EFFECTS OF CONTOURED ROCKWALLS ON SOILS: THE ATA EXPERIENCE

Rowe V. Cadeliña and Rodrigo Puracan

Introduction

As mentioned elsewhere in the other paper in this volume the farms of the Ata are undergoing rapid deterioration. Top soils are virtually gone and those that have remained are no longer fertile. Through our Silliman University Research Action Development Program in the Uplands, an intervention project had been introduced to the Ata during the last three years. This intervention project is generally known as farming systems development.

The farming systems development project of the Ata has two major components. One is on cropping system and the other is on soil conservation and development. While soil conservation and development is essentially introduced to protect the remaining soils on the farms of the natives, cropping system also indirectly addresses the improvement of the fertility and the restoration of organic composition of the soil. Hence, the two related activities as implemented are designed to improve the soil condition of the farms of the Ata.

Having been introduced to the community around three years ago, the Ata project is expected to have brought in some positive effects on the soils of the farms. This paper, therefore, attempts to asess the present conditions of the soils of the Ata farms.

ISSUES AND PROBLEMS

Considering the limitation of the laboratory services available to us, we decided to limit our analysis of the soil condition on two major indicators. One is on the level of acidity and the other is on the macronutrient counts of the soil. Nitrogen, potassium and phosphorous were three macronutrients considered.

One of the anticipated effects of rockwalls is the accumulation of eroded soil from the hillside on the catchment areas along the sides of rockwalls. If the accumulation of erosion is effective, it is assumed that the thickness of "trapped" soil increases. This

increasing accumulation of top soil is expected to improve the pH level of the soil. In a highly eroded land area, the pH value is expected to decline tremendously making the soil highly acidic.

Since both the soil conservation and the cropping systems are designed to improve soil fertility, some macronutrients will be positively affected. The introduction of leguminous crops such as cajanus cajan along rockwalls is expected to improve nitrogen content of the soil. The growing of peanuts, mung beans and other legumes are also assumed to bring higher nitrogen reading on the soil.

The decomposition of organic matter will cause all those macronutrients trapped in the plant tissues to be pumped back into the soil. Assuming that the "nutrient pumping" into the soil is approximately positive for all macronutrients, an increase on most of the macronutrients can be expected in areas where rockwalls have been installed. Since erosion is prevented from taking place, "pumped-in" macronutrients from organic materials can also be trapped in the soils held by the rockwalls.

The following questions are raised in this paper:

(1) Are there soils trapped by rockwalls? Is there any indication of increase?

(2) What is the status of macronutients in farms where rockwalls have been installed?

FIELD PROCEDURE

For trapped soils, monitoring was done by ocular inspection of soil catchment areas of rockwalls. This ocular inspection was done regularly with occasional measurements of thickness of soil trapped especially after heavy rains.

To determine the effects of rockwalls on soil pH and macronutrient content, soil samples were taken from two sites. Soil samples were taken from areas where rockwalls are constructed and from areas where no rockwalls are established. Holes with a diameter of six inches were dug four inches deep into the ground

and around one-fourth of an inch of soil was scrapped from the side of the soils. Holes were randomly distributed within a specified area.

Ten trials were made for each area with rockwalls and those without. The soil samples were analyzed by the provincial soils laboratory in Negros Oriental.

RESULTS

It should be noted that cropping development has been only limited on area where soil conservation measures have been introduced. Hence, it must be assumed that whatever changes in soil macronutrients are taking place on the developed areas, those changes should be considered as the results of cropping and coil conservation measures.

Soils Trapped By Rockwalls

Field observation on soil catchment areas of rockwalls shows that a substantial amount of soil has been trapped. Trapped soils range from one inch to two inches in thickness with a width of around four to six inches. During a period of 12 months, observation showed an increasing thickness of the soil trapped by rockwalls. This suggests certain level of efficiency of rockwalls in preventing soil from erosion. Hence, the soil within the 18-hectare farm land which the Ata now cultivates is no longer threatened by erosion.

Soil pH

The higher the pH level of the soil, the more favorable the soil is for crops. Otherwise, the soil will have poor supporting capacity of plant life. This is expected since pH value usually results from extensive soil erosion and loss of nutrients either by leaching or by plant use.

The pH level can be improved by keeping soils from erosion and increasing organic materials on the ground. Since the new system of the Ata allows more biomass and tissues to decompose in the ground and the soil conservation measures protect the soil from erosion, an improvement on the pH reading can be expected on the developed farms of the Ata.

Table 1 shows the results of the laboratory analysis of two sample groups of soils. Soil samples for rockwalled areas yielded a higher pH reading compared to that yielded by the soil samples taken from those sites without rockwalls. The former is higher by around four percent compared to the latter.

Variation from the mean of the pH value for soil samples taken from areas with rockwalls is smaller compared to those found among soil samples from areas without rockwalls. This suggests that in the former category of samples, we tend to find a consistently high pH reading, although they may not be statistically significant. In those areas without rockwalls, pH reading tends to be on a lower level and more erratic. This implies that the cropping system and the soil conservation measures tend to have a positive uniform effect on the soil pH. Such effect is now taking place in the Ata farms.

