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*Transferring new technology to village
communities: a non-government
organisation experience in Indonesia*

Colin Barlow and Mes Beeh

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abstract

Non-government organisations often play key roles in transferring technologies to poor rural communities. This paper analyses the case of a non-government organisation introducing water closets to households on a remote Indonesian island and explores the economic benefits and costs, and aspects of social structure influencing adoption. The prevalence of market failure due to absent information is discussed, along with the consequent need for outside help until profitable innovations are seen as such by participants.

The case study illustrates advantages of non-government organisation interventions, including those flowing from close local community contacts and large voluntary labour and material contributions from targeted groups. It also denotes the crucial importance and difficulty of associated social engineering.

Comparing non-government organisation initiatives with government projects suggests they can be cheaper and more effective for village-level ventures, however, it also appears that the new and more community-oriented official Indonesian approach adopted in 1994 shows promise. Grassroots non-government organisation interventions are broadly viewed as complementing government actions in rural development.

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Abstract

The National University Division of Development Studies has been studying the role of non-governmental organisations in rural development. This paper analyses the case of a non-governmental organisation introducing water close to households on a remote Indonesian island and explores the economic benefits and costs, and aspects of social structure influencing adoption. The presence of market failure due to absent information is discussed, along with the consequent need for outside help until suitable innovators are available to participants.

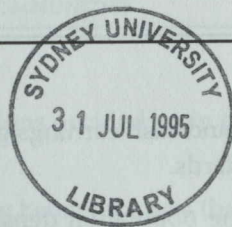
The case study illustrates advantages of non-governmental organisations in rural areas including their ability to work with local community contacts and large voluntary labour and material contributions from targeted groups. It also explores the crucial importance and difficulty of associated social engineering.

Comparing non-governmental organisation initiatives with government projects suggests they can be cheaper and more effective for village-level ventures, however it also appears that the more community-oriented official Indonesian approach adopted in 1982 shows promise. Current non-government organisation initiatives are reviewed as to their effectiveness in rural development.

Keywords: community development, rural development, social engineering, water supply, non-governmental organisations.

Introduction
The National University Division of Development Studies has been studying the role of non-governmental organisations in rural development. This paper analyses the case of a non-governmental organisation introducing water close to households on a remote Indonesian island and explores the economic benefits and costs, and aspects of social structure influencing adoption. The presence of market failure due to absent information is discussed, along with the consequent need for outside help until suitable innovators are available to participants.

Centre for Development Studies



transferring new technology to village communities: a non-government organisation experience in Indonesia

Study background

The island of Batu Putih had low, unpredictable rainfall averaging some 500 millimetres per year concentrated in the period January to March. There was a long dry season from April until December. The cropping system was based on maize for subsistence, grown both within village precincts and isolated fenced *ladang* cultivated on a slash and burn system. Dry rice, various root crops, chicken eggs, pigs, goats and vegetables including beans, groundnuts, watermelon and garlic were also produced. The vegetables and goats were sometimes sold for cash in the nearest mainland town of Bandar Kubu, 35 kilometres from the northern tip of Batu Putih.

Store cattle were the chief cash earner and roamed freely in the huge dry areas of scrubland surrounding the villages. These were mainly sold to outside traders. A few cattle were also finished locally, being tethered and fed on tree branches and grasses collected from surrounding paddocks. The ownership of cattle was skewed, with only about two-thirds of households in each locality owning cattle.

Maize was an improved type introduced in the 1960s, but yielded only 300–500 kilograms harvested crop per hectare under the dry conditions. Its output appeared to be declining, with falling soil fertility and an absence of fertiliser. There were often difficulties in securing 200 kilograms per person per year of this staple, regarded by locals as necessary consumption when supplemented by small quantities of rice, root crops and vegetables. This estimate may be compared with the 240 kilograms of rice per person considered by Sayogyo and Wiradi (1985) as necessary to stave off poverty in Java. Some rice consumed in Batu Putih was purchased from town, but this crop was usually used only for guests or if late dry-season conditions resulted in insufficient home-grown food. Maize and other subsistence items were crucial to most villagers'

diet, and cash earnings generally did little more than supplement the meagre living standards.

The population density of Batu Putih island was low at 33 persons per square kilometre. There were eight villages, each usually comprised of five separate hamlets (*dusun*) covering wide areas of 400–500 square kilometres with hamlets sometimes being far apart. There were no proper roads and all travel was by foot along rough tracks. Other public facilities were inferior, with poor schools and few children going beyond primary stage. Health centres (*pukesmas*) were few and ill-equipped, and endemic malaria and diarrhoea were the main causes of death. Water was frequently scarce, and some hamlets had only one well which dried up late in the year. There was no electricity supply. There were two chief ethnic types—*dua* and *satu*—and most hamlets comprised a majority of one of these.

