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CONTENTS

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Philippine Geographical Journal, Vol. 35, No. 2
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EDITORIAL

THE BLEEDING OF THE UPLANDS

The bleeding of the uplands is the ugly process that is generally ignored by both the users of the land and the resource scientists. The bleeding processes are synonymous with the loss of vigor in land productivity brought about by the misuse, abuse and the consideration/belief that the uplands are secondary only to the lowland plains as the traditional sources of food and other economic needs.

For so long, the development efforts in the upland lack the urgent element of sustainability and at best are palliative in concept, with the aim merely of augmenting the development needs of the lowland. Understandably, the net effects of such a secondary role of the uplands in the total national development efforts is the decline in land and human resource productivity.

The present land use systems are historical imprints of national neglect as the uplands are transformed with the growth in population. It is significant to note that despite the ideal conditions for multiple cropping in the Philippines, every place in the countryside is characterized by the dominance of coconut, rice and corn. These crops provide the key composite of the general land use pattern in the country.

Should the present strategies continue to exacerbate the bleeding processes that characterize upland utilization, the near future will no longer be able to react positively to the growing needs of the population in the Philippines and elsewhere in the world where uplands are treated as a residual strategy for development — *rather than the key or central framework for national development.*

It is a fact that the uplands represent the last and viable alternative to the full transformation of the terrestrial ecosystems as the "natural life support systems" that will sustain the quality of life of a growing population.

The bleeding in the upland occurs in the following ways:

1. *Physical form* — This is the most noticeable form of upland bleeding that affects the sustainability of development in the uplands. Better known as land degradation, the bleeding process is brought about by:

    a. erosion of the uplands
    b. salinization of the lowland coastal areas
    c. sedimentation of the estuary or the river mouth
    d. pollution of the soil caused by excessive use of fertilizers, pesticides and other agrochemicals

2. *Socioeconomic form* — This refers to the dynamics of human

influence on the overall productivity of the uplands and includes:

a. emigration-immigration of potential labor force
b. access to credit, market and other development services
c. land use conversion
d. availability of and access to appropriate and acceptable technologies

Why do the uplands bleed? The bleeding of the uplands can be attributed to various causes. These factors can be treated in terms of their single and/or combined multiple effects on the long-term productivity of the upland farms and their socioeconomic institutions.

The concept of *economic viability*, which provides the penultimate measure of productivity, makes the uplands the marginal areas for economic utilization vis-a-vis agricultural development. *The legal process of land classification is based on the marginality concepts of the uplands.* With this as the single basis of land disposition, the lowlands are given the priority in development and easy access to production incentives. The uplands are treated as residuals in land allocation and in the dispensation of agricultural support services. As a result, the availability of and access to various production incentives/infrastructures become inversely proportional to what can be found in the lowland.

It must be understood that the 18-percent slope criterion as stipulated in P.D. 705 is neither based on economic considerations nor on the sustainability of the environment. This criterion is in part an effort of one concerned agency to maintain a hold or jurisdiction over fixed portions of the country's resources.

The permanent adherence to the slope criteria can be interpreted to mean that the present technologies tend to remain unchanged over long periods. If this view is maintained, it will mean that technologies will not expand and no new knowledge is expected to overrun the 18-percent slope criterion.

Research done by the author on the real basis for the selection of the 18-percent criterion reveals that this slope trade-off is actually based on the unsuitability of the 4-wheel tractor on slopes greater than 18-percent. As the tractor or any machine-powered facility is irrelevant in the selection of lands suitable for upland smallholder agricultural schemes or as alienable/disposable lands, the present method of land classification should conform to the actual conditions of farming in the upland areas in the Philippines.

As a result of the *economic concept of land productivity*, the development infrastructures are concentrated in the lowlands. The overemphasis on the economic development of the lowlands has brought about several undesirable long-term results, namely: (1) overpopulation, (2) pollution, (3) land use conflict, (4) irreversible land use conversion, and (5) social unrest. These conditions cause serious losses in lowland productivity and rapid change in the land use scenario from agricultural greens to urban skyscrapers.

The economic concept generally applies to lowland development and its application in the upland would only produce negative results. Development measures for the upland must emphasize the environmental dimensions in order to truly support the sustainability of upland development. The imposition of the economic dimensions of productivity could

only result in the economic marginalization of the small farmholders in the upland. This marginalization is actually *the net result of the input-oriented technologies* that normally accompany project development documents and are imposed on the farmer-beneficiaries during the implementation of the project.

As a result of the decline in the quality of land and unequal opportunities in the lowland, *the migration of the urban poor into the rural areas resulted in the unwelcome assault of the hillsides/uplands with a very defined single objective — generate food for the farm family.* This situation is now clearly manifested in Palawan where the projected land use problem is attributed to the influx of migrants from the nearby Visayan islands who are desperately in search of lands. Unfortunately, Palawan is one of the islands in the Philippines where soil qualities are generally undesirable for the production of many agricultural crops because of complex soil chemistry (nutrient imbalance particularly in calcium and magnesium content) and micronutrient problems.

The lowland migrants carry with them *lowland technologies and the economic concept of land productivity.* The dominance of coconut, for instance, in the rolling uplands and the pattern of plantings retain the lowland scheme. Unfortunately, for a long time the agricultural technicians and research institutions did not recognize these technological gaps and oversights. Recent evaluations done by the Bureau of Soils and Management through the Agricultural Land Management and Evaluation Division, have revealed that significant land areas planted to coconut are grown in marginal and unsuitable locations.

With regard to misconceptions in *soil erosion technologies,* the author, after a review of the existing upland technological adaptations, firmly believes that at best the said technologies are only primers for the initiation of soil fertility improvement. Soil erosion control methods, to be truly addressed to soil conservation, must be based *on the efficient management of runoff* which is the real culprit in the degradation of the upland farms.

Technological flaws certainly destroy the uplands and therefore contribute largely to the persistent bleeding processes. A case in point is the concept of soil conservation adopted from the United States Department of Agriculture. The most common and, in fact, most extensive in application is the adoption of ipil-ipil as the major component in sloping upland technology. This scheme constitutes the major effort in upland soil conservation. However, technologies like this cannot effectively provide the desired reduction in soil erosion.

What are the crucial erosion processes and their corresponding strategies that need to be addressed to? In order to determine the appropriateness of any available technology, there is a need to understand the basic causes of the problems and their corresponding solutions. In the case of soil erosion, the propriety of the known soil conservation measures is questionable as shown by the actual effects of conservation measures now in place in many farms.

As we all know, the following inverse but related processes have been going on for generations:

1. The uplands lose their soil through surface overflow of excess rainwater, better known as runoff;

2. This excess water accumulation in the lowland and over time fills up the plain with rich sediments which we now call the floodplains.

From the above processes, the following strategies can be formulated:

1. To control erosion, runoff management schemes must be established right there in the upper catchment to prevent the erosive movement of runoff downslope.

2. Considering that water is one of the most important resources in the upland, the runoff management schemes must accomplish at least two urgent steps:

a. retain adequate rainwater to maintain favorable hydrology of the sideslopes; and

b. redistribute excess rainwater in the watershed and allow sufficient and non-erosive runoff flow downslope for effective use in the lowlands.

The above basic requirements are described as *the water harvesting techniques* which are adopted by many farmers in Region 7 under the Central Visayas Regional Projects (CVRP) and are described in more detail in the author's paper entitled, "The Ridgeline Principles in Watershed Management".*

In conclusion, fundamental to the planning for the future generations is the formulation of strategies and policies, some of which have been highlighted above, that will sustain development efforts without prejudice to the quality of the environment. Basically, the Philippines is an upland country and yet the core of the national technologies and researches are centered on the lowland, input-oriented production processes. Technologies, to be truly upland-oriented, must be people-based and whose production processes must conform with the perceptions, capabilities and production objectives of the upland farming communities.

Sustainable development can only be made operational when the so-called technologies have evolved from the farmers themselves. There is no doubt that the farmers have generated farming systems that are compatible with the ecological conditions of their farms as well as systems that are congruent to the general aspirations of the surrounding institutions and communities. Thus, any deviation in the form of technology impositions and, more particularly, in the corresponding transfer processes, are bound to fail. And if ever successes are to be "enforced," the costs of such transfer would be prohibitive and the effects on the farming communities and the ecological environment will be negative. Furthermore, the impact against the credibility of formal institutions is counterproductive to the overall development efforts.

