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Analysis of Agricultural Plastics Recycling for the Banana Industry in the Dominican Republic

EXECUTIVE SUMMARY

The Dominican Republic is the main exporter of organic bananas in the world. This emphasis on organic and fair trade bananas has encouraged the industry to strengthen environmentally conscience production methods and further address recycling efforts in banana production. The biggest challenge for these producers has been the disposal of the plastic bags used to protect the bananas from disease and pests during the growing process. The bags are made of a low-density plastic making it difficult to recycle as it is a less desirable product to recyclers. Producers have required farmers to collect the plastic and some have established collection routes. However, end-uses for the plastic have not been well-established, leaving the plastic to sit in either producer collection areas or ultimately ending up in landfills where it is burned. Burning the plastic releases carcinogenic toxins and the plastic does not fully burn, leaving a melted waste product.

I volunteered with USAID's Farmer-to-Farmer Program from June 29 through July 12, 2014 in the banana producing region of the Dominican Republic to analyze the use of plastics in the banana industry and address ways to recycle the plastic after its use. The USAID field staff and I met with the three major banana producers in the region as well as environmental agencies and recyclers. We toured several farms, plastics collection facilities, landfills, and recycling facilities.

BACKGROUND

Each of the three main banana producers in the banana producing region of the Dominican Republic have some sort of plastic collection process established. Despite these collection efforts, the plastic is not recycled as there has not been an established end-use for it. They have been unable to secure a buyer or collector for the plastic. At least one producer has a collection site area where the plastic is awaiting transport but is exposed to wind and rain and has drifted to neighboring areas. In addition, there are not well-established means of preparing the plastic for transport, such as baling or compressing. The low-density composition of the bags make it an undesirable product for recyclers who will collect denser plastics such as beverage bottles. The bags are used to protect the bananas from pests and disease and have demonstrated increased yield. They are fairly inexpensive (about .003 cents per bag) so there is little incentive to reuse them, which would require thorough washing as to introduce disease from plant to plant. Producers we met with had preferred outcomes with the plastic such as converting to fuel, recycling into other products, or selling to a recycler.



ACTIVITIES

- Spent a majority of the assignment in the banana producing area of Mao, meeting with producers and touring farms.
- Met with executives from Banelino to discuss their recycling efforts. They indicated that as a producer with a socially-minded mission, they have some funds available to create social development projects. Their preference was to convert the plastic into fuel.
- Met with executives from Santa Cruz and toured their farms and plastics collection area
- Met with EKOBAN about environmental impacts of the banana industry
- Toured plastics recycling and compost areas of Montecristi
- Analyzed logistics of a central collection point by touring various farms and collection points
- Contacted compressor companies in the U.S.
- Contacted a facility in Florida to set up a micro-recycling facility
- Toured an economic development zone established by the government
- Researched plastic companies in the Dominican Republic
- Contacted a Canadian company that designs equipment that processes agricultural plastics into a crumb form that can then be made into consumer products.
- Contacted Plastic Flex in Santo Domingo and Mega Flex in Santiago Rodrigo, who may be able to take the plastic for their own reuse efforts.
- Met with Carlos A. Diaz of Recicladora del Cibao, a recycling company in Santiago and toured their facility. Mr Diaz is checking into buyers for that type of plastic.
- I contacted an agency in Florida that specializes in all types of agricultural plastic waste. If the volume is not enough to ship, they could help set up a micro processing plant to recycle the plastic for shipment. Source is Gene Jones, CEO Southern Waste Information eXchange, Inc.

Transport of plastic

Producers mention the possibility that the plastic can be sold, or at least taken by a recycler to be reused and/or shipped to another country for disposal and/or reuse. Yet it does not appear that any of these connections have been established. The recyclers we contacted were not taking the plastic, and some had tried to collect the plastic but also have difficulty finding an end use for the plastic (such as a producer to buy the plastic). Recyclers also experienced issues with the plastic clogging the machines at the recycling facility, which are built to process more rigid plastics such as beverage bottles. Most likely, producers will need to address collection efforts and logistical issues if an end use is established. Producers may need to invest in balers or compactors, or other equipment that could process the plastic into a product that is easier to ship, thus making it a more attractive and affordable product to recyclers.