The standard of living was low under such conditions, less than one-half of the national Indonesian mean. It was estimated at US\$200–300 per head per year in 1994. Batu Putih was in one of the poorest regions of outer island Indonesia.

Behavioural conditioning

Responses to new technologies are explained by direct economic factors, where agents characteristically weigh benefits and costs involved. But they are also determined by the underlying cultural and social system (Parsons 1976).

The *satu* and *dua* communities were paternalistic, based on extended families or clans with 'lines of command' from leaders and associated élites to lesser members. The *satu* lines were clearer than *dua* where directions from above were accepted with reservations. Lines of command were nonetheless strong in communities, and members often obeyed clan leaders rather than government authority expressed through village heads (*kepala desa*). Batu Putih populations had parallel governance structures with government and natural law (*adat*), although individuals frequently had responsibility in both systems.

The *satu* and *dua* community élites were normally comprised of well-off people and households. Élite members had social responsibility for other clan members. The paternalism of communities entailed an outward dominance of males, although within families there was much female influence.

Religion and the mosque played key roles for most Batu Putih people and provided a framework for socioeconomic and social development. Projects could be taken up, advocated and discussed at weekly prayer meetings and religious leaders were enlisted to obtain successful outcomes. The group or *kelompok* mode of social organisation entailed people undertaking cooperative tasks under an elected leader, who often belonged to the élite. Such joint activity gave economies of scale, while mutual

interaction of the group helped reinforce directions and actions decided on in group consultations (Mai 1994).

A significant and widely believed popular myth affecting behaviour was the 'just king' (*ratu adil*), who provides good harvests, health and even a perfect life. This belief lead people to feel that facilities given by outsiders were theirs by right without the need for accountability.

The Batu Putih subsistence agriculture was precarious and this had effects on most households. Hence the fluctuating crop yields constrained responses to possible transformations since big risks were attached using unknown techniques. Only households with higher incomes and asset levels had positive attitudes to new technologies. Such adoption behaviour is well recognised in the wider development scene (see for example Roumasset 1976).

All these factors are pertinent to how individuals and groups reacted to outside bodies—non-government organisations or government—hoping to effect transformations. The people of this study were not the independently acting agents often assumed in neoclassical economics, but were subject to many checks or constraints arising from social conditions. They were not working according to purely egotistical calculus, but had multiple functions in which ethical considerations were significant. These features must be recognised in analyses of adoption.

The non-government organisation approach

The non-government organisation (*yayasan*) in this study was common in rural areas of Indonesia. It comprised a small band of people headed by a local professional based in a town but originally coming from a nearby poorer district which they now wanted to improve. Thus the leader and two main staff of the non-government organisation lived in Bandar Kubu, but originated from Batu Putih. Similar grassroots non-government organisations have effectively established linkages with many village communities, leading to knowledge and other transfers and fruitful projects. They have grown significant in economic development, and handled an estimated 5 per cent of global foreign aid expenditure in poorer economies in the early 1990s.

The leader of the case non-government organisation expressed its goal as accompanying the people in order to use their potential and resources to increase their standards of living. Outside interventions were seen as stimulants and complementing internal resources with new information, skills, materials and limited capital. These provisions accelerated an economic and social development process still motivated by people striving to better their lifestyle, and grounded on resources and opportunities already available to them. The case non-government organisation

had equity objectives, aiming to improve the welfare of lower-income families. In theory at least, this matched the outlook of the communities themselves.

The 'accompanying' of the non-government organisation was viewed by its staff as delicate work, involving careful minimising of distortions arising from outside interference. It was approached through maximising community discussion and leaving fundamental decisions and organisation in local hands. Non-government organisation intervention in supplying information and other facilities to projects were usefully mediated through the *kelompok*, which provided economic advantages. Villagers employed as non-government organisation staff members were sometimes utilised as intermediaries. The impact of such collaboration was initially slow, but this was offset in that subsequent viable initiatives were sustainable. This approach is widely shared by other grassroots non-government organisations in similar circumstances.

Approaches

Non-government organisation staff first discussed the project with *kepala desa*, *adat* heads and interested villagers in 1991, and following keen reactions secured money from a foreign donor. Despite this early enthusiasm, switching to toilets was actually a change hard to make. This was underestimated, however, by all concerned in this early stage.

