Mobilizing local resources for irrigation development: the subsidi desa case of Indonesia

ANWAR HAFID and Y. HAYAMI

THE IMPACT OF NATIONAL SUBSIDIES on the rehabilitation of two small-scale river-diversion irrigation systems in Indonesia is examined. One system is in West Java and the other in South Sulawesi; both serve less than 100 ha. The rehabilitation involved the repair and raising of the diversion dams and the lining of some canals. The study shows that the subsidies were substantial inducements to the mobilization of local resources, and that as a result high rates of return on the rehabilitation projects were achieved.

Conversion of potential savings in the rural sector in the form of underemployed labor into productive capital such as roads and irrigation systems has been recognized as a potent means of agricultural and economic development in Asia.[1] But the success of this strategy depends on effective organization of labor at the village level.

This paper presents case studies on the use of communal labor to rehabilitate irrigation projects in two Indonesia villages. Both projects were supported by the Village Subsidy *Subsidi Desa* program, a national program to facilitate mobilization of local resources. The effectiveness of the program is analyzed in terms of the amount of local resources mobilized relative to the amount of outside assistance, the rate of returns to total investment, and the shadow price for communal labor.

Anwar Hafid, Research Scholar, and *Yujiro Hayami*, Agricultural Economist, International Rice Research Institute, Los Baños, Laguna, Philippines.

Subsidi Desa Program

Before proceeding to the case studies, we present a brief review of the *Subsidi Desa* program.[2]

A program of providing village subsidies to encourage community work in the construction of rural infrastructure was begun in 1969. The funds were used for the construction of irrigation systems, roads, and markets. Initially designed on a 1-year pilot basis, the program has since become nationwide with continuing budget appropriations.

Under the program, villages prepare project proposals that are sent through the subregency *kecamatan* to the community development offices of the municipalities *kabupaten* for assessment. Proposals approved by the *kabupaten* heads are sent to the provincial governors for final approval.

1 For a classical review, see Nurkse (1953).

2 For additional information on the *Subsidi Desa* program, see Prabowo (1973).

Table 1. Government subsidy, locally mobilized resources, and irrigation investment under the *Subsidi Desa* program. Indonesia, 1969-70 to 1973-74.[a]

Period	*Subsidi Desa* (million US $)			Irrigation investment (million US$)	Percentage of total *Subsidi Desa*	Inducement coefficient[b]
	Government subsidy	Locally mobilized resources	Total			
1969-70	11.2	27.1	38.3	18.0	47.0	3.4
1970-71	13.5	15.3	28.8	13.2	45.8	2.1
1971-72	12.7	13.2	25.9	11.0	42.5	2.0
1972-73	12.7	13.3	26.0	9.3	35.8	2.0
1973-74	9.2	9.1	18.3	6.5	35.5	2.0
Total	59.3	78.0	137.3	58.0	42.2	2.3

[a] Source: Unpublished data from the Community Development Office, Department of Interior, Republic of Indonesia.
[b] The sum of government subsidy plus locally mobilized resources divided by government subsidy.

The subsidy for each project was initially US$250[3], but the amount was raised to $500 in 1973 and $750 in 1975. The funds appropriated for the *Subsidi Desa* program by the central government come from the Community Development Office, Department of Interior, and are channeled to the villages through the local administrative hierarchy.

Between 1969-70 and 1973-74, total government subsidies amounted to $59 million and locally mobilized resources to $78 million (Table 1). The mean investment-inducement coefficient — the ratio of the total project cost to the government subsidy (Ishikawa, 1967) — was about 2.3 during this period, indicating that, on the average, $1 of government subsidy induced the mobilization of $1.30 of local resources.

These statistics suggest that the *Subsidi Desa* program was quite successful in mobilizing local resources of low opportunity cost for the construction of rural infrastructure. However, these data were taken from the *kabupaten* reports of community development and should be viewed with reservation. Because *kabupaten* offices process more than 100 project proposals each year, it is hardly possible for them to conduct substantive preproject and postproject appraisals. Without adequate data, some local officials may inflate achievement levels in their official reports. In addition, estimates of social benefits of *Subsidi Desa* projects are generally not made.