Macronutrients

Three macronutrients are considered. These are nitrogen, potassium, and phosphorous.

Nitrogen: Measured by percentage of organic materials, soil samples were tested for nitrogen content.

Table 2 shows that the soil samples taken from sites with rockwalls have higher nitrogen contact compared to soils from areas without rockwalls.

The former is higher by around 72% than that of the latter Percentage of organic matter content in the soil tends to be consistently high in most of the soil samples from areas with rockwalls. This is suggested by the low coefficient of variation from the mean (33%) of soil samples from areas with rockwalls compared to that established (81%) for soil samples coming from areas without rockwalls. Nevertheless, the difference appears to be not statistically significant yet.

The data sugest that both the cropping system and the soil conservation development have improved the nitrogen supply in the soil. Obviously, the emphasis on leguminous crops as one of

the buffer plants against the rockwalls must have contributed to the increment of the reading on organic matter content. The level may still be low for both, but indications suggest an improvement in those areas where rockwalls have been introduced.

Potassium: For potassium, the treated areas yielded higher reading compared to those coming from the untreated sites. Soil samples from sites with rockwalls yielded 61 parts per million of potassium; while soil samples from sites without rockwalls yielded only 56 parts per million. The former is higher by around nine percent from the latter (see Table 3). This result, however, is not statistically significant.

Reading of potassium level for soil samples from sites with rockwalls tends to be consistently high and homogeneous. This suggests that the farming systems intervention program or the Ata must have a unifying effect on the condition of macronutients like the amount of potassium available in the soil for plant use. In areas where no such intervention is implemented, potassium content level tends to be generally low while its distribution on the ground is generally erratic and fluctuating. This is expected since the areas do not have any controlling machines on the supply and utilization of soil nutrients.

It is apparent from the data that the intervention package must have started to have its effect on the soil. The continuation of this effect will obviously have to depend on a sustained practice of the recommended appropriate cropping systems and soil development.

Phosphorous: Unlike other macronutrients, phosphorous yielded the highest margin of content from the sites with rockwalls compared to the sites without rockwalls. The difference is around 83%. For sites with rockwalls, the average parts per million of potassium is 174 in contrast to only 95 for sites without rockwalls (see Table 4).

Like the other two nutrients just discussed, phosphorous content tends to be uniformly high on sites that are developed toward appropriate farming systems. The opposite is taking place on sites where such development is not taking place.

Table 1

The pH Value of Soils From Two Samples

Samples Types of Soils	No. of Test Soil Samples	Average pH Value	Coefficient of Variation	
Soils from areas with rockwalls	10	7.2	44%	3.168
Soils from areas without rockwalls	10	6.9	57%	3.933
t = .1878 NS		.30		

Table 2

Nitrogen Content of Soil From Two Samples

Types of Soil Samples	No. of Test Samples	Average Percentage of Organic Matter	Coefficient of Variation	
Soil Samples taken from sites with rockwalls	10	4.5	33%	1.485
Soil Samples taken from sites without rockwalls	10	3.7%	81%	2.997
t = .7563 NS				

Table 3

Potassium Content Level From Two Soil Samples

Types of Soil Samples	No. of Soil Test Samples	Average Parts Per Million of Potassium	Coefficient of Variation	—
Soil samples from sites with rockwalls	10	61	51%	31.11
Soil samples from sites without rockwalls	10	56	71%	39.76

t = .3131 NS

Table 4

Phosphorous Content Level From Two Soil Samples

Types of Soil Samples	No. of Soil Test Samples	Average Parts Per Million of Phosphorous	Coefficient of Variation	
Soil samples from sites with rockwalls	10	174	57%	99.18
Soil samples from sites without rockwalls	10	95	65%	61.75

t = 2.138 Sign .05

SUMMARY AND CONCLUSIONS

Three issues were explored: (1) soil trapping capability of rockwall; (2) pH level, which suggests the general nutrient condition of the soil; (3) macronutrients. Because of the limitation of the laboratory facility, only the macronutrients were tested.

For the last two issues, a comparative approach was used. Soil samples from farms with and without rockwalls were taken and their average pH and macronutrient readings were recorded. The effects of rockwalls on these issues were measured by the difference of readings between the two samples.

On the basis of the data just presented, the following conclusions are drawn:

(1) Indications show that the contoured rockwal s on the Ata farms are effectively trapping eroded soils;

(2) The pH level of the soil has been improved by rockwalls since soils are prevented from erosion. The introduction of new cropping system into the rockwalled areas must have also helped improve the general nutrient condition of the soil;

(3) Contoured rockwalls and the appropriate cropping system introduced have collectively brought positive effects on the macronutrient condition of the soil. In all three types of macronutrient (nitrogen, potassium and phosphorous), indications for higher readings have been noted for samples taken from sites where rockwalls have been established;

(4) Improved farm productivity can be expected in the next ten years especially if there is a continuing practice of appropriate cropping system as well as maintenance and expansion of rockwalls.