Rogelio N. Concepcion**

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* The technique has actually been described earlier in: Dalton, John. "Managing Denuded Watersheds: Proven Approaches, Strategies and Techniques for Community-Based Resource Management in the Philippine Timberlands." *Philippine Geographical Journal* 33(2)(April-June, 1989):49-62.

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ARTICLES

SPATIAL DISTRIBUTION OF CRIMES IN JAMMU AND KASHMIR WITH SPECIAL REFERENCE TO THEIR CAUSES AND GROWTH: A RELATIONSHIP ANALYSIS

Mohd Yousuf Bhat*

ABSTRACT. Like many other states in the country, the accelerated growth of criminality is a problem of a very serious nature in Jammu and Kashmir. This paper attempts to identify some of those important factors responsible for the happening of crimes in the state. Their relationship with the crime rate has been attempted methodically. The spatial distribution of the identified crimes and their growth pattern has also been worked out. Finally, to check the present increasing trend of crimes, remedial measures have been suggested.

Crime is inevitable in any human society since some violation or the other of any code of conduct prescribed for the members of a society is bound to occur. There is no society that is not confronted with the problem of criminality, but its rate and magnitude varies spatially from one place to another and this needs to be studied for its cause-and-effect relationship. To classify crime among the phenomena of normal sociology is not to say merely that it is an inevitable, although regrettable, phenomenon on account of the incorrigible wickedness of men; what is more, it is to affirm that it is a factor in public health, an integral part of all health-conscious societies (Durkheim, n.d.).

The kind of curiosity which is the basis of interest in criminology can be termed scientific curiosity. This type of curiosity is concerned with the quest for answering various questions related to crime, its causation, and the response by the society to the challenges posed by it.

DISTRIBUTION AND GROWTH OF CRIMES

The distribution of crimes is highly varied from one district to another in the state, depending upon various factors. Table 1 reveals that Srinagar and Jammu districts are the leading ones followed by Baramullah, Udhampur and Doda. The highest magnitude of criminal cases has been recorded in Srinagar (highly urbanized and capital city) while the least has been registered in the Ladakh region which consists of the two districts of Leh and Kargil. The distribution has been found to be low in districts having more rural characteristics and high in the urbanized ones. In other words, it could be inferred that crime rate is inversely proportional to rural percentage of population.

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The growth rate of crimes has registered a sharp increase from 1981 to 86. The state has experienced a significant compound and annual growth of 6.62 and 1.32 percent, respectively, during the five-year period. Jammu and Kathua districts have shown an annual positive growth of 8.85 and 7.51 percent, respectively, whereas Rajouri and

TABLE 1. DISTRICTWISE GROWTH RATE OF CRIMINAL CASES IN JAMMU AND KASHMIR (1981-86).

S. No.	District	Criminal Cases (1981-82)	Criminal Cases (1985-86)	Growth Rate Percent Annual	Growth Rate Percent Compound
1.	Anantnag	9,080	8,770	— 0.68	— 3.41
2.	Pulwama	2,302	2,157	— 1.26	— 6.30
3.	Srinagar	41,829	34,991	— 3.27	—16.35
4.	Budgam	2,007	2,614	+ 6.05	+30.24
5.	Baramulla	11,351	9,449	— 3.35	—16.76
6.	Kupwara	1,949	2,503	+ 5.68	+28.42
7.	Leh	1,225	1,088	— 2.24	—11.18
8.	Kargil				
9.	Jammu	33,806	46,502	+ 7.51	+37.56
10.	Udhampur	6,043	6,694	+ 2.15	+10.77
11.	Doda	5,228	7,542	+ 8.85	+44.26
12.	Kathua	4,158	5,579	+ 6.84	+34.18
13.	Rajouri	4,758	3,748	— 4.25	—21.23
14.	Poonch	2,326	2,769	+ 3.81	+19.05
Total	J&K	126,062	134,406	1.32	6.62

Source: Registrar High Court, published in *Digest of Statistics* by the Directorate of Economics and Statistics, Planning and Development Department, Jammu and Kashmir Government.

Udhampur have recorded negative annual growths of 4.25 and 3.35 percent, respectively. These figures further support the foregoing statement that the districts which are adding to their urban population every year tend to experience a constant increase in crimes.

The significance and the extent of the crime problem, and hence the utility of criminology, may be gauged from the following crime figures for some of the most serious offenses in the state of Jammu and Kashmir during the past few years.

In 1979, the following cases were reported to the police: 8 cases of murder, 7 cases of kidnapping and abduction, 10 cases of robbery and decoity, 4 cases of rape, 53 cases of theft, 49 cases of burglary, 110 cases of riots, as well as 83 other serious cases (Ministry of Home Affairs, 1955).

Keeping in view the above facts, the present study attempts to examine the spatial distribution of crimes in the state districtwise. An attempt has also been made to find out the relationship between the crime rate and selected indicators.

LITERATURE REVIEW

Various studies have been carried out establishing the relationship between crime rate and several relevant variables. Woodward, using

psychometric tests, has found mental deficiency in criminals during his study of criminal behavior. He examined all the studies pertaining to the relationship between low intelligence and crime and was convinced that low intelligence does not play any significant role in delinquency (Woodward, 1955:281-330).

Freud, Goethe and Dostoievsky have considered the psychoanalytical approach as an important parameter in the study of the causative factors in crime. They emphasize the fact that with the basic weakness of the *ego* or when *ego* function is impaired due to fatigue, physical illness, intoxication, psychological conflict or any other cause, personality problems arise that result in socially disapproved behavior (Siddique, n.d.).

There is yet another approach which has been used to explain criminal behavior in terms of glandular malfunctioning, i.e., the connection between glandular functions and human conduct. It has indicated that criminals, the unsuccessful, the socially inadequate, the impoverished, and the psychologically disturbed are all seen by some endocrinologists as the products of malfunctioning glands (*Theft and England: Criminology*, n.d.:91).

Goring, Healy and Broner, Sheldon, Gulueek, and Burt have tried to find out the relationship between hereditary features in a person and his general behavior, but they have not found any positive evidence that there is necessarily any similarity between the conduct of the members of the same family, e.g., between father and son or brother and brother (Siddique, n.d.:21-23).

Environmental approaches like the sociological study of crime and criminals with reference to the society's organization and culture would constitute an appropriate scale for measuring the ramifying magnitude and distribution of crimes. The causative factors of crime in the institutions of society would include family relationships, educational institutions and their role, rate of urbanization, unemployment, morbidity, economic relationships, organized religion, and means of mass communication.

METHODOLOGY

Statistical data pertaining to seven variables at the district level have been used in order to work out a relationship of these selected variables with the number of crimes. In order to find out the relationship between the dependent variable and several other independent variables, Simple Linear Regression Analysis was employed. For numerical analysis, "number of crimes" has been considered as the dependent variable "Y" throughout the analysis, with other selected variables considered as independent variables and denoted as $X_1, X_2 \ldots X_7$. These selected variables are:

X_1 = Density of population/Km²
X_2 = Percent urban population
X_3 = Percent literates
X_4 = Number of educated unemployed persons
X_5 = Index of demographic development
X_6 = Index of social development
X_7 = Index of economic development

The linear relationship between dependent variable "Y" and independent variable X_i is given as:

$$Y = \alpha + \beta X_i + U$$

where the constants α and β are the intercept and slope of the straight line and "U" is the error term. The basic objective of regression analysis was to estimate the regression coefficient "β" and the value of "α." The estimated least square form of the relationship is given by:

$$Y = a + bx$$

where $b = \dfrac{\Sigma XY - \dfrac{\Sigma X \cdot \Sigma Y}{n}}{\Sigma X^2 - \dfrac{(\Sigma X)^2}{n}}$ is an estimate of β and $a = \overline{Y} - b\overline{X}$ is an estimate of α.

Thus the regression coefficient "b" or the slope of regression line also indicates the relationship between the X and Y variables.

To test the hypothesis that $b \neq 0$ (means there exists a relationship between X and Y, and to find out whether average change in X would cause change in Y also, the test of significance (t test) was used, which is given by:

$$t = \frac{b - 0}{S.E.(b)}, \text{ with (n-2) degrees of freedom, and where:}$$

$$S.E.(b) = \frac{\delta u}{\sqrt{\Sigma X^2 - \dfrac{(\Sigma X)^2}{n}}}$$

and

$$\delta u^2 = \frac{\Sigma Y^2 - \dfrac{(\Sigma Y)^2}{n} - b\left\{\Sigma XY - \dfrac{\Sigma X \cdot \Sigma Y}{n}\right\}}{n-2}$$

Note: S.E. = Standard Error
n = Number of spatial units under study

RESULTS AND ANALYSIS

The analysis of the data reveals that there exists a strong relationship between number of crimes and selected indicators. The data thus obtained have been statistically tested and the results show that the relationship is significant at the 1 percent level of significance for all the indicators except for density of population whch is significant at the 5 percent level, or corresponding to the 95 percent confidence interval. It would be also instructive to examine the computed regression equations in which the regression coefficient is given. This coefficient helps to understand that a unit change in "X" (independent variable) would cause an average change in "Y" (dependent variable), which is equivalent to the regression coefficient of that particular variable.