Evaluating the effectiveness of the *Subsidi Desa* program therefore requires the collection of village-level data. Case studies of the rehabilitation of two communal irrigation systems were thus undertaken. Irrigation projects were chosen because the major share (about 42%) of *Subsidi Desa* investments has been used for irrigation (Table 1), and because it is relatively easy to measure irrigation benefits.

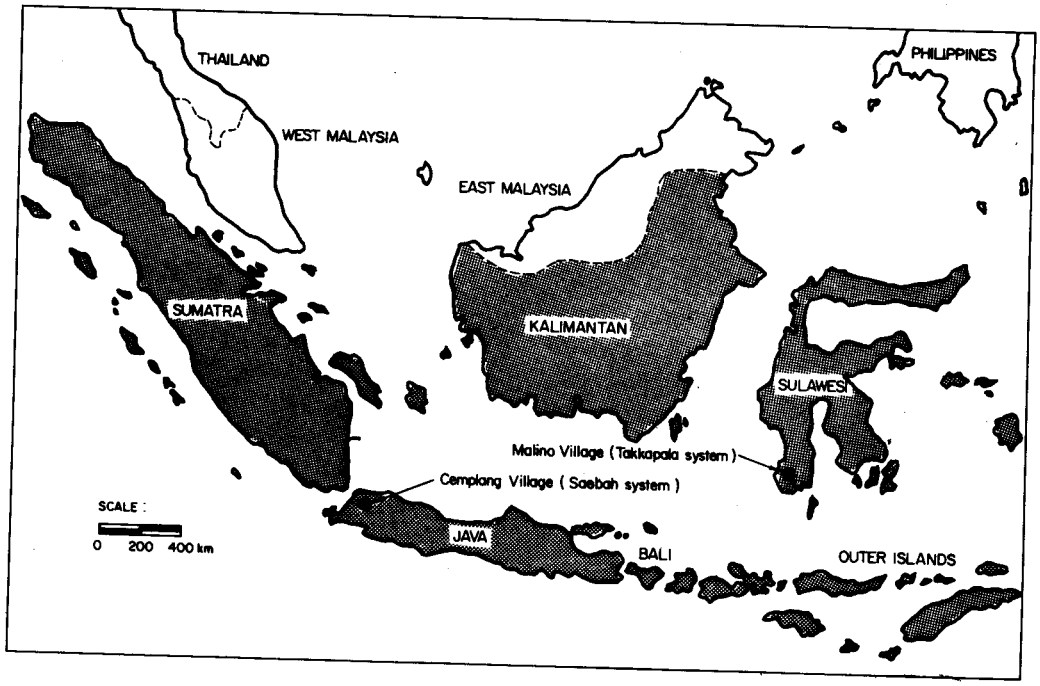
The Study Areas

The cases selected for study were the Saebah Communal Irrigation System in *Desa* Cemplang, West Java, and the Takkapala Communal Irrigation System in *Desa* Malino, South Sulawesi[4] (Fig. 1). Both systems involve gravity irrigation by river diversion, which is operated and maintained by village communities.[5]

3 All cost and price data in this paper have been converted to US dollars at Rp400 = US$1.

4 Irrigation systems in Indonesia are usually classified into technical irrigation systems *pengairan technis;* semi-technical irrigation systems *pengairan semi technis;* and village or communal irrigation systems *pengairan desa.* The first two are national systems operated and maintained by the government, while the third are communal systems managed by villagers. The areas covered by the technical, semitechnical, and communal systems in 1972 were 1.54, 1.02, and 1.51 million ha, respectively. Both the Saebah and Takkapala systems are *pengairan desa.*

5 Locally elected village ditch tenders *ulu-ulu desa* manage the systems, utilizing communal labor for operations and maintenance.



1. Major islands of Indonesia.

The Saebah system was rehabilitated under the *Subsidi Desa* program with $250 subsidies in both 1971 and 1972. During 1971, its rock-and-gravel diversion dam was renovated and heightened. In 1972, lining of critical canal reaches with concrete improved the water distribution system. The rehabilitation was undertaken during the slack agricultural season (June to August) by mobilizing 30 villagers each for 45 effective working days in the first year, and each for 30 effective working days in the second year.

