PN-ABH-222

Executive Summary

ECONOMIC ANALYSIS OF THE MODEL FARM PROGRAM AND ITS SUBSIDIZATION UNDER THE CITANDUY II PROJECT

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Report to:

U.S. Agency for International Development (USAID)
Jakarta, Indonesia

and

Unit Studi Dan Evaluasi Sosial Ekonomi (USESE)
Ciamis, Indonesia

Contract Number ANE-0000-C-00-6067-00
Work Order 3

June 1988

The views expressed herein are the views of the Contractor and are not necessarily the views of A.I.D.

INTRODUCTION

The Citanduy II Project was started in 1981 with the dual goals of increasing farmer incomes and reducing erosion. The program established 48 model farm units and impact areas over a 5 year period. The model farms are located in the Citanduy watershed at the eastern edge of West Java.

The model farm program consists of introducing a package of upland agricultural technologies. The model farm package includes constructing bench terraces and using new cropping patterns, seed varieties and inputs of chemical fertilizers and insecticides on land with slopes up to 50 percent. Land with slopes of more than 50 percent get an agro-forestry package. Subsidies are provided for the construction of bench terraces and the purchase of inputs.

This analysis differentiates between evaluating the technology and evaluating the program. The technology is defined as the package consisting of building bench terraces and utilizing new cropping and input mixes; the program is defined as the process of getting farmers to adopt the model farm technology. The evaluation of the model farm technology requires that we assess its benefits and costs; the evaluation of the model farm program requires that we determine the degree to which it spreads the model farm technology.

This summary examines the success of the model farm technology, the success of the model farm program, the need for subsidies, and additional research needs.

SUCCESS OF MODEL FARM TECHNOLOGY

The model farm technology is intended to yield both on and off-site benefits. On-site, the technology is suppose to improve farm incomes. Data are available for assessing the on-site returns from the model farm technology in terms of farmer incomes, where farmer incomes measure the net value of production, including that production which is consumed on the farm.

Off-site, the model farm technology may also yield benefits due to the reduction of soil erosion. Sediment and other pollutants resulting from water erosion that are carried to streams and rivers can cause a variety of in-stream and off-stream damages. In-stream damages include damages to aquatic organisms, water-storage facilities and navigation. Off-stream damages include flooding damages and damages to water-conveyance systems. However, insufficient data are presently available to assess the off-site effects.

Average gross farm incomes increased over the span of time the model farm program has been in existence. It appears that both project and outside project farmers shared in these gains. The most important factor explaining the increase in farm incomes appears to be a shift in the cropping mix. During the early years of the project, the shift was into rice and out of cassava production and, more recently, the shift has been into cassava and out of rice production. This shifting cropping mix has been triggered by fluctuations in the relative prices of cassava and rice.

Nearly pure cassava producers or rice producers are worse-off than producers who grow a combination of both crops. Using 1985 prices, net incomes are highest for those farmers with a cropping mix that includes approximately 40 percent cassava by weight. This is approximately one half of a typical farm's cassava production prior to 1981. At 1987 prices, the optimum output mix rises to approximately 60 percent cassava by weight.

Bench terracing appears to facilitate a shift in the cropping mix towards rice production. During the early stages of the model farm program, when rice prices were rising relative to cassava prices, farm incomes rose both because of the rising prices and because bench terracing permitted the shift into rice production.

But as the relative price of cassava has risen in recent years, the benefits of weighing the cropping mix towards rice production and, thus, the benefits of bench terracing, have declined. Bench terracing appears more important for rice production than for cassava production. As the relative contribution of rice production to farm income has declined with

declining rice prices, there has been an associated decline in the income benefits attributable to bench terracing.

That is, bench terraces yield the greatest income benefits when the optimum cropping mix is weighted towards rice; they yield the least income benefits when the optimum cropping mix is weighted towards cassava. During the 1981 to 1987 period examined by this study, the overall effect of relative prices moving in favor of cassava production has been to diminish the income benefits of bench terracing and to yield a negative net return to the technology.

The USESE data sets used for this analysis were subjected to a wide range of statistical tests in order to examine alternative explanations proposed to us for the apparent lack of success of the model farm technology. The data represent a relatively short time period, however, so the results should be treated with caution. The statistical tests indicate that we can rule out the learning process, soil degradation, source of income, diversion of subsidies to lowland sawah, and differences in soils (i.e., volcanic versus sedimentary) as reasons for the apparent lack of success of the model farm technology to increase incomes.

