PRODUCTIVITY CHANGES OF THE ATA: EFFECT OF AGRICULTURAL INTERVENTION ON NATIVE TRIBAL POPULATION

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Introduction

The ultimate test for effects of intervention activities on ming practices is farm productivity. Since productivity rep- ents the results of the interaction between various biophysi- and chemical qualities of the land, changes in the production el suggest an over all condition of the farm with re- d to its capability to support plant life. Of course, other ex- eous factors have to be considered such as rainfall and other atological factors. Given a particular nature of the climatolo- l forces, production level of the farm can therefore be attri- ed to the biophysical and chemical characteristics of the farm. ce, productivity changes can serve as indicators for changes the soil characteristics of the farm.

About three years ago, the Ata in Cangguhub, Mabinay, Ne- Oriental started introducing in their farms soil conservation ures designed to conserve and improve the soil conditions. iously, such measures did not provide immediate effects on crops. If their effects in the farms were positive, over time, farm productivity level can be expected to rise. Otherwise, the ctivity level of the farm can be conversely expected to de- e.

RM PRODUCTIVITY OF THE ATA: RESEARCH ISSUE

Farm productivity is a composite measure of output of a . As a measure, it has both time and crop component. Time ntially represented by one agricultural cycle which may in- e the multiple planting and harvesting "episodes" of similar . The "episodes" of harvesting are usually done in a series or

sequence since serial or sequential planting of similar crop may be introduced. Hence, sequential harvesting may take place during one agricultural cycle.

The crop component would include the variety of crops grown simultaneously during one agricultural year. Hence, multiple varieties of crops may be harvested simultaneously during one agricultural cycle from a particular piece of land.

Farm productivity, therefore, measures the total harvest of a particular crop as well as all the other crops harvested during one complete agricultural cycle.

One agricultural cycle among the Ata involves three croppings of corn. The most common is two croppings; the least common is three croppings. Corn, a staple crop, is a permanent crop. Cassava and sweet potato, which are annual crops, are planted as supplements — hence, considered as famine crops.

Unlike corn, root crops are planted only once a year and it is usually harvested toward the end of an agricultural cycle. The end of an agricultural cycle is marked by the coming of the dry season.

The beginning of an agricultural cycle, on the other hand, is evidenced by the coming of the rainy season after the dry season. This happens between the months of May to July.

An agricultural year among the Ata therefore, could have the following months composition—from May to April, from June to May, or from July to June. If the rain comes during the months of May or June and the rain continues until January the next year, the Ata generally plant and harvest corn three times in one agricultural year. Otherwise, they only plant and harvest twice a year.

The first cropping in one agricultural year is known as *panuig*, the second cropping as *ulilang*, and the third, *pangagpas*. On the basis of production, the *panuig* tends to have the highest production level per unit area of land. This is expected, since the land has been given a brief fallow period after the last cropping of the previous agricultural year.

The second cropping produces lower than what is yielded by the first cropping. This is expected, since the farm has not been given enough time to rest unlike what had happened in the *panuig*. Since the *ulilang* cropping uses the same plot where the *panuig* production took place, the soil nutrients left for the *ulilang* will be more limited compared to that of the *panuig*.

Similar problem holds true for the *pangagpas* cropping. Production level of the *pangagpas* tends to be lower to that of the *ulilang*. The exhaustion of soil fertility for the tribal cropping will obviously bring down production level. Since the Ata no longer have the luxury of shifting cropping sites, farms are cultivated twice or thrice in one year. This repetitive use of similar piece of land will obviously hasten nutrient lose and reduce farm productivity.

The introduction of mixed and rotation cropping systems of leguminous crops (peanuts, mungbeans, soya bean, and others) with their staple crop (i. e. corn) are expected to help improve productivity level of the Ata farms.

ATA PRODUCTION LEVEL: BASELINE DATA

In 1983-84, farm production data of the Ata farmers were collected for one agricultural year. The activity went on from March 1983 to February 1984. This took place immediately before the intervention program on farm systems development was introduced in 1985.