The regression equation of Y on X_1 , X_2 ... X_7 for all independent variables with t_c (computed "t" value) and t_t (tabulated "t" value) at $(n - 2)$ degrees of freedom are given as follows:

Variable	Regression Equation	Computed "t" t_c	Tabulated "t" t_t	level of Significance
X_1	3080.19+78.85 X_1	2.575	2.23	5%
X_2	662.53+562.72 X_2	6.66	3.11	1%
X_3	—21949.85—11259.83 X_3	3.648	3.11	1%
X_4	6294.79+298 X_4	4.317	3.11	1%
X_5	14413.14+5894.92 X_5	7.843	3.11	1%
X_6	—6043.56+2278.53 X_6	4.255	3.11	1%
X_7	3389.17—3627.15 X_7	6.996	3.11	1%

Discussion

After deriving the equations for each indicator it is clear that with a decrease or increase in the selected indicators there is commensurate change in the crime rate (Table 2). The occurrence of these changes and the relationship between the two variables could be attributed to specific reasons. It would be pertinent to discuss each indicator one by one.

Density of population. A significant relationship has been found between crime rate and population density, which is due to overpopulation, overcongestion and the dense rehabilitation of people in many areas. All these factors have caused multidimensional conflicts which are uncontrolled by the concerned authorities. There are resultant conflicts in crowded streets and buses as problems of residence, parking and excessive pressure on available amenities, etc. These problems may ultimately lead suffering people towards criminality. The relationship between population density and crime rate is supported by the data which show that the districts having high population densities are accordingly leading in criminal cases.

Urbanization. The process of urbanization has indicated both positive and negative effects on society (Grolier, 1983:345-347). But in the case of crimes, it has been established through the present analysis that society has been negatively affected by urbanization. There is no doubt urbanization brings overall social awareness and innovative ideas for various needs of people but at the same time it has skewed some sections of the population towards a negative path. Drug addiction, intoxication and alcoholism has become an overramified business of white collar criminals in the red light areas of city limits. This business has not only accelerated the crime rate but has introduced and spread crime to places catering to such vices. Certain types of crimes are committed more often by narcotic addicts, mainly because they need money to support a habit made overly expensive by illegal trafficking and black marketing. These crimes could be disorderly conduct, disturbing peace, robbery, decoity, rape and other serious offenses. The relationship between drunkenness and motoring offences is apparent as many serious accidents and injuries on the road involve persons driving under the influence of liquor.

Literacy level. The literacy rate is usually considered to be the most powerful indicator for the overall socioeconomic transformation of any society as it brings new ideology and techniques that lead to the optimum utilization of the resource base. Earlier theories have suggested that education keeps a person away from crimes. According to the *New Encyclopedia Britannica* (1973-74), "A study has been carried out that there does appear a relationship between education level and crime, as

TABLE 2. DISTRICTWISE BREAKUP OF CERTAIN SELECTED INDICATORS (1981-82).

District	Density/Km²	% Urban Pop.	Literacy Rate (%)	No. of Educated Unemployed Persons	Index of Demographic Development*	Index of Social Dev.*	Index of Economic Dev.*
Anantnag	165	10.71	22.93	9,099	3.79	5.21	6.58
Pulwama	289	8.98	20.47	5,522	4.30	4.45	8.39
Srinagar	318	80.50	33.90	11,028	9.80	21.07	15.74
Budgam	268	14.13	17.86	3,784	4.17	4.26	10.03
Baramulla	146	13.40	20.62	5,118	3.60	6.63	7.47
Jupwara	133	2.90	16.82	3,083	2.83	5.11	5.56
Leh / Kargil	3	9.11	22.02	118	2.59	7.68	1.49
Jammu	305	29.46	42.86	8,485	6.59	7.57	11.55
Udhampur	100	9.53	30.52	2,062	3.11	4.89	3.72
Doda	36	5.92	18.50	5,598	2.56	4.80	3.43
Kathua	139	11.38	31.90	4,110	3.83	5.41	6.74
Rajouri	115	5.23	24.73	2,400	2.82	5.63	3.20
Poonch	134	6.32	23.39	1,902	3.14	7.11	2.63

Source: *Digest of Statistics, 1985-86*, Planning and Development Department (J&K Gov't.)
* See references

prisoners have been found to have poorer education and higher illiteracy rates than non-prisoners." In other words, to grow the plants of development, education is the seed to be sown, provided the problem of oversaturation by the educated unemployed youth is nonexistent. Otherwise, it would create the problems of moral degradation and drug addiction as has happened in Simla (Himachal Pradesh) (Najm-ul-hasan, 1989:8).

The above statement is also supported by the present study since a strong relationship has been found between high literacy rate and criminal cases. It is clear from Tables 1 and 2 that Jammu and Srinagar are the only two districts having higher literacy rates than the state average. But correspondingly, the crime rate is also very high in these two leading districts, a situation that is most probably due to the unemployment problem. The other reason could be that literate people are more sensitive and cautious about their rights which in most cases are not availed of properly and easily, and the struggle of detaining them afterwards leads them to criminality.

Unemployment of educated youth. The rate of unemployment has been found to be one of the controlling factors of the crime rate, as there exists a strong positive relationship between the magnitude of educated unemployed youth and the rate of criminal cases in the state of Jammu and Kashmir. Referring to Tables 1 and 2, it is evident that the highest unemployment problem is in the Srinagar district, followed by Anantnag and Jammu districts. This rate of unemployment is concomitant with the crime rate and may be due to the fact that rising unemployment tends to make idle but educated youth turn to illegal means of livelihood in facing the challenges of modern life. The highly educated people in this situation are never satisfied even if they are earning more from other business activities. But they always think of getting government jobs which disguise their illegal activities and affect their health through mental tensions and finally lead them to take drugs and commit immorality and criminality.

Other factors. The indicators of social, demographic and economic development do bear a direct relationship with the rate of criminality. Logically speaking, the overall development of these three components in any region should have reduced the crime rate slowly if not steadily; however, a reverse trend has been observed in the socially, demographically and economically developed study districts. The reason is that inter- and intraregional disparities have played a vital role in maintaining a constant crime rate. This implies that the benefits from government's developmental policies and programs are not trickling down uniformly to every individual and this leads to abrupt and unusual crises and conflicts within the particular region.

The other reasons are "injections" and "leakages" of the society. The former means the introduction of new habits and cultural traits while the latter means acculturation or cultural degradation. These situations are always experienced by those regions/destinations that receive foreign tourist traffic. The same has happened in the state of Jammu and Kashmir in 1981, when there was a comparatively large-scale influx of "hippies" whose influence led some people towards drug addiction and alcoholism, particularly in those sections which were having close interactions with the tourists (Mahmooda, 1982). This came as a cultural shock to the people who then denied the ensuing moral degradation. Thus the occurrence of crimes could also be understood in terms of such cultural factors.

CONCLUSION

The incidence of crimes in Jammu and Kashmir state is determined mainly by urban population, high unemployment rate, density of population and some other factors discussed at length earlier. The distribution of these crimes is highly uneven in the state. Srinagar, Jammu and Baramullah are the leading districts with respect to crime rate followed by Udhampur and Doda, where its growth has been comparatively less. The cold desert of Ladakh consisting of Les and Kargil districts have registered less number of crimes during the past few years. There are some districts still recording negative growth but the overall growth rate in the state has shown a positive trend.

Effective crime control strategies that take into consideration both the police and the public have to be employed in order to protect the people from the crime business. The attitudes and policies of law enforcement agencies vary widely from one region to another. The behavior of the police depends to a large extent upon how the public sees them. Who will be arrested depends on the policemen's attitudes and on the enforcement policy of his department in the area he is operating. Theoretically, there should not be any crime that would remain undetected if the police were not careless or negligent. There is a need, therefore, for the police or any other operating agency to be trained, honest and strict in enforcing the rules which, if accomplished, should not make it difficult for them to arrest any criminal. Also, there should be no intervention among politicians in the making of arrests and the public must be wary of this while at the same time showing a favorable attitude towards the police.

