

National Fish and Wildlife Foundation

U. S. Coral Reef Task Force Partnership Initiative 2010 - Submit Final Programmatic Report (Activities and Outcomes)

Grantee Organization: Joaquin Chong

Project Title: Coffee Pulp Composting Demonstration and Utilization

Project Period	08/01/2010 - 09/30/2011
Award Amount	\$25,000.00
Matching Contributions	\$0.00
Project Location Description (from Proposal)	Lectures will be at a local Maricao facility, composts building at a Wilfredo 'Juni' Ruiz facility as well as other four participant locations, compost will be applied in selected plots.
Project Summary (from Proposal)	Conduct composting lectures to coffee processors at Maricao, following compost demonstrations and on farm compost use.
Summary of Accomplishments	Educational activities towards sustainable agricultural development practices were carried out at the Maricao region. More than 27 participants took seminars and more than 22 participated during the composting process field day. Along farmers other people receiving training were Agricultural Extension personnel, various representatives from the local Department of Agriculture, an NRCS representative and a professor from the University of Puerto Rico Agricultural Sciences. The workshop provided a new view from industrialized agriculture to a more sustainable agriculture view of production. The proposal composted more than 100 cubic yards of coffee pulp. This compost resulted in the stabilization of many thousands of pounds of nutrients, which otherwise would be easily exported from farms. The outsourcing of wood chips, a major ingredient to compost coffee pulp, became a problem as no local sources could be found. Hence different strategies using local tree prunings that are typically burn or left to root in the farm were suggested and used as an alternative. Although much still need to be implemented, new strategies were develop to reduce the work of farmers in composting on site where the coffee pulp falls after removing the coffee bean. Cover crops ornamental peanut, were planted on recently disturbed roads to avoid soil erosion, increase soil nitrogen and beneficial insect habitat. Overall the proposal had good success in introducing sustainable practices to farmers.
Lessons Learned	One of the main lessons learned is that the farmer's environmental impacts are abundant and require a holistic approach to be solved. Moving towards sustainable agricultural production is a gradual process, as it was the decades of movement towards industrial production. In our effort to develop economically we disregarded many other much more important sustainable relationships with our environment. The remarriage of environmental sustainability and agriculture must occur to solve many of the issues in mountainous region of Puerto Rico, which eventually show up contaminating coral reefs. There is no one size fits all solution, integration between many disciplines is important and required. An example of this can be farmers producing value added sustainable products that can demand a higher price point, which can make farmers economically sustainable. This however would require not only farmers learning more about their soil and how to feed it so it can feed the plant, but also that they have help with the marketing that would be required for their products to be positioned with the added features and benefits on the market place. Sustainability is about relationships and interrelationships.

Conservation Activities

Composting Lectures

Progress Measures	# farmers/private landowners in watershed applying BMPs
Value at Grant Completion	15
Conservation Activities	On Farm Composting
Progress Measures	# farmers/private landowners in watershed applying BMPs
Value at Grant Completion	6
Conservation Activities	On Farm Compost Use
Progress Measures	# farmers/private landowners in watershed applying BMPs
Value at Grant Completion	6
Conservation Activities	Lectures
Progress Measures	Other (# of farmers that participate)
Value at Grant Completion	15

Conservation Outcome(s)	On farm composting
Conservation Indicator Metric(s)	Other (# of coffee producers composting)
Baseline Metric Value	0
Metric Value at Grant Completion	7
Long-term Goal Metric Value	15
Year in which Long Term Metric Value is Anticipated	2012
Conservation Outcome(s)	On farm compost use or detoured
Conservation Indicator Metric(s)	Other (yd ³ compost applied to farm or sold)
Baseline Metric Value	0
Metric Value at Grant Completion	100
Long-term Goal Metric Value	300
Year in which Long Term Metric Value is Anticipated	2012
Conservation Outcome(s)	Composted coffee pulp
Conservation Indicator Metric(s)	Other (#tons of composted coffee pulp)
Baseline Metric Value	0
Metric Value at Grant Completion	65
Long-term Goal Metric Value	295
Year in which Long Term Metric Value is Anticipated	2012
Conservation Outcome(s)	Diverted Nitrogen from liable organic matter
Conservation Indicator Metric(s)	Other (lb of nitrogen diverted in compost)
Baseline Metric Value	0
Metric Value at Grant Completion	1950
Long-term Goal Metric Value	8850
Year in which Long Term Metric Value is Anticipated	2012
Conservation Outcome(s)	Diverted Phosphorus from liable organic matter
Conservation Indicator Metric(s)	Other (lb of Phosphorus diverted in compost)
Baseline Metric Value	0
Metric Value at Grant Completion	195
Long-term Goal Metric Value	885
Year in which Long Term Metric Value is Anticipated	2012
Conservation Outcome(s)	Diverted Potassium from liable organic matter
Conservation Indicator Metric(s)	Other (lb of Potassium diverted in compost)
Baseline Metric Value	0
Metric Value at Grant Completion	2925
Long-term Goal Metric Value	13275
Year in which Long Term Metric Value is Anticipated	2012
Conservation Outcome(s)	Reduction of EC at drainage channel
Conservation Indicator Metric(s)	Other (% difference (mS/cm) reduction from background)
Baseline Metric Value	0
Metric Value at Grant Completion	12.5
Long-term Goal Metric Value	34