The water closets used were squat bowls set in concrete with a pipe leading to a septic tank. They used minimal amounts of water for flushing and were often accompanied by a water container for washing and were surrounded by a wall for privacy. The septic tanks of the previous toilets had lasted 15–20 years under the hot dry conditions which stopped liquid build-up and precluded pollutants from entering adjacent wells. Such simply designed toilets were relatively easy to construct and were already popular in urban centres of the mainland.

Materials for the toilets were distributed by the non-government organisation to 20 households in one hamlet of Pasir Penyau, Polak Pisang and Simpang Kota Lumpur. These materials included squat bowls, cement and piping (Table 1), all of which were purchased in Bandar Kubu and transported to the island. Recipient households were then expected to contribute labour, sand and lime. Those securing toilets in each hamlet had in fact organised themselves into *kelompok*, and bore responsibility in consultation with the non-government organisation for executing the project. The *kelompok* also handled households getting toilets then paying cash into a revolving fund or *arisan* over two years. This would then enable other families to receive the same facility. The *kelompok* were further expected to exercise pressure on members to complete projects.

Table 1 Characteristics of households receiving toilets, villages of Batu Putih, 1994

	Villages ^a			Total
	Pasir Penyu	Polak Pisang	Simpang Kota Lumpur	
Number of households	20	18 ^b	20	58
Number of ethnic types				
<i>Satu</i>	20	3	7	30
<i>Dua</i>	-	13	13	26
Other	-	2	-	2
Per cent beyond primary education ^c	15	22	5	12
Number of animals per household ^d				
Cattle (125) ^e	2.2 (60) ^f	1.3 (61)	3.2 (70)	2.3 (64)
Pigs (5)	2.0 (65)	2.4 (67)	3.0 (95)	2.4 (76)
Goats (15)	2.0 (50)	1.1 (28)	4.1 (60)	2.4 (47)
Chickens (2)	5.1 (80)	10.5 (100)	6.6 (100)	7.3 (93)
Crop output per household(kgs) ^g				
Maize (0.2) ^h	530	451	788	594
Groundnuts (1.0)	143	122	7	114
<i>Padi</i> (0.2)	-	49 ⁱ	51 ⁱ	33
Cash income per household per month (US\$) ^g				
Fixed ^j	0.6	20.4	0.5	6.75
Side ^k	10.7	6.9	9.9	9.3
Total	11.3	27.3	10.4	16.0

- a Where one of the five hamlets in each village shown received all toilets.
 b Excluding the mosque and sub-health centre, each of which also received one toilet.
 c No-one went beyond upper secondary school.
 d Overall average for all households (some households did not have particular types of animal).
 e Figures in brackets are estimated sale prices per animal in US\$.
 f Figures in brackets are percentage of households with animal shown.
 g Overall averages for all households.
 h Figures in brackets are estimated sale prices in US\$.
 i Unhusked.
 j Only one household each in Pasir Penyu and Simpang Kota Lumpur and three households in Polak Pisang had such income. Hence the income was substantial for each of the few households concerned.
 k Largely from trading, and mainly involving sales of cattle and cash crops.

While foreign donor money for toilets was received by the non-government organisation in August 1992, pressures of other work meant that materials were not distributed until mid-October. Some participants received supplies even later, owing to losses during transportation. Since this was already well into the dry season, little toilet construction occurred until wet season cropping ended in April 1993. The unfamiliar technology meant training was important and could have been carried out in each *kelompok*. In fact, however, training was delayed until each household actually commenced toilet construction where it was given on-the-spot training by non-government organisation staff.

The characteristics of households receiving toilets in each hamlet are given in Table 1. Although these may not fully represent all families, they are thought to reflect key hamlet features quite well. Virtually all households receiving toilets in the hamlet in Pasir Penyu were *satu* ethnic type, while the other two village hamlets were predominantly *dua*. There were small numbers of animals per household, although mean hamletwide proportions of families with cattle were probably lower than the sample figure of 60–70 per cent. Crop outputs per household were small and overall average hamlet cash incomes from the sale of cattle and cash crops were probably less than indicated.

Benefits and costs

The benefits of toilets not only included reductions in diarrhoea and worms, but also personal convenience and security, building and construction training, demonstration effects where toilets were adopted by others, efficiency improvements in non-government organisation operations, and higher status (Table 2).