Unemployment seems to have a profound impact on the growth rate of crimes in the state. Consequently, creation of job opportunities in both the public and private sector should be a priority concern of the state. For one, self-employment schemes need to be introduced to absorb the unemployed educated youth. Major industrial establishments should also introduce new investments that can produce jobs and somehow reduce the crime rate. A reevaluation and modification of penological techniques would also help to reduce the crime rate.

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ALTERNATIVES TO THE CURRENT DISPOSAL PRACTICES FOR SUGARCANE TRASH AND BAGASSE

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ABSTRACT. The current practice of disposing waste in sugarcane farms, particularly those of the trashes and bagasse, has become a crucial problem that needs serious attention. This paper presents a synthesis of alternative ways of disposing these wastes vis-a-vis cost reduction and utilization for other productive undertakings. While the present state of knowledge points out that sugarcane trash and bagasse are poor sources of fertilizer and feed materials, they can be managed to increase their fertilizing and feeding value to a considerable extent. Besides they can be effective mulching materials not only for sugarcane but probably for other crops. The technology for producing protein out of the bagasse has also been evolved although it still needs further improvement. The potentials of sugarcane trash and bagasse therefore are enormous and they may just be the answer for sustaining the Philippine sugar industry.

INTRODUCTION

Waste disposal is a grave problem both in the agricultural and industrial aspects of the sugar industry. At the farm level, sugarcane, being a leafy crop, produces a tremendous volume of trashes. The common method of disposing them is merely burning the entire field. Obviously, this practice of burning, while it has also positive merits in sugarcane culture, explains the diminishing productivity of the sugarland (Mendoza, 1985). This practice results in much loss of nitrogen and the forfeiture of the benefits of organic matter to the soil as 95 percent of it is lost through burning (Urgel, n.d.). Although it is not technically advisable to burn the trashes, the waste management practice has persisted because of the inavailability of an alternative or less expensive disposal system.

On the other hand, bagasse comprises the major waste at the mill level. Most of the factories meet the problem of excess bagasse disposal by blowing off the material to an open storage pile several hundred yards from the factory where it is burned. This method of handling bagasse has been cited as unsatisfactory by the Louisiana Air Control Commission (Ballet, 1969).

While the local sugar industry still enjoys high prices, the continuing increase in the cost of production presents a threat to the continued stability of the industry. Alternative strategies to sustain the industry are obviously necessary. The high cost of sugar production in the country can be directly attributed to the low productivity of the sugarcane farm. Increasing the productivity level and at the same time decreasing the cost of production will naturally increase farm income. Can this be done?

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Magnitude of Sugarcane Trash and Bagasse

Some of the important organic materials generated by the cane sugar industry include trash and bagasse. Trash, according to Cochran (1969), is any material that does not contribute to the production of recoverable sugar. On the other hand, bagasse is the solid waste produced after juice extraction from the sugarcane stalks (Cosico, 1985).

In India, Singh (1980) reported that by-products of the cane sugar industry represent 1-30% of the value of sugar. If all of the by-products are utilized in the sugar industry, its profitability may increase by as much as 50%.

It is estimated that approximately 45 metric tons/ha (dry weight basis) of sugarcane trash at each harvest (Nickell. 1970) are burnt in the field. In Florida, USA, the trash content in sugarcane is about 33% before burning and this is reduced to 5.7% after burning (Clayton and Whittmore, 1972). In a separate report, Lamuse (1979) indicated that the trash content of burnt cane field is 65% lower than that of unburnt ones.

On the other hand, bagasse is estimated to reach an annual quantity of 6 million tons in the Philippines (Cosico, 1977). From just one sugar central alone in Negros, for instance, 568,174 metric tons of bagasse was produced in 1983. In the same year, the 41 sugar centrals in the Philippines produced an aggregate amount of 5,432,175 metric tons (Philippines, 1984).

Current Trash/Bagasse Disposal Practice

The soil has been looked upon as a waste disposal treatment system for trash and residue that remain after harvesting and processing operations. However, this will likely create plant nutritional problems due to nitrogen immobilization (Asghar and Kanehiro, 1976). The addition of nitrogen fertilizer has sometimes been recommended to accelerate the decomposition of organic matter and thus help to alleviate the temporary adverse effects of nitrogen immobilization by the soil microbial population. However, the results reported in the literature are quite conflicting (Lenken, Hutchen and Paul, 1962; Newton, 1956).

The principal method of removing trash from sugarcane at the present time is burning. Burning a field before the cane is cut removes the dry leaf trash only but the immature cane in the form of tops and suckers is not removed by burning (Cochran, 1969). Although burning removes a considerable amount of trash, satisfactory results depend on certain field conditions. At the beginning of the harvest season, the cane tops are green and will not burn. They are allowed to dry first. Also, during rainy periods burning obviously cannot be satisfactorily undertaken. Burning the cane or the trash is easily done during the dry months, i.e., from December to April.

Fertilizer Value of Sugarcane Trash and Bagasse

The productivity of cultivated soils is closely associated with the maintenance of an adequate supply of organic matter and nutrients (Urgel and Hernandez, 1972). At present, the average organic matter content of Philippine sugarcane soils is less than 1% which is below the normal requirement necessary for the productivity of crops (Paningbatan, personal communication).

For an effective soil management, it is essential to replenish the supply of organic matter in the soil in conjunction with other soil management practices such as fertilizer application, liming and crop rotation. The farm and factory where the produce of the farm is processed can be sources for materials to build up the soil organic matter. In sugarcane farms, there are the stubbles and trashes as sources of organic materials, and from the factories, the bagasse, among others. These materials either go up in smoke or are left in the factory dampsite to rot away. These are valuable sources of organic matter that should be availed of (Urgel and Hernandez, 1972).

The fertilizer value of trash can be gleaned from its typical analysis of 0.34% N, 0.12% P_2O_5, 0.28% K_2O and 0.03% CaO (Urgel, n.d.). On the other hand, the average elemental composition of trash (including tops) of 10 sugarcane varieties left in the field (Puyaoan, 1971 as cited by Cruz, 1974) is shown in Table 1.

The above analysis according to Cruz (1974) indicates that if trash is converted into fertilizer, it can already supply the elements or nutrients needed by the crop. This needs only to be supplemented in amounts needed to approach the optimum requirement. Aside from this, it considerably improves the texture of the soil due to the organic matter added into it, thereby promoting good aeration which is essential to good growth especially in heavy clay soils.

TABLE 1. ELEMENTAL COMPOSITION OF SUGARCANE TRASHES INCLUDING TOPS

Elements	Kg/Ha
N	192
P	31
K	132
Ca	11.9
Mg	10.1
Fe	2.38
Cu	0.33
Zn	0.40
Mn	0.37

In Japan, Ishizuka (1982) reported the quantity of fertilizer nutrients out of sugarcane residues as 33, 37 and 38 kg/ha, N, P_2O_5 and K_2O, respectively. By percentage, Islam (1988) of Bangladesh reported that sugarcane trash has 0.35 N, 0.42 P_2O_5 and 1.00 K_2O. While the potential of sugarcane wastes as source of fertilizer has been established, the fertilizer substitution studies in sugarcane production in Malaysia conducted by Leong (1980) indicated lower yields as compared to the other treatments (Table 2). But then the Philippine Sugar Commission (PHILSUCOM) — now Sugar Regulatory Administration (SRA) — obtained better yields (Table 3) by trash composting or incorporation (Urgel, n.d.), which is an improvement over the national sugar yield of 53.3 TC/ha. The generally accepted international standard sugar yield is 70-80 TC/ha (PHILSUCOM, 1984). This shows, therefore, that trash management is an important aspect in making full use of the benefits of sugarcane residues.

An improved trash management system has been evolved recently by Mendoza, *et al.* (1987). This is done by modifying the normal

equidistant row spacing of sugarcane. The double row intercropping system (Rosario, Mendoza and Andam, 1986; Mendoza, 1988; Andam and Mendoza, 1987) fittingly complements trash farming. The furrows are set at 0.75 m intervals. In planting the sugarcane seedpieces, two rows are skipped usually for intercropping mungo. Initially, low tiller population can be overcome by passing a harrow to destroy the primaries and to flush in turn the tillers. This should be followed by a side-dressing of liberal amounts of nitrogen fertilizer (30 kg N/ha).

