

# MARINE POLLUTION HAZARDS RELATED TO AGRICULTURE

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## INTRODUCTION

For several centuries, agricultural activity (arable farming and livestock-raising) has developed in harmony with the environment. Farmers produced what nature allowed them to produce without large quantities of input.

At the end of the last century, with the introduction of fertilizers, the development of plant breeding and modern techniques of livestock-rearing and crop protection, yields have progressively grown to present the levels.

At the end of the 1970's, it became apparent that progress in agriculture had brought with it several less desirable phenomena such as the presence of residues of plant protection products in food, nitrates in ground water, the degradation of certain soils, growing uniformity of the countryside, and so on (F.A.O., 1994a).

Some of these negative effects, due to the increased agricultural activity, may also affect the marine environment. Following is an outline account of the various hazards emanating from agriculture with special reference to the Maltese Islands.

## FERTILIZER APPLICATION

In the agricultural season 1992-93, fertilizer application in the Maltese Islands was divided as follows: 125 kg/ha for nitrogen, 20 kg/ha for phosphorus and 20 kg/ha for potassium at country level with reference to the effective arable surface. In Italy the corresponding rates of fertilizer application have been reported as 53 kg/ha for nitrogen, 39 kg/ha for phosphorus and 23 kg/ha for potassium (F.A.O. 1994a).

It can be noticed that in the Maltese Islands a rather higher application of the nitrogenous element of fertilizer is applied. This high use of nitrates can have direct effects on the ground water table i.e. drinking water and also a direct effect on the marine environment. Since Malta is a small island, runoffs from Agricultural lands will in some way end up in the marine environment. If a high nitrate level is emanated in the marine environment phytoplankton and algal population growth can occur. This growth is also enhanced by phosphates also found in fertilizer applications. Thus as a result, an explosive growth of algae occurs and far more than usual die before being consumed. The subsequent process of decomposition is carried out by aerobic bacteria which in turn, multiply and deplete the water of oxygen. This sequence may be rapid and the lack of oxygen may lead to the death of fish and mother animals and plants. This eutrophication process, if rapid constitutes a form of marine hazard.

Toxins produced by algal blooms, particularly by blue-green algae, can also cause fish mortality. This can be a threat to the fish farming industries. In addition such toxins may be stored in shellfish which if eaten by man can cause several diseases such as paralytic shellfish poisoning.

## **PESTICIDE USE**

With reference to the cultivated land area, in the Maltese Island, a total of about 25kg of pesticides are applied per hectare, compared with 15kg/ha for Italy (F.A.O., 1994a). As a result of runoff, erosion and infiltration, pesticide residues can end up in the marine environment and following the different food chains, such harmful residues can end up in fish.

## **IRRIGATION AND DRAINAGE**

A rational management of irrigation is needed to prevent any negative effect on the environment, due to the eventual leaching of fertilizers and/or toxic compounds. A superficial regulation through a proper drainage can allow a correct irrigation and a proper infiltration of the meteoric waters. So superficial ground waters can be recharged and the runoff / rainfall ratio improved.

## **MECHANIZATION AND LAND CULTIVATION**

The fast productive and technological development of Agriculture during the last 50 years has involved an intensification of mechanization and the adoption of new tillage techniques. In some cases negative for the natural resources of the ecosystem.

The techniques of land cultivation must avoid the degradation of the physical, chemical and biological properties of the soil; i.e. the relations among porosity, content of organic matter and micro-organism activity must give the soil the same constant and self-regulating characters peculiar to the natural ecosystem.

Soil degradation linked to mechanization and land cultivation is mainly due to the many and deep socio-economic changes occurred in agriculture. At present farmers have a double function:

- (a) producers of primary goods to sustain man's life;
- (b) the control and the management of the territory.

## **SOIL EROSION**

In the Maltese Islands care must be taken since soils are at a high risk of erosion and environmental unbalance. Cultivation of land will bring about the loss of natural means of holding the soil together e.g. particular trees and other plant species.

Most of the soil erosion will undoubtedly end up in the marine environment. Most of it will sediment and it may be a danger to fish breeding grounds. Some proportion may remain for a longer period in the moving waters. If this is found in high quantities, this can end up in fish gills diminishing respiration and thus decreasing the fish's ability to cope in the environment. This is particularly important near fish farms where such an effect can reduce fish growth (Winpenny, 1991).

## **AMMONIA AIR POLLUTION**

Livestock farming and particularly the spreading of effluent lead to the release of ammonia into the atmosphere. It is thought that 95% of ammonia emission in Hungary comes from farming - livestock, plants, fertilizer application and emissions from the soil (F.A.O., 1994b).

Ammonia can be oxidized into nitrate which act also as a fertilizer, dissolving in the marine environment and enhancing algal blooms,

## **LIVESTOCK SOLID WASTES**

In the Maltese Island livestock solid waste is directed into the drainage system or is removed by bowsers and later discharged at sea through the sewer. This will further enhance algal blooms.

## **CONCLUSIONS**

Thus, summarizing, agricultural development on the marine environment will result in the following impacts:

### **Primary impact**

Agricultural Intensification/bigger production etc...

### **Secondary impacts**

Increased fertilizer application N,P and K  
Increased pesticide application,

### **Tertiary impacts**

Eutrophication due to runoff and leaching - algal blooms (fertilizer applications)  
Lethal poisoning of fish and other marine life (both from pesticides residues and Algal blooms)  
Sub lethal fish poisoning - food chain continued

Besides, there can be also some socio-economic effects of marine contamination by agricultural practice. These can include:

Navigation channels blocked by weeds  
Algal blooms affecting surface water quality  
Bio-accumulation of pesticide residues in humans  
Threat to export of fish from aquaculture establishments.  
Lower fish catches inducing higher prices and loss of income to fisherman.

Thus there can be several negative impacts due to agricultural intensification in relation to the marine environment. Some of these can have long term effects and others are usually short termed. It is important that such issues are adequately addressed, so that our marine environment will not suffer unduly from such negative effects.

On the other hand agriculture still has a positive effect on the marine environment. The area under cultivation still absorbs hundreds of tonnes of farm yard manure, and now through composting, a substantial proportion of domestic organic wastes. These wastes would otherwise end up in the sea with much more serious negative effects. Land cultivation and rubble walls contribute also to the conservation of soils, reducing soil erosion and soil run-off into the marine environment.

## **REFERENCES**

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