On the average, the Ata households were cultivating barely one hectare. Two subsistence crops were planted: corn and root crops.

Eighteen Ata households were monitored from March 1983 to February 1984 and data showed that, on the average, 97 percent of the household production in its farm consisted of corn and root crops.

An Ata household, on the average, consisted of five individuals (Oracion 1984-; 99). For a period of 12 months, an average Ata household was producing around 106,071 calories of corn and root crop from a barely one hectare piece of land. This would suggest that from agriculture alone, the Ata were producing far below than what an average Ata needs for his caloric requirement (see FNRI 1980). Hence, his caloric deficit has been supplemented by food products derived from exchange (see Oracion 1984:81-105).

The following table shows the pattern of harvesting and the volume of the crops harvested or produced from farm by an average Ata household.

Using the "Food Consumption Tables" of the FNRI (1980), the caloric production level of the Ata farm was tremendously low during the 1983-84 agricultural year. A slightly less than one hectare farm during that time was only producing between three to four cavans of unmilled corn. Such level of productivity suggests the level of degradation of the farms of the Ata during that period.

Indeed, an intervention program on the development of their farms was necessary. In 1985, farming systems development was introduced. Rockwalls and other soil conservation measures were introduced along with appropriate cropping systems. Three years later, production of their farms was monitored.

1988 PRODUCTION LEVEL OF ATA FARMS: RESULT FROM FARMING SYSTEMS DEVELOPMENT

During the 1987-88 agricultural year, farm productoin was monitored. The data revealed similar types of products during the 1983-84 agricultural production count. Root crops constituted only less than five percent of the total farm production and the rest consisted of corn. Hence, root crops contribution to the total household production is very insignificant.

Table 1

Estimated Monthly Caloric Production of An Average Ata Household From Its Farms (Barely One Hectare In One Agricultural Year of 1983-84). Estimated from Oracion's (1984:77) per capita caloric production from farm per month.

Month (1)	Household Caloric Production From Barely One Hectare Farm: Corn (2)	Root Crops (3)
March 1983	8,667	270
April	128	511
May	none	364
June	none	99
July	none	128
August	2,379	none
September	49,448	none
October	17,365	none
November	2,747	357
December	5,967	991
January 1984	12,484	517
February	3,649	none
Total Average Annual Caloric Production	102,834	3,237

Twenty-three farm sites were monitored during the 1987-88 agricultural cycle. Sixty-one percent of these farms have been provided with soil development and protection devices, and the rest were not. The total area of the farms developed with soil protection devices is approximately 10 hectares while those without any soil conservation measures have a total area of 7.

The soil development inputs in the farms consisted of contoured rockwalls and contoured canal system. In addition to these, hedgerows of ipil-ipil (*Leucaena leucocephala*) and napier grasses are planted along the sides of the rockwalls and the canals.

Corn production was monitored on a daily basis during the maturity of the crop. The number of ears of corn harvested were recorded. The recording was made every six o'clock in the afternoon in order to include those harvested during the early and the later part of the day.

To provide a meaningful measurement of production in relation to food requirement of an average Ata, the total number of ears of corn harvested were converted into its caloric equivalent value.

The data on production from farms with and without soil development inputs provide an excellent synchronic indicator on the effects of these inputs of soils as reflected by the production differential between those farms with and without soil development inputs. Obviously, it can be initially claimed that those farms with soil development inputs will have higher productivity level than those without soil development inputs.

Table 2 shows the detailed production related information for every 23 cases of farm units. For each case, information on the size of the farm, the total number of ears of corn produced, the estimated level of production per hectare per *panuig* harvest, and the presence and the types of soil conservation measures introduced into every farms are provided. With these data, one can initially observe that those farms with soil development inputs tend to produce relatively higher than those without these inputs.