Rehabilitation of the Takkapala system, which was undertaken with a $250 subsidy in 1971, also involved concrete lining of dam and canals. The village received the government subsidy in September, and the project was carried out during September and October through the mobilization of 40 villagers for 45 effective working days.

Systems in these two areas of Indonesia were selected to reflect contrasts in population density and the share of total *Subsidi Desa* funds used for irrigation. The values for both criteria were substantially higher in West Java (469 persons/sq km and 54%) than in South Sulawesi (76 persons/sq km and 16%). Cemplang, West Java, also represents villages near urban areas with many off-farm employment opportunities. Malino, South Sulawesi, is an isolated village with few nonfarm employment opportunities.

Cemplang is on a highway about 30 km west of Bogor, the center of agricultural education and research in Indonesia. The village is made up of 53 neighborhood organizations *rukun tetangga* and 8 unions of *rukun tetangga* called *rukun kampung*. At the time of the survey, the village had 750 households with 5,048 inhabitants, many of whom were employed in construction and other trades in Bogor and Jakarta. The total agricultural land area is 415 ha, of which 360 ha are lowland rice fields. Rainfall is high and relatively evenly distributed throughout the year (Fig. 2).

Malino is 64 km south of Ujung Pandang, the provincial capital of South Sulawesi. It is relatively isolated with no improved roads

connecting it to any urban center, and consists of 71 *rukun tetangga* and 11 *rukun kampung* with 1,781 households and 9,828 inhabitants. Of the total 10,000 ha area, 610 ha are lowland rice fields, 2,645 ha are upland rice fields, and 6,845 ha are forest lands. Rainfall in Malino is also high and relatively evenly distributed (Fig. 2).

Surveys of the Saebah and Takkapala systems were conducted from March 15 to June 6, 1975. Random samples of 30 respondents from the list of 90 irrigators in the Saebah system and 34 respondents from 125 irrigators in the Takkapala system were taken. Data were collected on benefits and costs of rehabilitation and on the motivation of villagers to participate in rehabilitation.

Economic Evaluation of the Projects

General characteristics

A major difference in the socioeconomic characteristics of farmers in the Saebah system and in the Takkapala system is the proportion of family members of working age (15 to 65 years) who work on farms (Table 2). In Saebah, only 1.2 of 4.1 family members worked on farms, while in Takkapala 2.3 of 3.8 did. This difference arises because Takkapala has fewer off-farm employment opportunities and larger farms.

While the area commanded by the Saebah system was used exclusively for lowland rice production, the Takkapala area had a mixture of lowland rice and upland crops. In Saebah, most respondents were tenants while in Takkapala most were owner-operators.

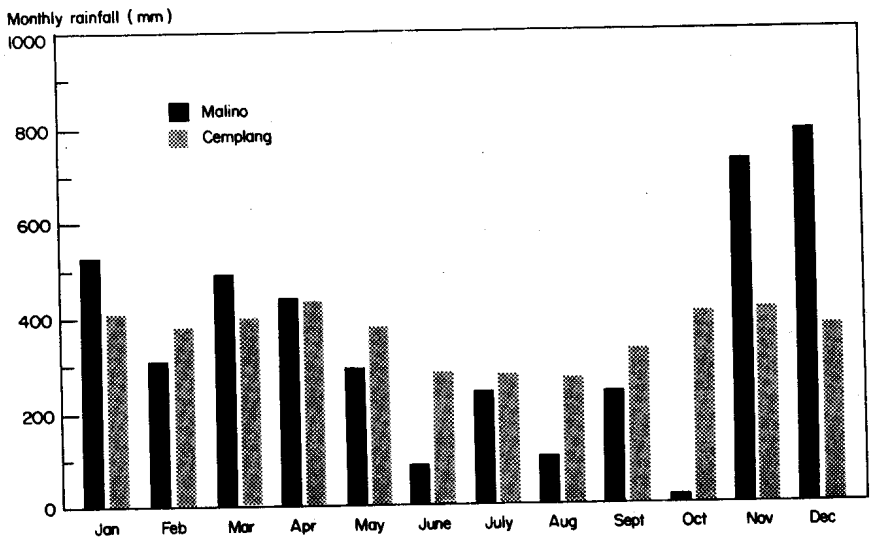
Only 2 of 30 respondents in Saebah own carabaos; the rest hire animals for the traditional means of land preparation. Farmers in Takkapala, on the other hand, average one draft animal each, and many invest earnings in animals rather than keeping cash or gold.