TABLE 2. SUGARCANE YIELD RESPONSE TO ORGANIC AND CHEMICAL FERTILIZER

Treatment	Can Yield (Ton/Ha)
Control	31.86
Cane leaves + straw	31.95
Cane leaves + straw + ½ fertilizer	39.91
Bagasse	25.14
Bagasse + ½ fertilizer	51.11
Cow Dung	83.69
Cow Dung + ½ fertilizer	89.29
Fertilizer	61.48

TABLE 3. SUGAR YIELD OF PHIL 56226 UNDER DIFFERENT TRASH MANAGEMENT METHODS

Trash Management	PS/TC	TC/Ha	PS/Ha
Trash burning	2.07	65	135
Trash mulching	2.05	65	133
Trash composting	2.05	72	146
Trash incorporation	2.04	76	150

PS/TC — Picul sugar/Ton cane
TC/Ha — Ton cane/hectare
PS/Ha — Picul sugar/hectare

The spaces in-between the wider rows are used for piling cane stalk, trashes and tops, alternately. The piling of trashes is done also in alternate intervals of the wider spaces in subsequent ratoons (Mendoza, *et al.*, 1987).

The average analysis of the trash indicates a modest amount of approximately 1% nitrogen. For a 10,000-15,000 kg/ha rate of trash application, about 100-150 kg/ha N is applied to the soil. Assuming 50% utilization, this means that 50% savings on N-fertilizer can be easily realized based on the average rate of application of 150 kg/ha. Data obtained (Table 4) shows that sugar yield is comparable between those without trash and those with trash but with only 75-75-150 kg NPK/ha (Mendoza, *et al.*, 1987). The N-benefits from trash farming should not only be evaluated in terms of the N-content of trash. Patriquin (1982) found out that during the process of decomposition, N-fixation by free living microorganisms could generate as much as 20 kg N/ha. Recent estimates, however, indicate higher values of 30-40 kg N/ha (Patriquin, 1989, personal communication).

TABLE 4. SUGARCANE YIELD AND YIELD COMPONENTS OF FIRST RATOON

Treatments	Yield Components*		
	TC/Ha	PS/TC	PS/Ha
1-5 m Spacing			
With trash	101.17	1.62	163.81
Without trash	105.56	1.62	170.69
Double Row			
With trash	83.05	1.69	139.69
Without trash	77.44	1.74	133.96

* Difference not significant

Bagasse, although having a low fertilizer value of only 0.20% N, 0.10% P_2O_5, 0.12% K_2O and 0.02% CaO (Urgel, n.d.) can be managed to increase its total nitrogen (ranging from 1.32% to 1.57%) by composting with some additives (Reyes, 1963). Cruz, *et al.* (1974) also reported that application of 100 tons/ha of bagasse in low yielding soil areas can increase the nutrient uptake of cane plant for P, K, Ca and Mg which used to be supplemented.

AS MULCHING MATERIAL

Sugarcane trash and bagasse have also been studied as mulching materials. For example, the combined effects of trash mulching and fertilization in sugarcane ratoon was studied by Tun-Po-Pao (1975). The result showed that yield was greater by 14% in sandy loam and 7% in clay loam by the application of trash and mulch plus heavy fertilization as compared with that produced in the trash-mulch plus conventional fertilization treatments. According to Coligado (1963), sugarcane bagasse mulch significantly increased fruit setting in tomato. More fruits with less cracks were also reported by Reyes (1971) from mulched than from unmulched plants. Recently, Famoso (1976) reported that four-month old bagasse had an unfavorable effect on tomato growth especially when applied 15 cm thick as evidenced by the burning effect on the lower leaves, yellowing, stunting of growth, and lower yield. Four months after, the same bagasse-mulch favored the growth and increased the yield of the second crop. She pointed out that the reason for this is the presence of a toxic substance given off by 1-8 month old sugarcane bagasse. Mulching of 8 months old bagasse favored the growth of tomato because the toxic substance had already been diminished by then.

In general, the yield of tomatoes was generally increased with more bagasse. However, bagasse mulching has to be accompanied by application of nitrogen to get maximum benefits. The thicker the mulch, the more nitrogen is needed for maximum yield (Famoso, 1978). In fact. her study showed that 90, 150 and 210 kg nitrogen are used for 5, 7.5 and 10 cm thickness of bagasse mulch, respectively. Jones, *et al.* (1977) obtained the highest tomato yield of 29.8 tons/ha on mulched plots fertilized with 60 kg N/ha, while the mulched plots required 138 kg N/ha to produce 25.6 tons/ha.

Feeding Values of Cane Tops and Bagasse

Sugarcane tops. Feed expenses constitute three-fourths of the total cost of production in livestock enterprises (Perez, 1973). Although low

in nutritional value, cane tops are plentiful and can considerably cut down feed expenses. Yield of cane tops range from 4 to 10 t/ha dry matter. In the Negros provinces alone where over 20,000 ha are planted to sugarcane, at least one million tons of cane tops (dry) can be produced each milling season. This amount can supply the bulk of ration for at least 600,000 heads of cattle. Nationwide, cane top yields was estimated by Mendoza (1981) to be about 7.7 million tons of obtainable fresh herbage or about 2.3 million tons of dry matter. He reported that this can support 1.2 million heads of cattle.

It has been found that cattle can grow at a daily weight gain of 0.41 to 0.58 kg when fed with sugarcane tops with additional concentrates of corn bran, rice bran, corn glutein feed and ipil-ipil leaf meals (Pepito, 1965). The weight gains were higher when the ration consisted of three cane tops per part of concentrate mixture of rice bran and ipil-ipil. Sugarcane tops apparently have poor feeding value, containing only 1.4% crude protein, 14.7% digestible nutrients and 0.5% crude fat (Table 5). However, this can be improved by supplementing with 20% molasses and 20% copra meal to give an average daily weight gain of 0.41 kg and a feed efficiency of 12.6 kg air dry feed per kg gain. Furthermore, with an average of 30% dry matter, the sugarcane tops can make a good silage.

Bagasse. Bagasse is the fibrous residue left after extracting the juice from the sugarcane stalk. About 50% of the cane tonnage is bagasse. Fresh bagasse contains 40-50% dry matter and 0.3 residual sugar.

Research at the Dairy Training and Research Institute (DIRI) has shown that dairy cows fed with Napier grass and a concentrate with 31% bagasse produced 6.0 kg of milk. However, bagasse has a low energy value of only 20% total digestible nutrients (TDN). Hence, bagasse should constitute no more than 25% of the total ration (McDowell, (1972). This may be particularly true in warm climates because the animal uses more energy to process the bagasse than it yields. High heat of digestion increases the heat load of the animal.

TABLE 5. AVERAGE COMPOSITION AND DIGESTIBILITY OF SUGARCANE TOPS (PEPITO, 1965)

Composition/Digestibility	Percent
Average composition as fed to animals	
Total dry matter	26.3
Total digestible nutrients	14.7
Crude protein	1.4
Crude fat	0.5
Crude fiber	9.0
Nitrogen-free extract	13.3
Mineral matter	1.9
Digestion coefficients	
Crude protein	51.4
Crude fat	47.4
Crude fiber	61.2
Nitrogen-free extract	57.6

Table 6 shows that more bagasse than cane tops are produced in the different sugarcane growing regions of the country. Total bagasse

output estimated by Mendoza (1981) for the country amounts to about 13 million tons per milling season. In some sugar districts, this by-product is being used as a soil conditioner. In Taiwan, bagasse together with rice straw is used in paper and board making. Compared to cane tops, bagasse is nutritionally inferior.

TABLE 6. SUGARCANE TOPS AND BAGASSE YIELDS IN THE DIFFERENT SUGARCANE GROWING REGIONS OF THE PHILIPPINES (MENDOZA, 1981)

Region	Cane Tops[1] (Top DM)	Bagasse[2] (mt)
Luzon	595,400	2,674,000
Panay	325,404	1,547,000
Negros	1,060,348	7,030,000
Eastern Visayas and Mindanao	379,651	1,628,000
TOTAL	2,360,803	12,879,000

[1] Estimated at 4.5 DM/ha. Maximum sugarcane top yield in heavily fertilized field is 10 T DM/ha.

[2] Estimated at 505 mt of total tonnage yield of sugarcane (Spencer and Meade, 1963).

Utilization of sugarcane tops for ruminants (carabao and cattle) is a common practice among small sugarcane farmers. Its translation into large-scale operation is beset with supply seasonality, besides low feeding value. It is also uneconomical if collected and transported in long distances.