Year in which Long Term Metric Value is Anticipated	2012
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Final Programmatic Report Narrative

Instructions: Save this document on your computer and complete the narrative in the format provided. The final narrative should not exceed ten (10) pages; do not delete the text provided below. Once complete, upload this document into the on-line final programmatic report task as instructed.

1. Summary of Accomplishments

In four to five sentences, provide a brief summary of the project's key accomplishments and outcomes that were observed or measured.

Coffee Pulp Composting Demonstration and Utilization

The implementation of agricultural industrial production techniques in the mountainous region of Maricao has provided financial sustainability for many families. However the continual use of chemicals, harsh fertilizers, pesticides, fungicides, herbicides has resulted in detrimental environmental effects. Prior to the industrial model, farms in Puerto Rico were more sustainable organic matter was purposely laid to decay on specific areas to feed the crops, the soil had more organic matter, shading trees in the coffee region was the norm, and labor and workers were more available. The advent of industrialization did initially bring higher yields and reduce labor force, which is considered good in industrial agriculture; however after decades of implementation the farms now have reduced-yields, -farm income, and reduced-farm and -family sustainability. Additionally paired with improper agricultural techniques nutrient, sediment and chemical exportation is the norm from the mountainous region farms of Maricao. Unfortunately and partially because of lack of knowledge the Agriculture authorities still aim farmers to the industrial production model instead of sustainable models. In order for farmers to receive 'industrialized incentives' they have to dedicate much of their time in government sponsored activities, which reduce the time they can spend in their farms or sustainable activities. The partial or the initial distribution of composting-sustainable knowledge, which could start to reverse this unsustainable trend, has been the aim of this proposal.

The proposal started with the creation of demonstration composts piles at Mr. Wilfredo Ruiz 'Juny' facilities followed by two full day seminars which included a field day to the already made compost piles and the creation of new compost piles. The already made compost was tested to observe stability with Solvita tests as well as by hand, touch and feeling. A good discussion took place during the compost build, about its use and effects on the soil. There was a twofold intent for all compost made 1) educational and 2) application/use of it on the field. Discussions on which plot Mr. Ruiz was going to apply the compost took place. Initially Wilfredo wanted to apply the compost on a steep slope that had been continuously farmed for more than 30 years with the intent to rejuvenate the area as it did not produce a single coffee bean. The continuous herbicides application in the area and its steep topography caused great soil erosion even forming large crevasses in some places. The application of the compost in the area would have been washed away as there was no support system for it, aka cover crops. This was an important clue suggesting that it was not only compost that was needed to mitigate the system, but many more sustainable strategies. Another area with lesser steep terrain was chosen for the testing. It was also suggested to Mr. Ruiz to allow the steep sloped area to rest, followed by a cover crop planting. After allowing the area to rest for a few months, the area became naturally covered with Mustard plants. Mustards work on the soil to mitigate phosphorus through association with Mycorrhiza fungi. This strategy was one easily acceptable by a large grower like Mr. Ruiz as it

did not require any effort and specially did not require any more of his time, but yet the effects of resting the soil had a great impact on acres of land. Pictures can be seen here:

<https://picasaweb.google.com/jachong/RestingSoilRestauration>.

Clover ‘Palestine’ and red clover were obtained to follow compost application with the cover crop, hence allowing the compost to be used not only as a nutrient source for the coffee plants, but as a source of stability for the cover crops. Later during that time Mr. Wilfredo Ruiz started to work towards the presidency of the Association of Coffee Processors of Puerto Rico. Being the current president of this organization, plus having his farm responsibilities, has tied Mr. Ruiz time, not allowing him to proceed for the time being, with the application of the compost or cover crops. Mr. Ruiz farm is one of the largest farms in Maricao and the amounts of coffee pulp produced range in the hundreds of tons. This suggests that for Mr. Ruiz to properly process all these coffee pulp he would need to invest not only in some basic machinery, but with his *time* in the process. He is a good candidate for NRCS incentives to compost coffee pulp; Incentives which have been recommended to NRCS by the Agricultural Experiment Station and are in the works to be facilitated by this agency.