The Saebah respondents had less education than those from Takkapala, again reflecting Saebah's greater exposure to the infrastructure and economic opportunities of nearby urban areas.

Locally mobilized resources

The first criterion for assessing the effectiveness of the *Subsidi Desa* projects is the extent of local resources, especially communal labor, mobilized for the projects.

The estimated capital costs required for the rehabilitation are computed from material con-



2. Monthly rainfall in Malino (Ujung Pandang Extension Service) and Cemplang (Central Research Institute for Agriculture). Indonesia, 1973–74.

Table 2. Characteristics of sample respondents[a] for the Saebah and the Takkapala Irrigation systems. Indonesia, 1975.

Characteristic	Saebah, W. Java		Takkapala, S. Sulawesi	
	Mean	Range	Mean	Range
Family size (no.)	6.1	2-11	5.3	3-10
Family members aged 15 to 65 (no.)	4.1	3-9	3.8	2-8
Family members working on farms (no.)	1.2	1-3	2.3	1-6
Age of family head (yr)	40	27-62	37	25-57
Age of family members (yr)	22	2-30	22	11-34
Education of family head (years of schooling)	4.5	0-9	3.4	0-9
Farm size (ha)[b]				
Irrigated rice land				
Owned	0.2	0.2-0.3	0.6	0.2-1.5
Tenanted	0.8	0.5-2.0	0.1	0.0-0.6
Upland	0	0	0.7	0.5-2.5
Total	1.0	0.4-2.0	1.4	0.4-2.0
Carabaos (no.)	0.1[c]	0-1	6.8	3-13
Horses (no.)	0	0	0.7	0-4

[a] Based on 30 respondents from Saebah and 34 from Takkapala. [b] After rehabilitation. [c] Two farmers owned one carabao each.

Table 3. Capital costs of rehabilitating the Saebah and the Takkapala irrigation systems. Indonesia, 1971-72.

Costs	Capital costs of rehabilitation			
	Saebah, W. Java		Takkapala, S. Sulawesi	
	US$	%	US$	%
Government subsidy				
Administrative costs	85	3.9	12	0.9
Construction materials	382	17.6	92	6.9
Hired labor	32	1.5	145	10.6
Subtotal	499	23.0	249	18.4
Locally mobilized resources				
Construction materials	0	0.0	95	6.9
Communal labor[a]	1407	64.8	1012	74.7
Cash payment for hired labor	265	12.2	0	0.0
Subtotal	1672	77.0	1107	81.6
Total investment	2171	100.0	1356	100.0
Investment inducement coefficient[b]	4.4		5.4	
Community labor mobilization coefficient[c]	4.5		7.2	

[a] Computed from 2250 man-days of communal labor at the local farm wage rate of US$0.62/man-day for Saebah, and 1880 man-days at US$0.56/man-day for Takkapala. [b] Total investment divided by government subsidy. [c] Total man-days of communal labor divided by government subsidy (man-days/US$).

tributions valued at market prices (Table 3). Communal labor contributions were imputed using the local farm wage rates of $0.62/man-day for Saebah and $0.56/man-day for Takkapala.

The proportion of locally mobilized resources was 77% for Saebah and 82% for Takkapala. Estimates of the investment inducement coefficient, the ratio of the value of total resources invested to the government subsidy, were 4.4 for Saebah and 5.4 for Takkapala. These estimates are substantially higher than the national average (Table 1), indicating that the projects under study are relatively successful.