INDUSTRIAL PROSPECT

In Brazil, two research institutes have found new uses for bagasse and that is to produce protein from it through biotechnology. This process involves the use of microorganisms to break down the cellulose which bagasse is made of. When the microorganisms are through digesting the cellulose, bagasse is reduced to a mash that is so rich in protein that it can be used as an addition to wheat flour and corn starch to increase their protein content (Monteiro, 1988).

While the discovery is encouraging, one problem has yet to be solved. According to Monteiro (1988), the mash has a strong obnoxious odor. Nevertheless, this can eventually be resolved.

SUMMARY AND CONCLUSION

Waste disposal is one serious problem besetting all agro-industries, including the sugar industry. At the farm level, pre- and post-harvest burning contributes to the current pollution level of the atmosphere. Besides its ecological cost, it progressively increases the cost of production as N is directly lost to the atmosphere as a result of burning. The presently low organic matter content of sugarcane soils has been attributed to trash burning. It was also found that burning the trash deprives the free-living organisms their much-needed organic carbon for N-fixation. At the factory level (for purely raw sugar factory), burning the bagasse is also the current disposal practice.

This paper presents a synthesis of previously concluded studies detailing alternative utilization practices for trash and bagasse. Farm

level utilization or recycling of these waste products into organic fertilizer appeared to be the best alternative waste management practice. Utilization of trash for fuel as in the case of the Central Azucarera de Tarlac can be another alternative to minimize the importation of bunker fuel oil. An industrial utilization of bagasse to produce protein from it is currently being explored. Some economic considerations and further improvement of the current technology base present enormous potentials for its application to commercial scale.

The review points out that actually nothing can be wasted from sugarcane trash and bagasse. They can be utilized to significantly help in sustaining the Philippine sugar industry.

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INTEGRATED RURAL DEVELOPMENT AND THE COMMUNITY: A CROSS-SECTORAL APPROACH

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ABSTRACT. The benefits of different sectors working with each other in rural development and on agriculture programs are recognized but less often put into practice. The paper presents a snapshot of an experiment which has operated and worked successfully for several years with tribes people in Maharashtra State, India. Viewed from the author's perspective as a participating development worker, the approach is seen as stressing the links between the agricultural program, education, health and nutrition, and employment.

INTRODUCTION

The setting is the north of Maharashtra State, India in an area covering 23 kilometers in which there are thirty villages inhabited by *adivasi* (tribal) people from three distinct tribal groups: the *Tadavis* and *Pawares*, classified as "scheduled" tribes, and the *Banjaras*, a non-"scheduled" nomadic tribe which therefore does not qualify for the government funding that the other tribes receive.

The *adivasis* in this district number more than 40,000 while in Pal ashram (the focus of this paper) there are approximately 3,800 families, each with an average of five or six members. The Pal area received substantial government aid until the late '60s after which "development management" was handed over to a local development agency Satpuda Vikas Mandal in the hope that change could be achieved at the local level by and for the people themselves.

This paper considers the purposes and achievements of an integrated rural development scheme at Pal. In addition, it examines the role, forms and appropriateness of education within the project. The discussion draws on data related to Pal village and *ashram* as well as three villages: Banjara, Morval and Garkedha.

INTEGRATED RURAL DEVELOPMENT

The various national five-year plans in India have sought to raise the socioeconomic levels of all the people including scheduled castes/scheduled tribes and other weaker sections (Planning Commission, 1986). However, it would appear that three decades of development may not have had the required impact on these people socially and economically. The Planning Commission admits that their problems cannot be simply resolved through the percolation of economic growth.

For the purposes of this paper, the sociopolitical aspects of the development question will not be discussed since the present focus is

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more on processes which may operate in the rural setting to improve day-to-day operations. From one point of view, development can be understood as the result of many interacting forces which can best be promoted through planned coordinated action by the different sectors impinging on rural life. Integration of sectors is an instrument for maximizing the effect of any development program and is highly desirable where the aim is to "overcome highly interdependent needs in rural areas" (International Institute for Educational Planning, 1981:33). This integrated development deals with nonagricultural as well as agricultural activity. The rural economy is diversified so that there is an increase in productivity, employment and general social welfare.

While overall national development remains the ultimate goal, the focus of integrated rural development programs is upon the local area with its complex of resources — natural and human, individual and institutional, actual and potential, utilized and unutilized (Saraf, 1980). The development infrastructure now comprises village clusters, habitations and even families.

Commonly accepted goals for integrated rural development include: an overall increase in agricultural and related yields in the area, net of costs; an overall increase in noneconomic welfare benefits (e.g., health and housing); the spread of both categories of benefits to disadvantaged population segments in the area (International Institute for Educational Planning, 1981:4). Berstecher, Carron and Malpica (1981:20) indicate five mechanisms by which this integration may be implemented: (a) sharing and exchange of information, including organizational integration of different development agencies; (b) coordination of different government departments and rural development agencies and a partial form of organizational integration which can serve to avoid serious overlaps and duplication of resources; (c) joint use of certain facilities, personnel and resources between different departments and agencies: (d) integration of the functions of several previously separate sectors; (e) establishment of regional or provincial bodies which practice more or less autonomous forms of designing, programming and budgeting of intersectoral development.

The Pal project is an integrated rural development program focusing on the "grassroots" development of education, agriculture, dairy and breeding, water conservation and irrigation schemes, and improvement in the areas of health, nutrition and housing. Villagers participate in the management of the development process in relation to local needs. Nonformal as well as formal education has a significant role to play in this.

THE AGRICULTURAL PROGAM

As the later discussion of the educational program will show, much of the educational endeavor at Pal fits easily under the heading of employment development or agricultural development. The main means of subsistence for the *adivasis* (tribal people) in this area is agriculture. Therefore, the local development association (*mandal*) promotes agricultural improvement and material development through the activities of the Centre of Agricultural Awakening. It is this agency which organizes farm demonstrations, symposia and training camps, research and innovation, extension service, and cattle breeding and development. The purposes of the agricultural section have been described as: (a) carrying out experiments and trying innovative practices for the guidance of the

adivasis in the area; and (b) maintenance of the *mandal* and making up the deficit which it incurs in organizing various developmental activities.

In addition to plantations of guavas and pawpaw, coconuts and bananas, several acres are also devoted to experimentation with a variety of crops, e.g., mustard, linseed, safflower and sunflower. All relevant data are fully documented on display boards as well as in filing systems. Workers collect and record data relating to the successful crops and to the production of fodder. The information is then passed on to local farmers and to other agricultural programs in the state interested in the experiments or having similar climatic conditions to Pal.

Experimentation is also being carried out on crops relying solely on rainwater. For large areas of this region, lack of irrigation and natural water supply inhibits the growth of particular crops. Expertise, aided by a systematic program of agricultural experimentation and by the construction of wells nearby, have made the Centre economically productive and the *mandal* and tribal people self-sufficient.

Dairy Scheme

Along with the demonstrations, researches and innovations, and training camps, an important work carried out by the Centre is the breeding of dairy cattle and production of milk for sale. This is recognized by the development agency as supporting the agricultural program and as being an important source of employment. An equally important side benefit of the project is the general improvement in the health and lifestyle of tribal people who have introduced milk into their diet.

The dairy program has been in operation for five years and incorporates one of the most important forms of education in all villages: the crossbreeding program. By observing and studying results of milking the introduced species of cow rather than the local Indian cattle (*Talpakas*), villagers have become convinced that a change is necessary. Clearly, the most effective form of education in this regard is that which convinces by its success rate.

Crossbred cows are able to be milked for a longer period each year, producing a larger quantity of milk (25 liters) each day. Village people bring milk to the *ashram* dairy where it is sold. Half a liter of milk is given to each worker daily. Milk is also sold to the Milk Federation after *ashram* dairy workers have strictly tested all samples for fat content.

Tribal people are also being taught the benefits of artificial insemination (AI) in the cattle breeding program. AI is seen as a success in the outer villages as well as in Pal, where cows are also serviced by this method. Originally, the liquid nitrogen used in the program was supplied by an Australian Rotary club but replacement of materials has remained a problem for villagers. When bull calves are produced, they are donated to villages so that members can be convinced of the program as they see the effects of crossbreeding. Free medical assistance is given by a district veterinarian. The facilities at the government-sponsored veterinary clinic are used by all villagers. The clinic supplies vaccine for disease prevention and for control of affected areas.