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strength of the banana producers is the collection efforts that are already in. Several of the top producers already have well-established collection methods in regards to collecting plastic from the field. One company, Santa Cruz, picks up the plastic and holds it at a collection facility. To comply with producer standards, many farmers are collecting the plastic. The problem lies in what to do with the collected plastic, thus an end use for it needs to be established. There are several opportunities for the plastic including reuse in the banana industry, conversion to fuel, and sent and possibly sold to a recycler.

The plastic bags used by the banana industry is a low-density plastic making it less desirable to recyclers. The plastic bags are considered contaminated from the bananas themselves, as well as any pesticides that may have been applied. Please note some producers and/or farmers grow certified organic bananas (indicated by the use of a white plastic bag) thus this plastic is only contaminated with resins from the bananas, but could spread disease to another plant if reused without washing. As far as agricultural plastics standards, the bags are considered only slightly dirty with normal use. Plastic becomes more contaminated as it sits outdoors awaiting transport. It is possible to wash and reuse the plastic bags several times, and producers in Costa Rica have a small facility that employs spouses of the farmers to wash the bags for reuse. However, this is not being done with producers in the Dominican Republic.

An attempt has been made to recycle the plastic bags in the same method as other types of plastic. However, some recyclers have had problems with the bags clogging their machinery, a problem they do not have with the more rigid plastics. This has caused some recyclers to discontinue recycling efforts of the plastic bags. Conventional methods of recycling include converting plastic to a pelletized form for transport and reuse.



Logistical issues include analyzing the most efficient means of transporting the plastic, from the fields to an end point of use. Banelino and Santa Cruz have both addressed the collection of plastic and have systems already in place. One possibility is purchasing a compactor to help ease the transportation and handling of the plastic.

Ultimately, it would depend on the end use of the plastic as to what form the plastic needs to be in to be accepted by the end use company. Currently the producers rely on outdated, manual compactors which are not properly installed and pose a hazard to workers.

RECOMMENDATIONS FOR FOLLOW-UP

1) Convert to Fuel

Producers seem eager to convert the plastic into fuel. At least two companies are able to convert plastics into fuel. The first is a Spanish company who has visited banana producers in the area. The second is RES POLYFLOW, located in Ohio. <http://www.respolyflow.com/>.

2) Recycle into other products

There is a potential for job growth in the area. Dole hires spouses of banana farm workers to run the wash plant to wash and reuse bags. Another option would be to set up a side industry to make products used in the production of bananas includes the corner pieces used to ship pallets of boxes, produce crates, stability stakes to support the trees, or pallets. Possible products:

- a) Produce crates: <http://reusables.org/3450/general/new-wood-effect-plastic-crate-from-polymer-logistics-is-set-to-transform-fresh-produce-aisles-2>
- b) Pallets: <http://www.usereusables.com/downloads/Gatorade-10-25-web.pdf>
- c) Support stakes: producers indicated a strong interest for support stakes for growing plants over other types of products. This is most likely due to products such as pallets or produce crates being shipped abroad with little use and reuse for producers. Current practices for supporting plants during growth include tying plants to one for another for support with plastic. The low density plastic of the plastic bags combined with a more rigid plastic has the potential to create a support stake that is slightly flexible to support the plant while growing. Several supports stakes per plant would be needed, possibly creating a sustainable industry.
- d) Corner posts: some producers are currently utilizing corner posts made from recycled bags to provide stability to pallets of bananas being shipped overseas.