Table 3 shows that those farms with soil development inputs estimated to produce during *panuig* harvest around 6,861 ears corn per hectare. This is around seven cavans (6.9 to be exact approximately equivalent to 350 kilograms).

On the other hand, those farms without soil development inputs produced only 4,689 ears of corn per hectare during the *panuig* harvest. This is around 4.7 cavans (approximately equivalent to 250 kilograms).

Those farms with soil development inputs produced higher around 47 percent compared to without soil development inputs. Such difference can be attributed to the positive effects of soil development activities on the farms of the Ata.

On a household level, production during the *panuig* harvest approximately 4.8 cavans from those farms with soil development measures. On the other hand, those households that have not developed their farms toward soil improvement only produce around 3.9 cavans per *panuig* harvest. The former is higher by around 23 percent from that of the latter. Those domestic animal owning farms that are developed with soil protection tend to have higher per capita production during *panuig*. The former will have a per capita production of around one cavan while the latter will have less than one cavan. The difference is around 44 percent.

Since production in this study is reckond with a complete agricultural cycle, the succeeding corn cropping have to be likewise measured in order to determine the total production level of the farms. As mentioned earlier, the Ata may have a second cropping (*Ulilang*) and a third cropping (*Pangagpas*) depending on the availability of rainfall.

Compared with the first cropping, the second cropping generally drops at around 50 percent in terms of area cultivated and level of production. The third cropping decreases by 75 percent in terms of cultivation and level of production per unit of land. The decline is caused by the limited time between harvesting and cropping and the inadequate exposure of the cultivated land to sunlight

Table 2

Corn Production Profile of Major Cropping (Panuig) in 1988

Case (1)	Size of Farm(Ha.) (2)	Total # of ears produced (3)	Estimated Production Per Hectare For Panuig (Ears) Col. 3/col.2) (4)	Soil Development Inputs (5)
1	1.90	5,738	3,020	Contoured canal and hedgerows of napier
2	.10	1,372	13,720	Contoured rockwalls with ipil-ipil and napier grass
3	.33	2,196	6,655	None
4	.25	3,590	14,360	Contoured rockwalls with ipil-ipil hedgerows
5	.10	612	6,120	None
6	1.50	9,270	6,180	None
7	.25	2,600	10,400	Contoured rockwalls
8	1.50	5,830	3,887	None
9	.33	3,870	11,727	Contoured rockwalls and hedgerows of napier
10	.80	3,528	4,410	Countoured rockwalls, canal with napier grasses
11	1.80	6,814	3,786	Countoured rockwalls with ipil-ipil
12	.33	3,119	9,452	Countoured rockwalls with ipil-ipil
13	.33	1,964	5,952	Countoured rockwalls with napier grass
14	.75	4,949	6,599	None
15	.50	3,549	7,098	Countoured rockwalls with napier grass
16	.50	3,470	6,940	Countoured rockwalls and canals with napier hedgerows
17	1.00	1,465	1,465	None
18	.33	3,810	11,545	None
19	1.00	3,942	3,942	None
20	1.00	12,345	12,345	Countoured rockwalls, canals
21	1.40	12,642	9,030	Countoured canals
22	.33	2,776	8,412	Countoured rockwalls with ipil-ipil
23	.9	2,670	2,967	None

Table 3

Comparative Corn Production Level of Major Cropping (Panuig) In 1988 Between Farms With and Without Soil Development

Types of Farm (1)	Total Area of Farm (2)	Total Number of Cases (3)	Total Number of Ears Produced (4)	Estimated Panuig Production Per Hectare (Ears) (Col. 4/Col. 2) (5)
With soil development inputs	9.82	14	67,377	6,861
Without soil development inputs	7.41	9	34,744	4,689

before planting for the second and third planting, and the depletion of soil nutrient during the second and more especially for the third cropping.

