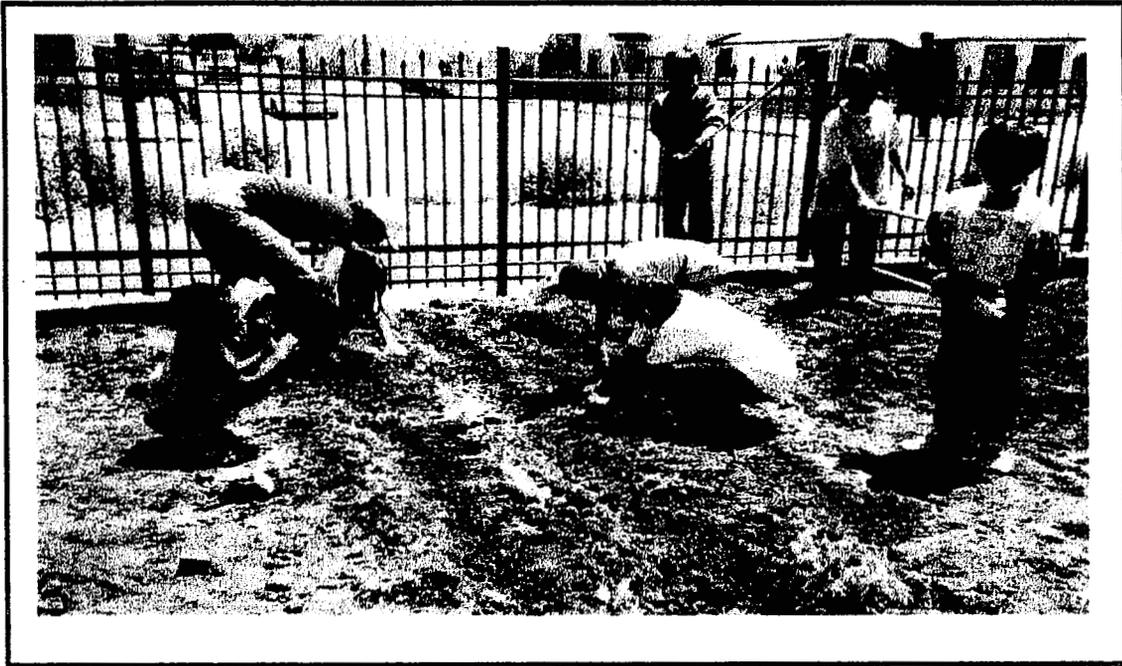
Table 3: Cabbage Yields in Monocrop Vs. Intercropping Schemes

Treatments	Average Yield (Kg/Plant)
Cabbage Monoculture	5.5
Cabbage-Pole Bean	5.3
Cabbage-Phacelia	4.8
Cabbage-Fava Beans	4.5
Cabbage-Tomato	3.7
Cabbage-Buckwheat	3.5

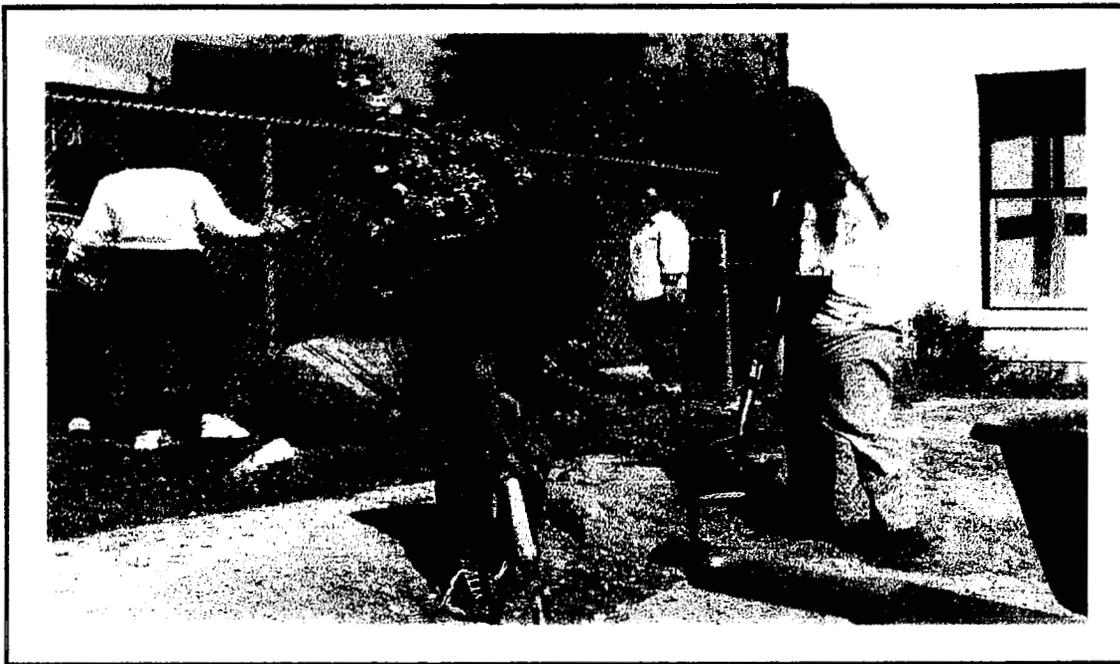
Source: Youth Summer Interns, UC Berkeley Gill Tract, 1999

