

Economic Losses to the Agricultural Sector from Industrial Waste water Pollution: A Study from Myanmar

The weaving of the traditional longyi in Myanmar brings many social and economic benefits. However, emission of the dye wastewater from longyi production negatively impacts nearby villages and farming communities. A study by Dr. Tin Tin Htwe of the Yangon University of Economics estimated the economic losses suffered by farming households near Meiktila Industrial Zone, which is largely dominated by clothing and apparel manufacturing industries. It was found that the revenue of the polluted farms is 45.5% lower than that of the revenue of the non-polluted farms. This is based on the findings that the revenue of the polluted and non-polluted farms are MMK 162,690/acre and MMK 356,450/acre, respectively.

Meiktila Industrial Zone

Industrial zones not only bring economic and social benefits but also negative impacts such as the environmental pollution caused by industrial wastewater dumping. Myanmar has experienced many such cases since the establishment of industrial zones in the country.

The Meiktila Industrial Zone (MIZ) is located on Yangon-Mandalay Highway. It was established in

1997 and 64% of the industries it houses is made up of weaving firms, which are identified to be the major wastewater polluters. The total water consumption of these firms is a huge amount ranging from 10,000 to 16,000 gallons per day. Almost all of these firms emit wastewater without any kind of treatment.

Being in Myanmar's Central Dry Zone (CDZ), farmlands near MIZ cannot get enough rainwater for paddy cultivation and are too far from the township water dam. Hence, these farming households have had to rely on groundwater for their household needs. For irrigation, they rely on a nearby pond, which has been contaminated by the wastewater dumped by MIZ industries. The use of polluted water for irrigation is believed to be directly linked to farming losses such as low quality crops, decline in output, and land degradation.

Local farmers have made their complaints known to the industrial zone management, which has not made any progress in solving the wastewater pollution problem. Some farmers have adapted to the situation by getting rid of the wastewater on their farmland and this has considerably increased their cost of production. Farming households also boil the groundwater harvested to avoid health issues from consuming it.

A summary of the research "Economic Losses to the Agricultural Sector from Water Pollution: A Case Study of Meiktila Industrial Zone" by Dr. Tin Tin Htwe, Department of Commerce, Yangon University of Economics, Pyay Road, Kamayut University Campus, Kamayut Township, Myanmar. Tel: +95 1 536761. Email: tinhtwe776@gmail.com. This research was conducted with support from the Economy and Environment Program for Southeast Asia (EEPSEA), a program supported by the Swedish International Development Cooperation Agency (Sida) and International Development Research Centre (IDRC).

The study site

To estimate the economic losses suffered by farming households, the study focused on the farmlands in two villages nearest to Meiktila Industrial Zone (MIZ): Htanaung Kan and Kyune Pho Pin. The farmers in these villages are similar in terms of demographic and socio-economic backgrounds. The villages also have similar soil types and practice the same crop cultivation pattern.

Three farm plots in the area were covered: 564, 565, and 566 (see Figure 1). Plots 564 and 565 are at the right side of the industrial zone and are located on lower land. Thus, the industrial wastewater released by MIZ mostly goes to these areas, with plot 564 suffering a higher level of pollution. Plot 566 is located on the left side of the industrial zone on higher land. Given that it is about one mile away from MIZ and does not suffer from industrial wastewater pollution, it served as the control site of the study.

Data gathering

A preliminary survey was done on November 2015 to get a feel of the local situation. The main survey was conducted on February 2016 wherein 122 paddy rice farmers (35 farmers from plots 564 and 565, 87 farmers from plot 566) were interviewed, which represents 65% of the total farmer population in the



study site. The survey was done during harvest season allowing the researchers to gather data on farming cost, paddy rice yield, and the current selling price.

The survey questionnaire used had five parts, which gathered the following information: the respondents' (i) demographic background, (ii) agriculture and business practices, (iii) farm inputs, and their perception of the impacts of wastewater pollution on their (iv) paddy rice yield and (v) health.