Some benefits pertained solely to households, while others also involved the broader community. All were significant, but were hard to quantify and varied between situations. Reductions in diarrhoea/worms could provide an extra 10 working days per adult per year, worth US\$15.55 per person at current wage rates. Again, reduced disease from toilets could have community-level effects of much larger value in reducing overall infections. Efficiency improvements in non-government organisations could mean both reduced *yayasan* time per toilet and higher toilet quality, enabling more and better toilets to be built.

Although all benefits had value, they were not well appreciated by villagers, especially in cases of market failure, where outcomes were not fully evident owing to lack of information. The wider community benefits of toilets were thus positive externalities, which could take even longer for people to recognise than specific household gains. The only benefit recognised in calculating the benefit–cost ratios is that of diarrhoea/worms reductions, and the present value in year 1 of the 10-year

Table 2 Estimated benefits and costs of toilets

Benefits accrued over time	Household	Community
Reductions in diarrhoea and worms	*	*
Increases in convenience and security	*	*
Wider applicability of construction training	*	*
Demonstration effects		*
NGOs efficiency improvements	*	
Higher status		*

Benefits from reductions in diarrhoea/worms (US\$)

Year	Actual benefits	Present values (Year 1) at 15% ^a	
1	-	-	-
2	15.55	(0.7561) ^a	11.76
3	15.55	(0.6575)	10.22
4	15.55	(0.5718)	8.89
5	15.55	(0.4972)	7.73
6	15.55	(0.4323)	6.72
7	15.55	(0.3759)	5.84
8	15.55	(0.3269)	5.08
9	15.55	(0.2843)	4.42
10	15.55	(0.2472)	3.84
Total	139.95	n.a.	64.50

Per household costs of toilet (US\$)

Donor agency and ngo payments for outside materials and ngo time ^b		Imputed household donor agency and <i>kelompok</i> costs (Year 1) ^b	
Bowls	14.13	Household labour	
PVC piping and septic tank	12.15	(14 person-days @ \$1.55/day)	21.70
Binding wire and cement	10.22	Household-supplied materials	7.72
Transporting materials	1.55	Donor agency monitoring	5.99
Ngo's time on project	7.61	<i>Kelompok</i> time	
Total materials and time	45.66	(2 person-days @ \$1.55/day)	3.10
Interest @ 15 per cent ^c	13.39		
Grand total including interest	59.05		

Household repayments to *kelompok* (US\$)

	Actual costs	Present values (Year 1) at 15%
Year 1	-	-
Year 2 ^d	19.03	14.39
Year 3 ^d	19.02	12.51
Total	38.05	26.90

Benefit-cost ratios^e

To donor agency and non-government organisation

= (Present value of diarrhoea/worms reduction—1.5 persons, \$96.75) divided by (non-government organisation and donor agency payments, \$59.05) plus (foreign agency monitoring, \$5.99) less (household repayments to *kelompok*, \$ 26.90)

= 2.5

To household

= (Present value of diarrhoea/worm reductions—1.5 persons, \$96.75) divided by (household labour, \$21.70) plus (household-supplied materials, \$7.72) plus (household repayments to *kelompok*, \$26.90)

= 1.7

To household without subsidy^f

= (Present value of diarrhoea/worm reductions—1.5 persons, \$ 96.75) divided by (household labour, \$21.70) plus (household-supplied materials, \$7.72) plus (costs of outside materials, \$4.86^g)

=1.4

a Present values of the stream of benefits/costs at the beginning of the year 1. The interest rate of 15 per cent is judged to be the opportunity cost of cash to villagers.

b On the assumption that these costs are incurred at the beginning of year 1.

c On \$45.66 outstanding for 2 years, and \$22.83 outstanding for one further year. This assumes that \$22.83 is repaid by households at the end of year 2, and \$22.83 at the end of year 3 (see note d). These interest payments are then converted to their total present values at the beginning of year 1 (\$13.39).

d Paid at end of years 2 and 3 respectively.

e Considering benefits from reductions in diarrhoea/worms only, and assuming that these apply to one and a half working persons per household.

f Assuming that the households buy outside materials privately.

g Assuming that privately bought materials cost 10 per cent more than when purchased by the non-government organisation.

flow of saved working days arising from these is estimated in Table 2. The procedure of discounting items to present values at 15 per cent interest (the estimated opportunity cost of cash to villagers) provides comparability to flows of revenues and costs over differing time periods.

Another factor delaying acceptance of materials and adoption were gender differences. Females were keener on toilets than males, perhaps valuing 'security' more highly (Table 1). Gender was a greater issue in lower-income households, whose expenditure on toilets was of lower priority to male members.