Table 4: Winged-Aphid Infestation of Cauliflower Using Various Fertilizer Treatments

Fertilizer Treatments	# Aphids per Sticky Trap (Mean of Three Samplings 21 Days After Planting)
Chicken Compost	230
City Green Waste Compost	300
Worm Compost	370
Chemical Fertilizer	380
Source: Youth Summer Interns, UC Berkeley Gill Tract, 1999	



A planting day with youth from the Coliseum Housing Project in Oakland



A garden construction day at Columbus Elementary School in West Berkeley

Figure 1
Garden Constructions

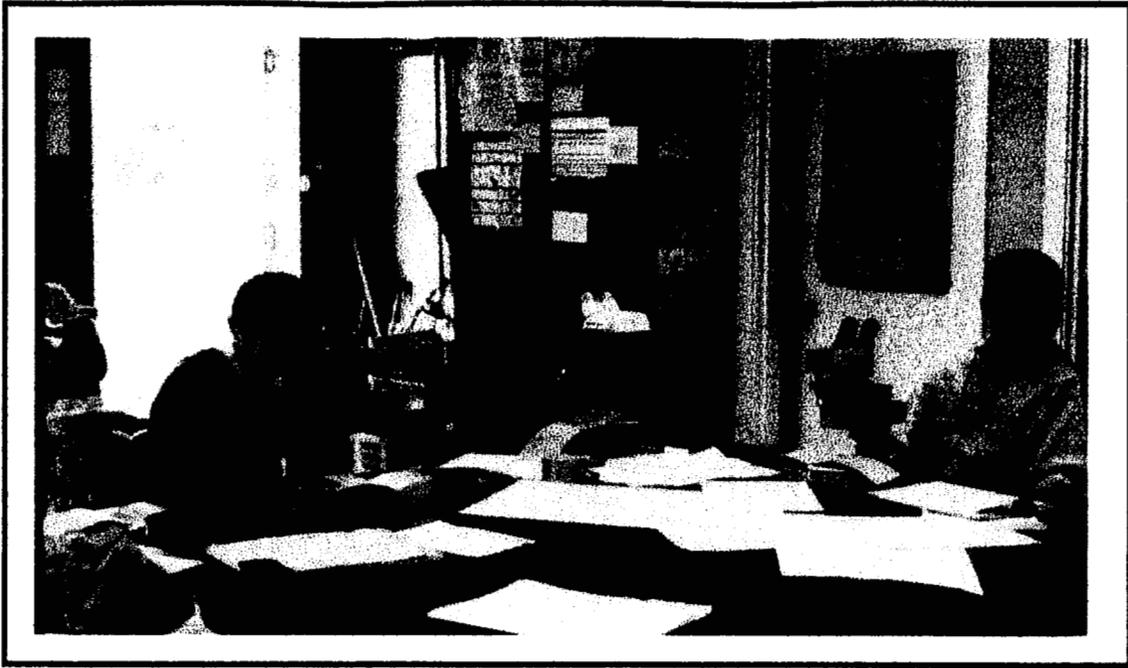


Youth summer interns examining sticky traps in a comparative fertilizer experiment at Gil Tract



A Strong Roots youth hard at work in a youth garden located in West Berkeley

Figure 2
Project Youth in the Field



Youth summer interns counting insects from an intercropping experiment at Gil Tract



Strong Roots youth planting seeds at UC Berkeley's Oxford Tract facility

Figure 3
Project Youth Working
Indoors



A summer youth Intern describing the results of his experiment to the public during an open field day at Gil Tract



Another summer youth Intern describing his potted experiment to the public

Figure 4
The Open Field Day at Gil Tract