Two estimates of farm production during one agricultural cycle were developed: "Minimum Estimate" and "Maximum Estimate." In the "Mininmum Estimate," we assume that the Ata made only two croppings of corn in one agricultural cycle. For the "Maximum Estimate," three croppings were assumed to be practiced.

For the "Minimum Estimate," Table 4 shows that the 14 cases of farm lands with soil protection devices and having a total area of 9.82 hectares yielded a total of 84,221 ears of corn. This is approximately 84 cavans with a total weight of around 4,200 kilograms. Per hectare, the production level of these farms is around 8.6 cavans weighing approximately 430 kilograms. Per household, the production is approximately six cavans for one agricultural year. This is equivalent to 300 kilograms. Assuming that there are five individuals, on the average in an Ata household, this would suggest a per capita production of slightly one cavan per one completed agricultural cycle.

For the farms without soil development inputs, a "Minimum Estimate" of production for one agricultural cycle was also computed. These farms involved a total land area of 7.41 hectares occupied by nine families or households. These types of farms have a total production of 43,419 ears of corn for one agricultural cycle (see Table 4). This is equivalent to around 43 cavans or 2,150 kilograms. Per hectare, the yield is around 290 kilograms or around 5.8 cavans. Per household, the annual production is around 4.8 cavans or 240 kilograms. This would indicate a per capita production of less than a cavan or around 48 kilograms per annum.

The percentage difference of our minimum production estimate between those farms with soil development inputs and those without these inputs is around 95 percent, with the first type of farms leading. This further suggests a positive effect of our soil development activities in the Ata farms.

For our maximum production estimate, those farms with soil development inputs yielded an annual production of 88,509 ears of corn (see Table 5). The land as we saw earlier, involved an area of 9.82 hectares with 14 cases of farming families or households. The total annual production is equivalent to around 89 cavans weighing 4,450 kilograms. The annual yield level per hectare is around nine cavans or approximately 450 kilograms. Per household, this would suggest a productivity value of around six cavans or 300 kilograms. On a per capita level, an individual would must have produced annually around 60 kilograms or slightly over one cavan.

Among those farms without soil development inputs, our annual maximum annual production estimate is 45,646 ears of corn. (see Table 5). This is approximately 47 cavans or 2,350 kilograms. At this level, our per hectare estimate is around six cavans or 300 kilograms. Per household, this would mean a production of around five cavans or 250 kilograms.

Comparing the annual productivity level of the farms using the maximum estimate, the farms with soil protection measures yielded higher than those otherwise farms. The difference is around 94 percent, an indication of positive effects that soil conservation brings into the Ata farms.

To make our data comparable to the 1983-84 data and meaningful in the context of the Ata food consumption, our production figures were all converted into calories, a measure of energy derived from food (see Table 6). Two estimates were also made for the total annual caloric production: minimum and maximum.

Using the minimum estimate, an average Ata household with a farm that is developed with various soil protection measures has a total annual caloric production of around 258,077. On a per capita basis, considering that an average Ata household has five members, the annual per capita production level is only 51,615 calories. For households whose farms are not yet provided with soil development measures, the total average annual household production is around 206,873 calories. Among these households, their individual members have an average annual share of only 41,375 calories.

Table 4

Cooperative Corn Production Level During One Agricultural Cycle (Panuig and Ulilang) In 1987-88 Between Farms With and Without Soil Development Inputs (Minimum Estimate)

Types of Farms (1)	Panuig		Ulilang		Total Production of Corn During One Agricultural Cycle (Col. 3 + Col. 5) (6)
	Total Area of Farm (2)	Total Number of Fars Produced (3)	Total Area [1] of Farm (4)	Total Number of [2] Ears Produced (5)	
With soil development inputs	9.82	67 377	4.91	16,844	84,221
Without soil development inputs	7.41	34,744	3.70	8,675	43,419

[1]Total area of farm during Ulilang generally declines by 50 percent from that of the Panuig.

[2]Average production per hectare during the Ulilang generally declines by around 50 percent from that of the Panuig.