As this happen other farmers Emanuel Ruiz, Milagros Ruiz and Santiago Giovanetti demonstrated interest in knowing more about composting and conservation practices. A compost pile was built by Emanuel at his farm and advice was given at Mr. Giovanetti’s farm upon use of his facilities to compost. Furthermore, understanding that more sustainable practices were required to mitigate the system and although not described in the proposal originally, ornamental peanut cover crops were planted at Mr. Emanuel farm to control soil erosion (pictures: <https://picasaweb.google.com/jachong/CoverCrop>) and compost fermentations were made to remediate pond residue waters. You can find pictures of the water pond here:

<https://picasaweb.google.com/jachong/WaterPondRemediation>

Overall the proposal had good success in introducing sustainable practices to farmers, which have not had exposure to sustainability. Although it partially overestimated the impact it can had, given the needs farmers have to manage government incentive requirements, farming time, association requirements, personal time and farming towards sustainability. Nevertheless this proposal has had great success with smaller farmers which have impetus in implementing new ideas and which dedicate more time to their farm sustainability even with practices that went beyond the original ones described in the proposal. Needless to say much work needs to be done given that the current focus is not necessarily farm sustainability. The NFWF proposals are the only ones providing a venue for farmers to get exposure to conservation activities.

2. Project Activities & Outcomes

Activities

- Describe and quantify (using the approved metrics referenced in your grant agreement) the primary activities conducted during this grant.
- Briefly explain discrepancies between the activities conducted during the grant and the activities agreed upon in your grant agreement

Conservation Activity	Expected count	Actual count	Difference
Composting lecture participants	15	27 Saturday and 22 Sunday	12 Saturday and 7 Sunday
Farmers composting	6	2	(4)
On farm compost use	6	1	(5)
Farmers that receive lectures	15	27	12

There were four conservation activities stated in the approved metrics. Composting lectures with 15 farmers participating assisting lectures. The first day 27 farmers and coffee processors were present and 22 the second day. This is 12 more farmers receiving lecture than the expected farmer metric in the first day.

Pictures of the two day workshop can be seen in the following links:

The following link contains a few pictures of Day 1 composting and sustainability seminar; please watch it in full view. You can also add comments to it:

<https://picasaweb.google.com/jachong/DAY1Seminar>

and Day 2 field day composting and visit to growers.

<https://picasaweb.google.com/jachong/DAY2FieldDayPractice>



Talking about temperature

Looking at compost

The metric of farmers composting as a result of the proposal was overestimated, some of the smaller farmers were already composting, the need for wood chips and the lack of availability reduced the feasibility of building compost piles, and the time when the information was given was after the coffee pulp was in anaerobic piles. It simply takes at least a year of planning to compost, since the proposal started in the end of the coffee season farmers did not have time to implement what was learned. The on farm compost use metric is then dependent on the farm compost metric. Two farmers composted Mr. Wilfredo Ruiz and Mr. Emanuel Ruiz. Emanuel is in the process of using the compost in the farm. Wilfredo has not used the compost for the reasons stated above. Farmers receiving lectures were 12 above expectations.

Outcomes

- Describe and quantify progress towards achieving the project outcomes described in your grant agreement. (Quantify using the approved metrics referenced in your grant agreement or by using more relevant metrics not included in the application.)
- Briefly explain discrepancies between what actually happened compared to what was anticipated to happen.
- Provide any further information (such as unexpected outcomes) important for understanding project activities and outcome results.

On farm composting 7 farmers. As a result of this proposal 2 farmers have composted and one has been given on site advice. This is 5 farmers shy of the goal. The aim of increasing farmer composting will continue although other practices will also be encourage as composting is only one mean of sustainability.

Discrepancies between the expected and actual outcomes are explained in the text above as representing the opinions or policies of the National Fish and Wildlife Foundation. Mention of trade names or commercial products does not constitute their endorsement by the National Fish and Wildlife Foundation.

On farm compost used or detoured 100 yd³. There were more than 102.9 yd³ composted.

Composted coffee pulp 65 tons. The formula is $102.9 \text{ yd}^3 * 1 \text{ gal} / 0.004951 \text{ yd}^3 = 20783.68 \text{ gal} * 6 \text{ lb/gal} = 124702.1/2000 = 62.35 \text{ tons}$.