The value of the model farm technology and, particularly, bench terracing in terms of increasing farm incomes may be more of a long-run phenomenon than is observable with the available short-run data. Cyclical changes in rice and cassava prices induce changes in the cropping mix of farmers. Farmers with terraces are more able to take advantage of these price changes than farmers without terraces, especially when the shift is into rice production. Therefore, farmers with terraces are likely to have higher average incomes over the long-run than farmers without terraces. But the present data are insufficient for testing this hypothesis.

SUCCESS OF MODEL FARM PROGRAM

The model farm program is designed to extend the program's technology beyond the model farm. The model farm itself is intended as a demonstration of the model farm technology. Once the

model farm is established, the visual presence of the model farm and the efforts of extension workers are anticipated to convince other farmers to adopt the technology. First, farmers are induced with subsidies to emulate the model farmers. These are the dampak subsidy (DS) or subsidized expansion area farmers. Next, the additional returns from utilizing the technology are demonstrated to other farmers, who are expected to adopt the technology using their own resources. These are the luar proyek (LP) or unsubsidized outside project group.

Bench terracing, which is the major component of the model farm technology, spread rapidly during the 1981 to 1985 period, indicating that the program is a success. Not only is bench terracing within model farm projects nearly total, but bench terracing by nearby farms outside the project lags only slightly behind those in the project.

Extension workers are the primary source of information regarding bench terracing. This is the case not only for farmers in the projects, but also for outside project farmers. The extension component of the model farm program for spreading the technology appears successful.

The need for many model farms for spreading the technology, however, is not obvious. Extension workers, not the visual presence of the model farm, seem to be the catalysis for change. Moreover, the improved "before" condition of model farm sites since 1981 may be due to extension workers spreading the technology in advance of the model farms.

SUBSIDIES

Under certain conditions, bench terracing appears to pay for itself. Unsubsidized farmers outside the project are bench terracing using their own resources and their net incomes are increasing. The fact that the net incomes of the model farmers decline may be a function of input and output restrictions imposed upon them by the model farm program. If these mixes are somehow important to the demonstration function of the model farms, then subsidies are needed for these farmers. But neither subsidies for

terracing nor program input subsidies are economically justified for other farmers.

There may be other purposes of the subsidies. For example, it has been suggested that they contribute to the support of the extension workers. If this is the case, then there may be justification for subsidies beyond the model farms, but in terms of on-farm economics they do not appear warranted. Credit may be needed more, but data are not sufficient to assess this need.

RESEARCH NEEDS

A number of questions have been raised by the analysis. In order to complete the analysis of the model farm program and build confidence in the results reported here, the following questions need to be answered.

Flexibility to change the cropping mix in response to shifting relative prices is a prime determinant of the farmer's income. Terracing appears to enhance this flexibility, at least for some crops such as rice. The role of terracing in cassava production is less clear. Moreover, how the sustainability of cultivation on steep slopes is impacted by terracing is not well defined. Research is needed to assess the physical relationships between terracing and changing cropping patterns and the sustainability of this type of agriculture over time.

Erosion from upland agriculture is thought to have negative downstream impacts. The model farm program may reduce these downstream costs, but in order to assess the magnitude of the benefits produced we need to know how much on-farm erosion is reduced by the model farm program, how much on-farm erosion contributes to downstream sediment problems, and what is the magnitude and value of downstream sediment problems. The current study by Dr. David Harper should contribute to answering the first question, but further research is needed to determine whether or not reductions in on-farm erosion have appreciable impacts on downstream sediment loads and what costs this sediment imposes.

The macroeconomics of the "uplands problem" have not yet been systematically explored. The limited success of the model farm program to increase net incomes appears due to the rise of cassava prices in recent years. At least in part, these rising cassava prices have resulted from a national policy seeking alternative exports to oil. Since cassava is not a terrace dependent crop and the effects of terracing on cassava production are not clear, the model farm program and national export policy may be working at cross purposes. Moreover, rising cassava prices may be encouraging further expansion of cropping on steep upland slopes. This expansion will likely justify more government programs and expenditures to control erosion. These issues merit further investigation.

Finally, the experience gained in the process of conducting this study provides insights into how data collection might be improved. The large data set utilized by this study was invaluable, but as was discovered, it was also inflexible. We recommend that in the future smaller, more directed data sets be collected. That is, well defined hypotheses should be formulated at the outset, data should then be collected to test these hypotheses, and the testing should lead to both conclusions and new hypotheses to be tested, perhaps with new data. Sequential testing and evaluating will shorten the time required to collect and analyze the data, while focusing attention on the most important issues. In addition, use of carefully controlled experiments, although possibly more expensive than interview surveys, would contribute to the credibility and accuracy of the information. In our opinion, this strategy would contribute greatly to reducing the confusion and differences of opinion which inevitably arise when interpreting less structured surveys.