Table 5

Comparative Corn Production Level During One Agricultural

Comparative Corn Production Level During One Agricultural Cycle (Panuig, Ulilang, and Pangagpas)

In 1987-88 Between Farms With and Without Soil Development Inputs (Maximum Estimate)

Types of Farms (1)	Panuig		Ulilang		Pangagpas		Total Production of Corn During One Agricultural Cycle (Col. 3+Col. 5+Col. 7) (8)
	Total Area of Farm (2)	Total Number of Ears Produced (3)	Total Area of Farm (4)	Total Number of Ears Produced (5)	Total Area 1 of Farm (6)	Total Number of 2 Ears Produced (7)	
With soil development inputs	9.82	67,377	4.91	16,844	2.5	4,288	88,509
Without soil development inputs	7.41	34,744	3.70	8,675	1.9	2,227	45,646

[1]Total area of fare during Pangagpas generally declines by 75 percent from that of the Panuig.

[2]Average production per hectare during Pangagpas generally declines by around 75 percent from that of the Panuig.

Under a maximum estimate, an Ata household draw an annual production of around 271,189 calories from farms that are already provided with soil development measures. From those farms without soil development measures, a household only derived an average annual production of 217,360 calories (see Table 6).

An increment factor of five percent should be added to the minimum production estimate for both farms with and without soil conservation measures introduced. This correction factor should also be added into our maximum production estimate.

A correction factor of five percent is to take into account the calories that were derived from root crops. Other data base from our production monitoring activities suggest that root crop only takes around five percent of the calories derived from corn. This correction factor has to be added into our minimum and maximum estimates for annual caloric production (see Table 7).

On the whole, however, the production level is still very much lower compared to what an average Ata needs to keep himself alive. Using the recommended caloric requirements for an average Filipino, an Ata would need approximately 1,957 calories per day (FNRI 1980). The annual per capita caloric production for persons whose farms are already provided with soil protection measures, under our minimum estimate, can only last for 28 days. For our maximum estimate, it can only last for 29 days. This would mean that the Ata would have to take the other required calories for the rest of the year from another source. Oracion's (1984) study revealed that wage labor would provide a significant contribution to the total caloric need of the population.

Among those farms without soil conservation measures, per capita caloric production is worst. For our minimum estimate an individual caloric supply can only last for 22 days, while for the maximum, 23 days.

Individuals owning farms with established soil protection get more calories by around 27 percent than those who are working on farms without soil protection. This suggests that more be

Comparative Household Caloric Production From Corn During One Agricultural Cycle in 1987-88 Between Farms With and Without Soil Development Inputs

Types of Farms (1)	Minimum Estimate: Households Number of (2)	Minimum Estimate: Total Caloric Production[1] (3)	Minimum Estimate: Per Household Caloric Production (4)	Maximum Estimate: Number of Households (5)	Maximum Estimate: Total Caloric Production (6)	Maximum Estimate: Per Household Caloric Production (7)
With soil development inputs	14	3,613,081	258,077	14	3,796,650	271,189
Without soil development inputs	9	1,861,860	206,873	9	1,956,240	217,360

[1]Caloric production was computed by converting total number of ears of corn harvested into cavan. One cavan is equal to approximately 1,000 ears. One cavan was then converted into kilograms which is equivalent to 50 units. To get the edible portion of corn, the total kilograms produced was multiplied by 6. The result was divided by 100 and then multiplied by 143 calories which is the caloric value of 100 grams of edible portion of white corn (see FNRI 1980:6). White corn was chosen since the Ata only produce white corn.