According to the laboratory analysis of the compost (see table below) total nitrogen (N) detoured was exceeded by 1504 lb, so did phosphorous (P) with 391 lb and potassium (K) was below the proposed detoured pounds by 443 lb. Calcium and magnesium are reported, but were not included in the proposal metrics. The differences in actual and proposed detoured nutrients for N, P and K are due to differences in compost chemical composition from the original research estimates.

	% of compost	Detoured in compost (lb)	Proposed (lb)	Difference (lb)
Total N (TKN), %N	2.77	3454.2	1950	1504.2
Phosphorous, % P2O5	0.47	586.1	195	391.1
Potassium, % K2O	1.99	2481.6	2925	-443.4
Calcium, % Ca	1.98	2469.1		
Magnesium, % Mg	0.79	985.1		

Reduction in EC at drainage channel 12.5% reduction. There was no significant % reduction at the drainage channel in Mr. Wilfredo Ruiz farm as new coffee pulp material was dumped on site for the new harvest. Lamentably the EC is expected to climb at the drainage channel.

As mentioned, there were other conservation activities that were not in the proposal, but that were felt needed to be included as part of a holistic view of farm sustainability. This included the planting of about 200 cover crop plants *Arachis glabrata* ornamental peanut at a recently worked soil and the use of compost ferments at a contaminated pond.

At Mr. William Ruiz facility many acres probably more than 30 were put to rest, allowing Mustard and other natural cover crops to protect the soil against erosion. This should had had an impact on soil erosion and reduced herbicide use, however measurement of the effects on actual erosion avoidance is beyond the scope of the proposal as it does require more detailed research.

3. Lessons Learned

Describe the key lessons learned from this project, such as the least and most effective conservation practices or notable aspects of the project’s methods, monitoring, or results. How could other conservation organizations adapt their projects to build upon some of these key lessons about what worked best and what did not?

There are many lessons that can be learn from this project. One typically tends to underestimate the need to use holistic approaches to conservation practices. It is not only farms, households, families, individuals, employees but communities that have to be educated towards sustainable ideas, as these assure a clean environment for future generations, where greater development can occur. Agencies responsible of community development tend to think about economic development disregarding the environment, yet little economic development can be made when the environment is destroyed as people get sick along with their surroundings; a sad clear example of this is Haiti. One of the main lessons learn from this project is that the farmers environmental impacts is not something that can be solved during a year, after all there have been decades of training towards unsustainable production by government agencies including higher education

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institutes. It is not anyone's fault that this has happen this way, in our effort to develop economically we disregarded many other much more important sustainable relationships with our environment. Yet in the mountainous region of Puerto Rico environmental sustainable development should be started with farmers as farmers are main sources of employment and in some cases are the major sources of environmental pollution. There cannot be proper sustainable development if there is no sustainable agricultural development. Sustainable agriculture deals with the interactions of people and environment, and when sustainable, the farm provides proper nutritional food free from pesticides, herbicides and poisons to properly feed the people with dense nutrient rich food. There is no clear, easy answer to the environmental problems we are facing, but our decreasing sustainability from the economic to our environment is ultimately link to agriculture. The story of how these are link can be clear to some, but when is not, it does require greater length of explanation. Other conservation organizations **must** include sustainable agriculture to have very long term effects on environmental betterment.

4. Dissemination

Briefly identify any dissemination of lessons learned or other project results to external audiences, such as the public or other conservation organizations.

From previous experience I have found that the one of the best methods to disseminate information is through videos. People can be easily directed to them and can have a good impact, as these deploy information in an active manner yet it only requires a passive audience to receive the information. Additionally the information can be given 24/7 at the leisure of the audience. The channel at youtube.com compostapr has had more than 90,366 views, it has 58 subscribers and the video supported by this proposal has had 262 views. Videos are a good way of perpetuating the information that has been presented to future audiences. Having said all that videos are not available to all the population, especially in rural areas, as the broadband connections can be limited. Hence it could be a good strategy to burn DVD educational videos and distribute these in rural areas.

5. Project Documents

Include in your final programmatic report, via the Uploads section of this task, the following:

- 2-10 representative photos from the project. Photos need to have a minimum resolution of 300 dpi;

Please visit the hyperlinks throughout this document to observe many more pictures, which can be downloaded.



Introduction seminar

Explaining

The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the National Fish and Wildlife Foundation. Mention of trade names or commercial products does not constitute their endorsement by the National Fish and Wildlife Foundation.

- report publications, GIS data, brochures, videos, outreach tools, press releases, media coverage;

'Sustentabilidad con la Composta' can be seen here:

http://www.youtube.com/watch?v=ghbNyYZIYVg&list=UU1Fop1sGIHVnsuLSil_B5sg&index=8&feature=plcp

- any project deliverables per the terms of your grant agreement.

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