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ZERO WASTE IMPLEMENTATION AT SUGAR CANE FACTORIES IN JAVA, INDONESIA

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To implement the Government Environmental Regulation, PT RNI as a leading of Government Owned Enterprise in agroindustry in Indonesia has taken a real action by practicing zero waste systems. The main organic wastes produced by sugar cane factory are baggase and filter cake. Baggase is burned to heat-up the boiler while filter cake was remain unused until the year of 2002. An extra cost had to be spent not only to transport the huge amount of organic wastes to a dumping site but also the company had to pay an extra cost for renting land for dumping area of the wastes. On the other hand, filter cake is an excellent sources of organic matter. It contains high plant nutrients particularly phosphorous and potassium, improved the physical, chemical and biological properties of the soil.

Since 2003, this company had started to process their waste to useful materials i.e. Mixed-Fertilizer. Mixed Fertlilizer is a mixture between inorganic fertilizers and organic fertilizers. The wastes from sugar cane factory used as raw materials for Mixed Fertilizer are filter cake, bagasse ash, molasses and waste from vinasse. As sources of phosphorous, local available rockphosphate (25% P_2O_5) is added. This rockphosphate is partially acidulated. As a source of potassium, ash of empty fruit bunches of oil palm is used. This ash contains about 35% K_2O. Dolomite, gypsum and zeolite are also used. So, all of sugar cane factory wastes are used to make a Mixed Fertilizer.

Since 2003, PT RNI has built five Granulated Mixed Fertilizer (Mixed Fertilizer G) factories with the total capacity of 17,500 tons of Mixed Fertilizer G at five different sugarcane plantations i.e. PG Subang, PG Jatitujuh and PG Tersana Baru (West Java), PG Madukismo (Central Java) and PG Rejo Agung (East Java). The production capacity of each factory is 3,500 tons of Mixed Fertilizer a year.

In 2004-2005, Mixed Fertilizer G had been applied at more than 5,000 ha of sugar cane plantation. The avegare dosage was 1,400 kg per ha. Mixed Fertilizers G reduced the fertilizer cost by 3 to 15%. It was also noticed that the growth of cane treated with Mixed Fertilizer was better than conventional inorganic fertilizers. Other advantage is that Mixed Fertilizer G is ready at the time needed. This is mostly not the case for inorganic fertilizer.

In the future, the quality of Mixed Fertilizers G will be improved by incorporating local beneficial soil microbes such as *Azospirillum*, *Azotobacter*, phosphate solubilizing microbes, mycorrhiza. In a certain area where the attack of pest is severe, Mixed fertilizer enrich with antagonist such as *Metarhizium* will be used to control *Dorysthenes* sp.

Figure 1. Filter cake (above) and ash of bagasse (left, below) are the main waste from sugar cane factory

Figure 2. Pan granulator used to make Mixed Fertilizer G