Banking Scheme

The dairy project is the result of a credit or banking scheme to replace the traditional moneylending situation where villagers frequently

found themselves in a situation where they were unable to continue debt repayments. The lives and attitudes of many villagers have been transformed with regard to both security and employment. The *mandal* arranges finance through the bank for villagers requesting it. Repayments are allowed over several years. The eventual purchase of the animal is made by the villager, *mandal* representative, bank representative and veterinary officer going together to the market. This then becomes an educational experience for the villager, who is introduced to the financial and legal aspects of marketing, as well as improving his knowledge of cattle. The purchase, funded by the bank, is supplemented with "seed money" supplied by the agricultural activities supervised by the *mandal*. Bulls are donated to the villagers by the mandal and repayments of loans are made once the venture becomes economically viable.

While individuals benefit from such projects, the overall effect is noticeable in the gradual changes in villages, particularly with regard to employment. Significant numbers of *adivasis* have become involved in the dairy program where previously collection of firewood was the main occupation. The functioning of the dairy project and the involvement of villagers in the purchase of cattle and loan repayments is fast leading to a self-sufficiency which a decade ago would have been considered overambitious. Improved and regular employment for these people has meant an improved economic situation, the availability of the "luxury" of formal education in wider economic endeavors, and the confidence to take initiatives in the whole area of planning innovations for the village.

EDUCATION

As the previous section has indicated and the following will elaborate, education has opened employment possibilities for the youth and adult (particularly males) sectors. Education related to employment and skill training is benefitting *adivasis* in both qualitative and quantitative ways. Training camps encourage villagers to keep themselves informed about methods being tried and their success, while at the same time retraining farmers in adapting to methods which will benefit them more.

Formal Education: The Basic (Primary) School

The primary school at Pal has students from three different tribal groups, hence, the mixture of languages — Marathi, Hindi and Rajasthani. The school is residential, with classrooms doubling as sleeping quarters. The original conception was that there would be no classrooms as such.

While students of the post-basic *ashram* school tend to emerge with skills related to the village vocational situation, the emphasis at the primary level is on attitude. Basic literacy is seen as important in the move towards self-sufficiency, particularly in the area of accounting and familiarity with simple documents related to finance. The curriculum and methodology at this level, however, tends to be quite "traditional" though in the science classes attempts have been made to collect and classify plants from the nearby jungle, with medicinal attributes listed where appropriate.

The Post Basic (Secondary) School

The secondary school (from standards 5 to 10) was opened where a need for both post-primary training and some work experience training was identified. The school, constructed by students, is situated on 125

acres of land, 6 of which are cultivated. Students have designed and carried out garden works, planting and levelling of hills, and filling in of dry water courses, all being part of the "learning for life" approach at this level. While there is a higher proportion of boys to girls in the secondary school, there is still some opposition for formal schooling from more "rural" villagers, a point noted elsewhere by Newman in relation to Lucknow District (Newman, 1989).

Two aspects of the curriculum show a move in the direction of non-formal education: the work experience program and agricultural program. These areas adopt alternative methods of training and involve members of the wider village community, particularly the agricultural sector.

The idea behind the "work experience" program is that after leaving school, students will have a definite skill to take back to villages. This in turn will enable them to find employment and to pass skills on to others in turn. Regular classes are also held in sewing, welding, construction and maintenance of small spirit and gas stoves and electrical gadgets, drawing, cooking and agriculture. Students are free to develop other skills such as brick making and pottery building as the opportunities arise.

Students in standards 8, 9 and 10 choose two work experience areas over two years. Classes in "work experience" are conducted for two hours each week with students grouped in fours or fives under "teacher" supervision. Products made or produced are later sold to benefit the *ashram* as well as students themselves. A strong emphasis is placed on agriculture and village crafts in the agricultural program. Sixty-six acres of land granted by the government are now being used as a demonstration center. Generally, 50 sq ft of the school agricultural land is given to each student to work. Water, seed and fertilizer are given to students involved in the program by the *mandal*. Skills on grafting of trees, budding and pruning are taught by *mandal* members, particularly those involved in the agricultural experimentation project. Students propagate fruit trees such as mango in the nursery section and produce crops of tomato, ladies' fingers, chilli and eggplant in garden plots. At least an hour a day is spent on plots and the produce is sold, with strict records being kept of materials used, production levels and sales quotas. Proceeds are chanelled back to students who may use it for further study or banking, thus introducing students to finance experience. All activities take place "in the field" and teaching is generally carried out informally.

NonFormal Education: Sewing and Typewriting Courses

Nonformal education courses are organized to teach Pal women sewing and the use of sewing machines. As there are at least 3,000 women in the villages, participants in these courses are chosen from different villages since the area has only a small number of tailors. Participants need to have complete Standard 4 (basic) mathematics (in order to be able to read tape measures and perform basic measurement tasks). They must be *adivasis* and at least 16 years old. The State Government will supply a sewing machine for each woman trained provided she is from one of the "scheduled" tribes. Plans have also been made to instruct men and women in typewriting skills. Since Pal is the administrative center of the area and as the *ashram* members conduct their own post office, such skills are best put to use in a more commercial context. Participants must be from the unemployment group.

Farming Courses

Forty nonformal education farming courses are conducted each year. Twenty courses are held in different villages and the others at Pal *ashram*. Courses last from 3 to 5 days. Most participants are men although, theoretically, courses are open to women as well. Time is set aside in each course for basic instruction and training in other areas such as reading, mathematics, health and communications to complement the work on agriculture.

People are contacted by letter. Then trained workers go to a designated location in particular villages, or villagers go to a "central" village. Agricultural problems are discussed along with the latest methods being developed at the Centre for Agricultural Awakening. When workshops are held in Pal, villagers have the chance to actually visit the Centre. A variety of instructional methods are used but "field work" is always built into courses so that farmers have the opportunity for informal observation of methods and procedures and for periods of informal exchange with other farmers.

CONCLUSION

Development in the Pal context is taking place through the integration of various sectors in society, the integration of communities and the integration of various activities within the program. Villagers are able to see themselves becoming self-sufficient. Development leaders are emerging from the ranks of villagers, frequently having received education or training in the Pal schools. In the long term, the program encourages participation of local people in assessing their needs and deciding on plans of action and systems of training aimed at an improved lifestyle, economic security and increased dignity.

Farmers gain confidence and expertise in defining specific needs and in sharing their experiences, successes and failures. In the case of the agricultural and breeding programs, farmers are self-sufficient in the planning area, relying on outside financial and technical assistance only for the occasional situation. Even education is seen as a vital means of integrating projects, with the mode directly related to the outcomes desired. Thus "need" often informs the curriculum. "Texts" tend to be experiences gained through observation, trial and error. "Instructors" are other workers (unless a specialized problem requires a specialist veterinarian or agriculturist).

From the Pal situation, it becomes clear that education and integrated rural development must involve the active participation of community members. Over time, active participation of local people in such a program can lead to the emergence of local indigenous leaders through whom development may remain relevant and lasting.

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SLOPE FAILURE DURING THE JULY 16, 1990 LUZON EARTHQUAKE

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ABSTRACT. Landslides were observed to have been triggered by the July 16, 1990 earthquake in Luzon, Philippines, particularly in such regions as central and northern Luzon. Most of the slope failures were shallow and composed mostly of the upper horizons of highly weathered bedrock. The landslides occurred preferentially on steep slopes, drainage divides, valley heads, near river bends, and along road cuts. After the landslides of the main shock and the immediate aftershocks, incipient landslides were triggered by later aftershocks and monsoon rains. Loose materials were further remobilized as debris flows which eventually clogged river channels and caused flooding. A final inventory of damage in the study area showed 14 major landslides and 82 minor ones, with a total cumulative volume of 1.45 million cubic meters of mobilized mass on a 27-km stretch of highway.

INTRODUCTION

The July 16, 1990 Luzon, Philippines earthquake induced and triggered numerous landslides in central and northern Luzon (Fig. 1). Abundant landslides occurred in the mountainous regions northwest and west of the rupture along Digdig Fault from Tayabo to Kayapa, the northern terminus of the rupture, and on a narrow zone closely following the rupture on the Philippine Fault. Landslides can be observed as far north as Lagayan, Abra; Agoo, La Union in the west; and Dingalan, Aurora in the southeast. In Agoo and Damortiz, folded sedimentary formations forming ridges parallel to the coast experienced slope failure — few small landslides occurred within the broad flat Central Plain, principally as slumps along fault scarps and other moderately elevated terrains.