The costs of toilets could be better pinpointed (Table 2), but they too varied between circumstances. It is important to distinguish between costs incurred by the three parties of donor agency cum non-government organisation, household and *kelompok*. The estimated donor agency–non-government organisation payments for outside materials and non-government organisation time were incurred in cash, while costs of household labour, household-supplied materials, donor agency monitoring and *kelompok* time were all imputed using appropriate current values. The costs of subsequent household repayments of outside materials to the *kelompok* (which held the revolving fund) presume that full refunds of original nominal cash values were made.

Benefit–cost ratios to the donor agency and non-government organisation (assuming that parties perceive the value of disease reductions and that average estimated costs were incurred) were high at 2.5, reflecting the big economic advantage in non-government organisation projects with large household contributions of labour and materials. The ratio dropped to 1.5, however, if households did not repay costs of outside materials to the revolving fund. The pertinent ratio to a household receiving toilet materials from the non-government organisation was 1.7, rising to 3.3 if it did not make repayments. But a household could easily perceive the ratio below 1 if the benefits of the project were imperfectly known.

Another household ratio determined on the premise that there is no non-government organisation activity or subsidy and that households buy outside toilet materials privately, was lower at 1.4 and once more depressed by imperfect perceptions. Appreciations of family disease reduction, however, were likely to grow with time (Table 2), and be supplemented by household's realisations that community health improvements were beneficial. Hence even perceived private benefit–cost ratios of households would probably rise to well over 1.5 in the longer run. Achieving bigger ratios might take 3–4 years, however, with continued participation and subsidisation by the non-government organisation to keep the project going.

Adoption patterns

Encouraging 20 households per hamlet to accept initial distribution of toilet materials was fairly easy. Acceptance followed 'just king' expectations, resulting in 'gifts' being readily taken sometimes without forethought to longer-term implications. It was noticeable too that acceptance and formation of a *kelompok* was quicker at Pasir Penyuh hamlet, which could be partly attributed to its *satu* ethnic type and clearer line of command. It was relevant as well that only two main clans were involved, as opposed to several in the other two hamlets. The 'accompanying' by the non-government organisation was small at this stage, however.

The pattern of toilet adoption after one year differed between hamlets (Table 3), with Pasir Penyu after a good start, still with the most closets uncompleted. Polak Pisang had done well, while Simpang Kota Lumpur also had many unfinished toilets.

These differences can be attributed to several factors. Poor completion in Pasir Penyu was partly due to the *kelompok* head, who following earlier effective leadership lost authority through dishonest financial dealings. This person was finally replaced by the villagers, but several development activities including toilets suffered in the interim. A less drastic complication occurred at Simpang Kota Lumpur where the first head lacked technical expertise and authority within the clan system and had to be substituted. But there was also a land dispute in the relevant hamlet which was only resolved in late 1994 by the high court in Jakarta. During the dispute many had no incentive for continuation. Nearly all toilets at Simpang Kota Lumpur were poorly constructed owing to lack of non-government organisation training and the poor expertise of the first *kelompok* head.

Table 3 Distribution of toilet completion^a after one year, villages of Batu Putih, December 1994

	Villages			Total
	Pasir Penyu	Polak Pisang	Simpang Kota Lumpur ^b	
Completed	6	14	9	29
75 per cent completed ^c	9	4	4	17
Limited work only	5	-	4	9
Barely begun ^d	-	2	3	5

a Including erection of a surrounding wall, which was not provided for in materials given by *yayasan*. This wall was best constructed of concrete blocks, but could be made of wood and leaves.

Figures include two completed toilets at the mosque and health centre at Polak Pisang.

b Work of generally lower quality.

c Most work done except constructing surrounding wall.

d Digging of the septic tank hole only.

The increased headway of toilets at Polak Pisang was due not only to a good and well-informed *kelompok* head, but also to strong overall leadership and encouragement in toilet construction by the *kepala desa*. The only problem had been a part-time non-government organisation staff member, who saw greater financial reward in becoming a private trader, ceasing employment.