Table 7

Average Annual Caloric Production After Correction Factor Has Been Added Into Minimum and Maximum Production Estimate

	Minimum Estimate		Maximum Estimate	
Types of Farm (1)	Average Household Caloric Production (2)	Average Per Capita Caloric Production (3)	Average Household Caloric Production (4)	Average Per Capita Caloric Production (5)
With soil development inputs	270,981	54,196	284,748	56,950
Without soil development inputs	217,217	43,443	228,228	45,646

efits will be coming to the Ata household as the soil development easures continue to restore and improve the soil condition of e farms. At present, the soil development measures established the farms are barely three years old. Since the effects of these easures are long term, we can expect more increase in the ming years.

Table 1 shows that an Ata household during the 1983-84 crop ar produced only 106,071 calories (corn and root crops) for whole agricultural cycle. This is approximately two to three ans. For 1987-88 agricultural production, an Ata household producing 270,981 calories for our minimum estimate and 748 for our maximum estimate. These yield levels were all en from our experimental farms where soil protection and de- pment measures have been introduced. Since there was no ing systems development program introduced yet in 1983-84, increase in yield during the 1987-88 agricultural year could ttributed to the soil development inputs established in 1985. gricultural year 1987-88, around three years after the estab- ent, the effects of the soil development measures began to

The 1987-88 household caloric production is higher by around ercent for our maximum estimate and 155 percent for our um estimate from that of the 1983-84 crop year production. crease, after the soil development activities have been intro- can be attributed to these farm inputs. However, other s like rainfall and weather condition may affect pro- ity level aside from soil development measures intro- into the farms. Hence, control farms were monitored for productivity during the 1987-88 agricultural year. There ine control farms with a total area of 7.41 hectares. These not provided with any soil protection and development es. The assumption is that any increase in production in ntrol farm could be attributed to other factors like better condition and absence of pests, just to mention a few, the soil development inputs.

e control farms yielded an average household production 217 calories for our minimum estimate and 228,228 calories maximum estimate. The differences between our control

Table 8

Percentage Increase in Production in 1987-88 and 1983-84 Agricultural Year

Production Estimate	Percentage Increase In Production of Control Farms (1987-88) From that of the 1983-84 Agricultural Year % (1)	Percentage Increase In Production of Experimental Farms (1987-88) From that of the 1983-84 Agricultural Year % (2)	Percentage Increase In Production of Experimental Farms (1987-88) Caused by Soil Development Inputs From that of the 1983-84 Agricultural Year (Col. 2 - Col. 1) (3)
Minimum estimate	100	155	55
Maximum estimate	115	168	53

farm production in 1987-88 from that of our 1983-84 production level are around 100 percent for our minimum estimate and for maximum estimate, the difference is 115 percent.

Table 8 shows the estimated percentage increase in production as caused by the introduction of the soil conservation measures.

Table 8 shows the increase in production of our experimental farms (those with development inputs) that can be attributed to the changes in the soil condition caused by our soil development activities. For our minimum estimate of production, around 55 percent in the increase in yield of our experimental farm can be attributed to the soil development inputs; for our maximum estimate, around 53 percent.

SUMMARY AND RECOMMENDATIONS

Using a quasi experimental and diachronic monitoring of farm productivity, the study demonstrated the changes in production caused by an intervention project designed to improve the soil condition of the Ata. Longitudinal productivity data with an interval of around four years were compared. Another synchronic data sets were compared by taking into account the production level of experimental and control farms. The experimental farms were those provided with soil development inputs while the control farms were those without soil development inputs.

The data showed a positive increase in the production level of the experimental farms. Around 53 to 55 percent of the increase was caused by developmental inputs that were introduced into the farms.

For developmental implications, soil conservation and improvement should be given top priority in farming systems development. Especially in areas where soil erosion has already proceeded in advanced stage, soil conservation development should be considered as the foundation for another development effort to be introduced later. Cropping systems development would

be meaningless under a condition where the soils are not managed effectively. The study showed that by concentrating primarily first on soil conservation, the Ata farmers were able to increase their production within a period of four years after the measures have been introduced. Although their total annual household production is still very low, an increase in yield is in fact true. Continuing increase in yield can be expected over the years since the effects of these measures are long term.

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