Because the wage rate used for imputing the value of communal labor in the two systems differed, a physically based criterion was also computed. This community labor mobilization coefficient is the ratio of man-days of community labor to the value of the government subsidy. The respective coefficients for Saebah and Takkapala are 4.5 and 7.2 man-days/$1, showing a wider difference in real labor mobilization between the two irrigation systems than that reflected by the monetarily based inducement coefficient.

Profitability of the projects

Economic efficiencies of the Saebah and Takkapala rehabilitation projects were analyzed through benefit-cost (B-C) ratio and internal rates of return (IRR) analyses.

Benefits from the projects consist of increases in irrigated areas and in yields per hectare. This analysis is conservative, however, because it includes only those benefits stemming from increased area of irrigation. In the Saebah system, the area of rice increased from 70 to 100 ha during the wet season and from 50 to 90 ha in the dry season. The corresponding figures for the Takkapala system are 60 to 80 and 0 to 70 ha, respectively.

The first step in determining the annual flow of benefits was a farm budget cost and returns analysis (Table 4). Two extreme conditions were designated, Case A and Case B. The cost of man and animal power were assumed to be zero in Case A, and to reflect the prevailing wage rates in Case B. Because the increase in cropped area due to rehabilitation took place mainly in the dry season, the opportunity costs for labor would be much lower than the market wage rates, but not nil. Cases A and B therefore represent extremes between which reality lies.

Table 4. Costs and returns for rice production in the Saebah and the Takkapala irrigation systems.[a] Indonesia, 1974-75.

	Costs and returns (US$/ha)	
	Saebah, W. Java	Takkapala, S. Sulawesi
Output[b]	240	178
Total costs	212	101
Paid-out costs	106	37
Paid-out costs in cash	57	19
Fertilizer	37	4
Seed	10	8
Chemicals	0	1
Animal rental	6	0
Others	4	5
Paid-out costs in kind (hired labor)	49	18
Imputed farm factor costs	106	64
Family labor[c]	105	59
Animal costs	0	5
Net farm returns:[d]		
Case A: Output value minus paid-out costs	134	141
Case B: Output value minus total costs	28	77

[a]Data assumed to apply equally to wet and dry seasons. [b]Based on yields at 3.20 and 1.78 t/ha for Saebah and Takkapala, respectively, and price of US$100/t. [c]Based on 170 man-days at US$0.62/man-day for Saebah and 105 man-days at US$0.56/man-day for Takkapala. [d]The opportunity costs of man and animal power in Case A are assumed to be zero; in Case B they are assumed equal to the market wage rates.

The next step was to apply the farm budget data to the changes in the areas irrigated because of rehabilitation (Table 5). Common prices for inputs and outputs were used in the before- and after-rehabilitation analyses. Discount rates of 12 and 18% were also used.[6]

The final step in calculating B-C ratios and

[6] The highest interest rate of Indonesian government investment loans is 24%. Because the rate of inflation exceeds 20%/year, however, the real interest rate is less than 5%. This analysis therefore assumes discount rates much higher than the common real interest rate in the country.

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Table 5. Benefits from rehabilitating the Saebah and the Takkapala irrigation systems.[a] Indonesia, 1974-75.

	Saebah, W. Java		Takkapala, S. Sulawesi	
	Case A	Case B	Case A	Case B
Value of rice output (US$/ha)	240	240	177	177
Rice production costs (US$/ha)	107	212	37	102
Net return (US$/ha)	132	27	140	75
Annual rice area (ha)				
Before rehabilitation	120	120	60	60
After rehabilitation	190	190	150	150
Annual farm returns before rehabilitation (thousand US$)				
Rice production[b]	15.9	3.3	8.4	4.5
Vegetable production	0.8	0.8	5.2	5.2
Total	16.7	4.1	13.6	9.7
Annual farm returns after rehabilitation (thousand US$)[c]	25.1	5.1	21.0	11.2
Annual benefit of rehabilitation (thousand US$)[d]	8.4	1.0	7.4	1.5
Capitalized value of benefit (thousand US$)[e]				
12% discount factor	45.2	6.1	39.2	7.9
18% discount factor	36.5	4.9	31.6	6.4

[a] The opportunity costs of man and animal power in Case A are assumed to be zero; in Case B they are assumed equal to the market wage rates. [b] The product of the net return per hectare times the rice area before rehabilitation. [c] The product of the net return per hectare times he rice area after rehabilitation. [d] The difference in total farm returns before and after rehabilitation, excluding possible yield differences due to rehabilitation. [e] Assumes a usable life of 9 years beginning in 1971-72.