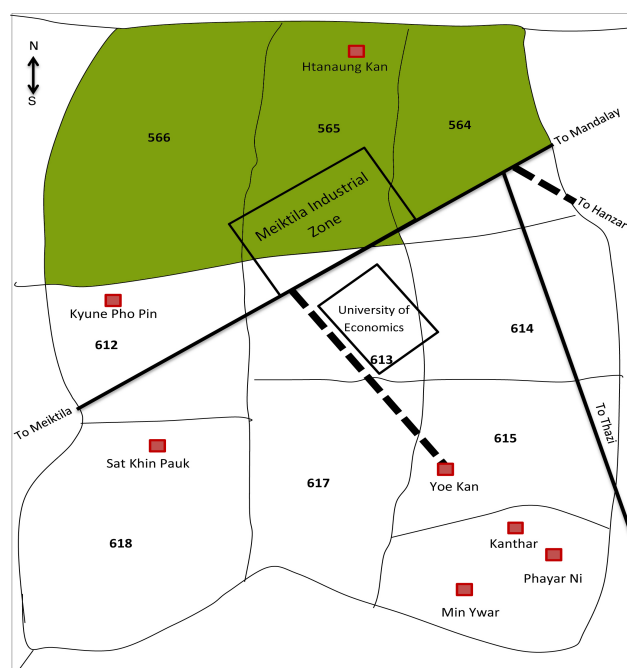


Figure 1. Location of plots 564, 565, and 566 relative to Meiktila Industrial Zone

Factors that determine yield level

The study used regression analysis to estimate the economic losses from the industrial wastewater pollution of farmlands. The independent variables explored in the production model were farm inputs and farm conditions as these influence paddy yield. Farm inputs include pesticides, natural and chemical fertilizers, and capital cost. Farm conditions include soil type, level of wastewater pollution, crop cultivation culture, and distance of farmland from the wastewater channel.

Three factors were found to influence paddy yield: (i) the wastewater pollution level, (ii) soil type, and (iii) farmland location. It was found that farms with a higher level of pollution, less fertile soil, and that are nearer to the wastewater drain experience greater yield decrease.



Source: Google Earth

Economic loss in agriculture

Results indicate that the average paddy yield is 71.49 baskets/acre for the non-polluted area (plot 566) and 43.28 baskets/acre for the polluted area (plots 564 and 565). Thus the loss in paddy yield attributed to wastewater pollution is 28.21 baskets/acre (39.46% yield loss).

Moreover, farmer-respondents report that the yield from polluted farms are perceived to be of poorer quality (i.e., lower weight) compared with that from non-polluted farms. This has resulted in a difference in selling price. Standard quality paddy is sold at MMK 5,000/basket while paddy from polluted farms is sold at MMK 4,500/basket (10% price reduction). This puts the estimated economic loss from wastewater pollution at MMK 162,690/acre, which includes the 39.46% yield loss and the 10% price reduction. For the 83-acre cultivatable polluted farmland covered by the study, total yield loss is 2,341 baskets and total economic loss is MMK 13.5 million.

If the economic loss from the 7-acre fully spoilt farmland (i.e., areas completely damaged by wastewater pollution) is included, using the estimated paddy yield loss at 71.49 basket/acre, then total yield loss is 500.43 baskets. With the cost of each basket at MMK 5,000, then total economic loss for the 7-acre fully spoilt farmland is MMK 2.5 million. This puts total

agricultural damage cost from wastewater pollution at MMK 16 million for the 90-acre polluted farmland.

Aside from the yield of polluted farms being lower compared to that of non-polluted farms, their farming cost was about MMK 49,000 higher. It was found that polluted farms had significantly higher labor cost (1% significance level), pesticide cost (5% significant level), and wastewater removal cost (1% significance level).

It should be noted that this study only considered yield loss and selling price decrease in determining the economic loss experienced by farming households as a result of industrial wastewater pollution. It does not include the cost function of production and the costs incurred from health issues, which may have increased as a result of using polluted water.

Also, aside from agricultural economic losses, a number of farmers from plots 564 and 565 have had to allocate part of their time to earn additional income to compensate for the lower return from rice farming. These farmers continue rice farming mainly to meet household consumption needs. Clearly, the economic losses determined by this study are still an underestimation because these costs are excluded.

Policy implications

There is a clear need for the MIZ administration and the responsible government agencies to act. All relevant stakeholders should be educated on the negative impacts of industrial wastewater pollution on agricultural production and on the environment in general. Putting a value on the damage caused by wastewater pollution, such as that done by this study, will help in communicating the magnitude of the problem.

The government ministry tasked with the monitoring and control of industrial wastewater discharge should work with MIZ in ensuring wastewater is treated before emission and that they abide by international wastewater emission standards. The government should also look into assisting farmers on finding more cost-efficient ways of removing wastewater from their farmlands and perhaps setting up a pond where the wastewater can be treated properly before it is used for farm irrigation.

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