3) Economic and Social Development in economically disadvantaged areas

The area of Montecristi has been established as an economic development zone by the government. Currently, the area has a 73% poverty rate. There is potential in this area for job development and growth to establish a subsidiary industry in several areas:

- Set up a washing facility similar to the setups found in Costa Rica. This could provide jobs to rewash the bags for reuse and/or for recycling, if desired by recyclers.
- A plastics injection molding facility that remanufactures the plastic bags into products to be used in the banana industry such as pallets, crates, corner posts, and supports. At least one company contacted, indicated that it would be rather easy to create these products with the recycled plastics. One benefit is that this machinery can be used by workers with relatively low job skills, creating jobs in the area. This company is able to provide technical support from Canada for its machinery, eliminating any significant downtime. In addition, any power grid challenges in the Dominican Republic for running the machinery can be resolved by installing a generator.

Other solutions:

- One specialty of the Canadian company CE Sparks Enterprises is a plastic lumber product. Given the limited forests in the Dominican Republic, there is a potential need for this type of product, which is durable and resistant to rot and pests.



This company has technology to process plastics used in agriculture into new products and might be able to assist with technology/plants. The company has machinery that converts agricultural plastic into a crumb form that can then be used to make a variety of products. Combining the low-density plastic bags with another form of higher density recycled plastic could make durable products used in the banana industry including support stakes for plants, pallets, and produce boxes for shipping. Currently at least one producer uses corner support posts made from recycled plastic bags for shipping pallets.

OBSERVATIONS



As with my work in the U.S., there seems to be a common mentality that the waste products of production, in this case, the plastic bags, are someone else's problem, and that someone else should want or take the plastic. The spillover costs of the plastic is not accounted for in the cost of production of the product. Producers jump to the "easy" solution that someone should buy the plastic from them, yet the plastic goes unwanted. The low-density nature of the plastic makes it less desirable to recyclers, thus less demand for the product. One common response is that they can sell and/or ship the plastic to China for recycling (again, someone else's problem). But China has increased regulations on waste

materials imported to the country for recycling, decreasing demand for the plastic. Another attractive solution for producers is the conversion into fuel, which would require costly initial investment and there might not be enough plastic from the banana industry to make it a feasible option. One thing not considered by producers is that ultimately there might be a cost to them associated with having the plastic transported for end use. They seem to be under the impression that they should be paid for the plastic, although the market does not seem to support that.

Opportunities include a somewhat well-established collection process as farmers must comply with producer standards, including plastics collection. Initially we thought the barrier was going to be getting farmers to collect the plastic for recycling, which does not seem to be the case. We were somewhat surprised to discover that the plastic was indeed being collected, as often as once per week by one producer, but that despite the collection efforts, no end use had been established and the plastic remained in holding areas. Another strength is that all three of the major producers are committed to finding an end use for the plastic.

I believe there is tremendous opportunity with creating subsidiary industries to recycle the plastic into other products, particularly products that can be reused in the banana industry such as pallets, corner posts, and support stakes. Unfortunately, this option has not been as attractive to producers as it involves significant start-up costs and planning.

NEXT STEPS AND VOLUNTEER NEEDS

- Further research on converting plastics to fuel. This could most likely be combined with another area of analysis.
- Address logistical issues such as compressing/baling of plastic for ease in transport. Determine needs of producers in managing the plastic pre-transport.
- Research opportunities for plastic to be sold and/or shipped to recyclers.
- Feasibility study of creating a factory to recycle plastic into other products.
- A volunteer with solid waste management experience would be helpful in analyzing the logistical needs of both collection and transport of the plastic.

PERSONAL REFLECTION



This trip was a wonderful opportunity for me personally and professionally, and a dream come true. I had studied economic development in Latin America as a college student, and frequently would do papers and projects on the banana industry. In my current profession, I work with farmers on recycling agricultural plastic. The opportunity to volunteer with Farmer-to-Farmer demonstrated that agricultural plastics recycling is a global concern and that farmers that I work with in a rural county in Wisconsin have the same concerns as those in the Dominican Republic, producing food for the world in environmentally conscience ways. I would like to return to the Dominican Republic and conduct further work on creating sustainable jobs in this region, which has a high poverty rate and is the focus of many governmental programs. I am so honored to have be chosen to participate in USAID’s Farmer-to-Farmer program, the staff is well organized and the programs and assignments are well thought out.