IRR was to introduce data on system costs (Table 6). The capital costs were based on data from Table 3, with the second year of the Saebah costs discounted to the present.[7] The annual operations and maintenance (O&M) costs were based on information from village officials. Annual O&M required 120 man-days of communal labor in the Saebah system, and 320 man-days in the Takkapala system:

Even with the conservative assumption of Case B, the B-C ratios are greater than 2 and the IRR greater than 50% for both the Saebah and Takkapala systems. Since the opportunity costs of family labor are lower than the market wage rates, the real profitability of the projects is substantially higher than the estimates of Case B. These results show that community rehabilitation projects are lucrative investment opportunities. It must be remembered, however, that the use of the *Subsidi Desa* program for the two irrigation systems covered in this study was considerably more favorable than the national average.

Rates of return to communal labor

From the standpoint of village communities, perhaps the most relevant criterion for appraising the value of work programs is the return to village labor contributed to the rehabilitation. In this study, a shadow price of communal labor was computed to reflect the value of that labor.

The shadow price was estimated as an average return per man-day of labor for initial capital construction, and for initial construction combined with O&M. The average return was calculated by substracting noncommunal labor costs from total benefits and dividing the resulting figures by the total man-days of communal labor. The ratios of shadow prices to market wage rates were also computed.

These calculations were made not only for the two types of communal labor, but also for the two wage rates assumptions, and for 12 and 18% discount rates, as in the B-C and IRR

[7] Discount rates of 12 and 18% and a usable life of 9 years were assumed.

Table 6. Benefits and costs associated with rehabilitating the Saebah and the Takkapala irrigation systems.[a] Indonesia, 1971-72.

	Saebah, W. Java				Takkapala, S. Sulawesi			
	Case A		Case B		Case A		Case B	
	12%[b]	18%[b]	12%	18%	12%	18%	12%	18%
Capital cost (CC) (thousand US$)	2.1	2.0	2.1	2.0	1.3	1.3	1.3	1.3
Capitalized value of operation and maintenance (O&M) (thousand US$)	0	0	0.3	0.2	0	0	0.9	0.8
Capitalized value of benefit (B)[c] (thousand US$)	45.2	36.5	6.1	4.9	39.2	31.6	7.9	6.4
Benefit-cost ratio: $\frac{B}{CC + O\&M}$	21.7	19.7	2.5	2.1	28.9	23.3	3.5	3.0
Internal rate of return (%)	610		58		530		89	

[a] The opportunity costs of man and animal power in Case A are assumed to be zero; in Case B they are assumed to be the market wage rate. [b] Discount factor. [c] Data from Table 5.

Table 7. Estimated shadow price of communal labor mobilized for rehabilitating the Saebah and Takkapala irrigation systems. [a] Indonesia, 1971-72.

	Saebah, W. Java				Takkapala, S. Sulawesi			
	Case A		Case B		Case A		Case B	
	12%[b]	18%[b]	12%	18%	12%	18%	12%	18%
Capitalized value of benefit (thousand US$)	45.2	36.5	6.1	4.9	39.2	31.6	8.0	6.4
Capital cost excluding imputed value of communal labor (thousand US$)	0.7	0.7	0.7	0.7	0.3	0.3	0.3	0.3
Capitalized value of O&M cost (thousand US$)	0	0	0.3	0.2	0	0	0.9	0.8
Total return to communal labor (thousand US$)[c]								
For construction only	44.5	35.8	5.4	4.2	38.9	31.3	7.7	6.1
For construction and O&M	44.5	35.8	5.0	3.9	38.8	33.8	6.7	5.3
Communal labor (man-days)								
For construction	2250	2250	2250	2250	1800	1800	1800	1800
For O&M[d]	1080	1080	1080	1080	2880	2880	2880	2880
Total	3330	3330	3330	3330	4680	4680	4680	4680
Shadow price of communal labor (US$/day)[e]								
Construction only	19.80	15.90	2.40	1.90	21.60	17.40	4.20	3.40
Both construction and O&M costs	13.40	10.80	1.50	1.20	8.30	7.20	1.40	1.10
Ratio of shadow price to farm wage rate[f]								
Construction only	31.9	25.7	3.8	3.0	38.5	31.1	7.5	6.1
Both construction and O&M costs	21.6	17.3	2.4	1.9	14.8	12.9	2.6	2.0