CHARACTERISTICS OF THE LANDSLIDES

Most of the landslides were shallow, 1 to 2 m deep, and composed in large part of soil coverings of highly weathered bedrock. A lesser volume of bedrock materials disaggregated and were mostly incorporated in the failed mass. Only a few block slides and slumps of soil and rock were observed, mostly along roads leading to Baguio. A small percentage of the total number of landslides was remobilized old landslides. These earthquake-induced landslides occurred preferentially on steep slopes, drainage divides, valley heads, near the concave side of river bends, and along road cuts with their crown coinciding with ridge crests. Initiation at this portion may be due to the fact that high areas, such as ridges, tend to have an amplifying effect on propagating seismic waves, thereby causing disturbance on weak surficial materials.

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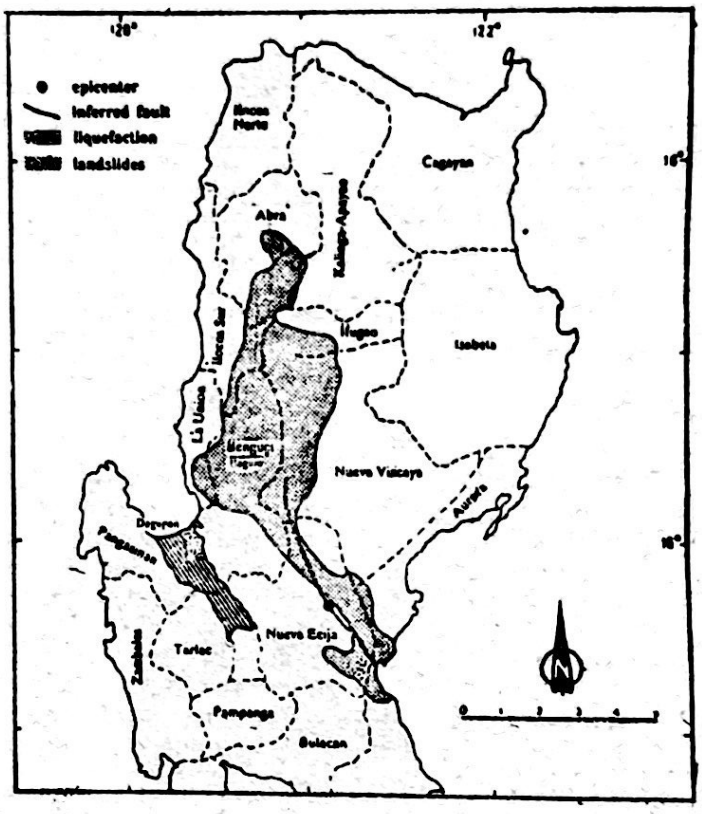

FIG. 1. LANDSLIDE-AFFECTED AREAS ASSOCIATED WITH THE JULY 16, 1990 EARTHQUAKE

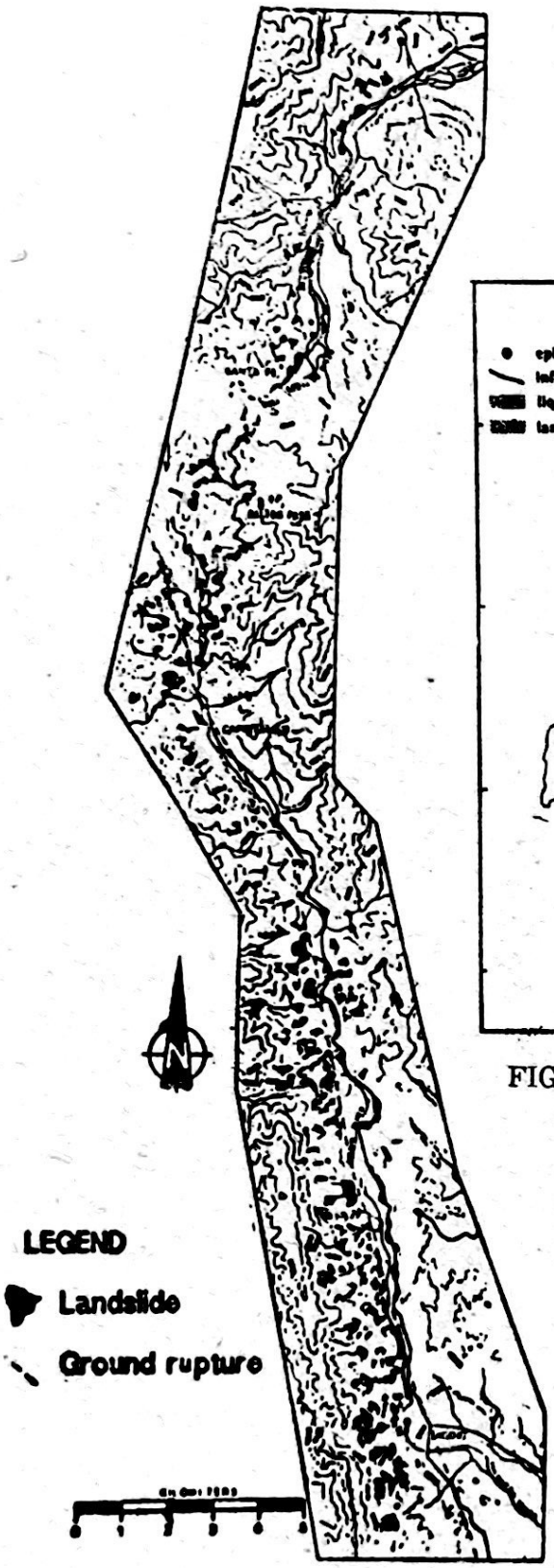

FIG. 2. MAP SHOWING THE LANDSLIDE ALONG THE MAHARLIKA HIGHWAY

LANDSLIDE INVENTORY

A landslide inventory (Fig. 2) of a stretch of Maharlika Highway from Digdig junction up to a little north of Santa Fe based on aerial photos taken of the area 40 hours after the main shock and on field investigations would more or less give an idea of the extent of damage. The area covered by the aerial photos is less than 5% of the total area affected by landslides but would more or less characterize the whole phenomena. Landslides considered in this inventory are those with a volume of at least 1,000 cubic meters. The total cumulative volume of mobilized mass of this area covered by aerial photos was 5.52 million cubic meters. On this 40-km road stretch, the highway was blocked by 13 major landslides and 8 minor slides with a total volume of 852,500 cubic meters. Two weeks later, the Department of Public Works and Highways recorded 14 major landslides and 82 minor slides with a total cumulative volume of 1.45 million cubic meters of mobilized mass on a 27-km stretch of this same highway.

As is typical of landslides induced during the July 16 earthquake, landslides on this area are mostly shallow slides of soil with a few incorporated disaggregated bedrock materials occurring on steep valley slopes. What were mobilized are the soil coverings derived from the weathering of the underlying rock materials. Correlating with the slope of the area, most of the landslides occurred on steep slopes of at least 20 degrees.

The major landslides in the area north of Santa Fe and away from the rupture were mostly from slopes modified and destabilized by deep road cuts.

CONTINUING LANDSLIDES AND DEBRIS FLOWS

Incipient slope failures brought about by the main shock were eventually triggered by the ensuing aftershocks and monsoon rains. The landslides in most places have oversteepened the slopes and left cracks and fractures that provided passageways for rain to infiltrate and accumulate on these unstable slopes and prepared these for more landslides. Heavy and sometimes light but sustained rainfall created new landslides which were more dramatic along highways as these hampered rescue and rehabilitation efforts.

Loose landslide materials were further remobilized into debris flows as rains saturated these deposits. Debris flow deposits and features were observed in Dipalo, Banila, Digdig and Talavera Rivers. The deposit consists of sand, silt, a few boulders and logs. The abundant logs suggest that the source materials caused log jams along the course of the river, especially where the debris abut against the piers of bridges. The debris flow diluted into hyperconcentrated stream flows further downstream.

CONCLUSION

Apparently, the landslide-related disastrous events that transpired on July 16, 1990 and the days following it resulted from an interplay of geologic phenomena that led to the occurrence of many hazards in succession of each other. The July 16, 1990 main shock and the aftershocks immediately after it triggered many landslides and at the same time left incipient landslides which were eventually triggered by more

aftershocks and monsoonal rains. Loose landslide deposits and slope materials with reduced shear strength were further remobilized as debris flows which surged down the major tributaries emanating from landslide-devastated areas. Consequently, the debris flows apparently reduced the capacity of the river channels by depositing sediments and debris on river beds which led to flooding of low-lying areas as streams tend to overflow.

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