[a] The opportunity costs of man and animal power in rice farming and of labor in O&M are assumed to be zero in Case A and equal to the market wage rates in Case B. [b] Discount factor. [c] The return to communal labor used in construction is the capitalized benefit minus both the above costs. The returns to communal labor used in both construction and O&M do not involve the subtraction of the capitalized O&M cost. [d] Nine years of O&M at 120 and 320 man-days/year for Saebah and Takkapala, respectively. [e] Shadow prices are computed by dividing the total return to communal labor by the corresponding man-days of communal labor. [f] Farm-wage rates for the Saebah and Takkapala systems are US$0.62 and US$0.56/man-day, respectively.

analyses. A wide range of estimates resulted, as illustrated by shadow prices ranging from $1 to over $20/man-day (Table 7). Even the lowest estimates — which are unrealistically conservative because the rehabilitation was undertaken primarily during slack agricultural seasons — show a very satisfactory economic return to communal labor.

Organization of Community Resource Mobilization

We now consider what are probably the main determinants of success with the rehabilitation projects: village leadership and community organization.

In accordance with the guidelines of the *Subsidi Desa* program, the requests for project proposals originated with the village heads in Cemplang and Malino. The village heads first consulted intensively with the heads of their *rukun kampung* and *rukun tetangga* and then convened village meetings. The formal project proposals that emerged from the meetings were submitted to and approved by their respective *kecamaten, kabupaten,* and provincial offices. In executing the projects, the village heads, in consultation with heads of *rukun kampung* and *rukun tetangga,* prepared schedules to mobilize villagers for the work.

A major organizational difference between Cemplang and Malino was the relationship between the official village administration and the unofficial community organizations such as *rukun kampung* and *rukun tetangga.* In Cemplang, the village head took the major initiative in planning and organizing the projects. Even though he consulted with the heads of the lower organizational units, his requests for participation in the communal project were delivered directly to the villagers. Also, he often supervised the rehabilitation work directly at the project site. In contrast, the head of Malino left major decisions to the heads of the *rukun kampung* and *rukun tetangga.* The leaders of these smaller community units thus took responsibility for scheduling and supervising the work. The study respondents noted these differences in decision making between the two projects (Table 8).

Table 8. Villagers' perception of major decision makers who determine which *subsidi desa* projects to undertake in Cemplang (West Java) and Malino (South Sulawesi). Indonesia, 1975.

Decision makers	Respondents			
	Cemplang		Malino	
	No.[a]	%	No.[a]	%
Head of *desa*	25	56	6	15
Head of *rukun kampung*	15	33	7	17
Head of *rukun tetangga*	5	11	20	50
Ditch tender *(ulu-ulu)*	0	0	3	8
Individual farmers	0	0	4	10
Total	45	100	40	100

[a] Some respondents identified more than one category of persons.

The differences may have resulted partly from the difference in size and population density of the *desas* (750 households in Cemplang and 1,781 in Malino). But the more basic reason appears to be the stronger community ties in Malino, because that village was more isolated and self-contained. Indigenous community organizations in Cemplang were relatively weak, and official village administration was relatively strong.

These differences are also reflected in the characteristics of the leaders of the two villages. The head of Cemplang had accumulated wealth as a trader and was elected in 1970 for his administrative capability. But in Malino, the village head was an ordinary farmer respected for his dedication to the community and for his piety. He had been in office since 1945, the year of national independence, and was more a symbol of village unity than of administration. These characteristics are consistent with the villagers' preferences in Cemplang and Malino (Table 9).

Despite differences in village leadership for the two rehabilitation projects, economic analysis showed both projects as successful. Not only were substantial amounts of communal labor mobilized for construction, but the systems also appear to have been properly maintained after rehabilitation. Other similar

Table 9. Attributes of community leadership preferred by villagers in Cemplang (West Java) and Malino (S. Sulawesi). Indonesia, 1975.

Preferred leadership attributes	Respondents			
	Cemplang		Malino	
	No.[a]	%	No.[a]	%
Community dedication	3	8	34	55
Religious devotion	0	0	15	24
Administrative ability	30	79	7	11
Technical ability	0	0	6	10
Educational qualifications	5	13	0	0
Total	38	100	62	100

[a] Some respondents identified more than one cetegory of persons.

US$100/t. [c]Based on 170 man-days at US$0.62/man-day for Saebah and 105 man-days at US$0.56/man-day for Takkapala. [d]The opportunity costs of man and animal power in Case A are assumed to be zero; in Case B they are assumed equal to the market wage rates.

Table 10. Primary motives of villagers participating in the rehabilitation of the Saebah and Takkapala irrigation systems. Indonesia, 1971-1972.

Primary motive	Respondents			
	Saebah, W. Java		Takkapala, S. Sulawesi	
	No.	%	No.	%
Social obligation	30	100	24	71
Economic benefits	0	0	10	29
Total	30	100	34	100

projects may have been less successful because their lifetimes were shorter due to inadequate maintenance or poor technical design — not necessarily because of insufficient mobilized labor.

The success of the two projects, in spite of different community structures and leadership, suggests that both villages had appropriate leadership for their undertakings. In Malino, where neighborhood community ties are strong, leaving major decisions to the local community undoubtedly provided incentives for villagers to participate in the project. But in Cemplang, where community ties are somewhat weaker, the strong initiative of the administratively capable village head was probably necessary to effectively mobilize local resources.

Differences in community structures also reflect differences in the motivation of villagers to participate in the projects. In Cemplang, all respondents identified "social obligation" as the major motive for participation, while in Malino, some respondents referred to "economic benefits" (Table 10). Perhaps when the villagers of Malino made decentralized decisions, they discussed the benefits they could expect from the project within their neighborhood communities.

Conclusions

National policy to promote the mobilization of low opportunity-cost resources — chiefly labor — at the village level by subsidizing the community construction of social and production infrastructure can be highly successful. It must be emphasized, however, that the projects investigated in this study are not fully representative of all such projects in other countries or even in Indonesia. Many unsuccessful projects have undoubtedly suffered from inadequate local leadership and attention to technical detail.

The nature of the projects in this study is somewhat special. Both involved the rehabilitation of certain components of irrigation infrastructure to enable the restoration of original water delivery capacities and, hence, original agricultural potentials. Because the benefits from such rehabilitation are apparent to the community, and because the projects do not involve dislocation of people or construction of the complete system (as many other projects do), villagers can be expected to participate actively.

Finally, we are impressed with the importance of village leadership in identifying and organizing viable community projects. The villages in this study had quite different socioeconomic environments, community structures, and types of leadership. Yet the projects in both were highly successful,

suggesting that national and local government agencies should use different approaches for different communities. Additional studies of both successful and unsuccessful cases would help identify appropriate approaches to mobilize underutilized local resources for economic and social development.

References Cited

Central Research Institute for Agriculture, Agroclimatology Unit, West Java. 1974. Monthly rainfall records for 1973.

Ishikawa, S. 1967. Economic development in Asian perspective. Tokyo, Kinokuniya. 488 p.

Nurkse, R. 1953. Problems of capital formation in underdeveloped countries. Oxford University Press, New York. 162 p.

Prabowo, D. 1973. The impact of government subsidy upon villages, Yogyakarta. Gajah Mada University.

Ujung Pandang Extension Service, South Sulawesi. 1973. Monthly rainfall records for 1972.