The general situation of progress in toilet establishment (and distribution of adoption at any stage) showed positive connections with educational, asset, output and income levels (Table 4). Many 'full' adopters of completed toilets were members of the village

Table 4 Characteristics of households^a receiving toilets by time of completion, 1994

	Time of completion		
	Jan-June	July-Dec.	Not completed
Number of households	5	22	31
Number of ethnic types			
<i>Satu</i>	2	6	22
<i>Dua</i>	3	18	5
Other	-	-	2
Per cent beyond primary education	18	13	7
Number of animals per household ^b			
Cattle	3.0 (80) ^c	2.1 (62)	2.0 (58)
Pigs	3.5 (76)	2.8 (70)	1.7 (80)
Goats	2.7 (60)	1.4 (35)	3.1 (50)
Chickens	10.8 (100)	7.2 (100)	6.7 (78)
Crop output per household (kg) ^b			
Maize	727	687	462
Groundnuts	144	127	97
<i>Padi</i>	62 (70) ^c	49 (69)	25 (7)
Other income per household per month (US\$) ^b			
Fixed	7.63	6.57	5.84
Side	19.31	12.27	6.20
Total	26.94	18.84	12.04

a Excluding the mosque and health centre at Polak Pisang, each of which received one toilet.

b Overall averages for all households.

c Figures in brackets are the per cent of households with animal shown/with padi production.

élite, where this matched income in a mutually reinforcing manner. Such persons perceived economic and social advantages of water closets, and wanted them in line with a high income elasticity of demand for these items. Some lower-income households, on the other hand, preferred to work on activities earning greater immediate returns and only committed labour to toilet construction when it had very low opportunity costs. A few poorer families even sold distributed materials, thus securing ready cash revenue.

Encouragement and sustainability

Little progress was made with toilets early in the 1995 wet season due to pressures of cropping and other activities. But the 60-toilet project was almost completed in the following months. This considerable advance involved further active extension and

training by non-government organisation staff, as well as promotion by *kelompok* heads. More support was forthcoming from government, *adat* and religious leaders.

Continuing guidance by the Polak Pisang *kepala desa* meant that all toilet receivers contributed to the revolving fund. This was not so at Pasir Penyu, however, and even less so at Simpang Kota Lumpur where most households were still not making repayments. It was necessary in these two latter villages to put more pressure on participants through government and clan systems. Yet the finished toilets in all hamlets would now probably be sustainable, given that septic tanks last so long, hence closet use would be inculcated as a behavioural trait and unlikely to change when tanks were renewed in two decades.

Further extension of toilets through communities was nonetheless still uncertain and required continued effort by the non-government organisation. This included subsidising revolving *arisan* funds to buy materials and to pay non-government organisation staff costs at Pasir Penyu, and paying bigger shares of costs in the other two villages. Given all this help, as well as effective participation by community *kelompok* and other support, toilet spread seemed likely to occur.

The benefits of toilets would become more apparent, being reinforced by social pressures following wider toilet adoption. Such a stage had almost been reached in Pasir Penyu. At this juncture of private viability, households would build water closets without the need for subsidies. This achievement of self-sustaining private adoption is already evident with many profitable technologies in more advanced rural economies (see for example Hayami and Ruttan 1985).

Other interventions

One set of non-government organisation projects was to construct 2–10 kilometre stone walls around hamlets so as to prevent grazing cattle from entering living areas and eating crops. Each project involved village males collecting and building stones during the dry period and the provision of a truck, driver and fuel by the non-government organisation. It led to great increases in crop production.

Despite the larger size than the toilet project (Table 5), walls were easier for non-government organisations and communities to implement. This was partly because animal fencing technologies were already understood and positive economic outcomes were expected. The project could be finished in a few months and there were no complications of revolving funds. There was little difficulty in getting people to contribute time and organisation for the necessary *kelompok* work team, while small wall maintenance to achieve sustainability was undertaken willingly. The estimated

Table 5 Estimated household benefit-cost ratios^a and external subsidies, projects in Batu Putih, 1990-95

Project	Ratio	External subsidy (US\$)
Non-government organisation		
Household toilets ^b	1.7 ^b	886 ^c
Hamlet walls	3.5	9,380 ^d
Cattle distribution	1.1	2,475 ^e
Government		
Maize (<i>Dinas Pertanian</i>)	1.2	15,000

a From the viewpoint of the household, and calculated using the approach of Table 2.

b For further details of calculation, see Table 2.

c For 20 toilets in one hamlet, and partly recyclable through revolving credit.

d For an average wall of 4.5 kilometres per hamlet.

e For 10 cattle per hamlet, and partly recyclable through revolving credit.

average benefit-cost ratio to households of seven wall projects completed in 1991-94 was very high at 3.5 (Table 5).

Other non-government organisation projects included distributing fattening cattle to poorer people and were centred, like toilets, on individual households. Its technology of tethering animals and feeding them on cut forage was once more technically familiar to villagers and economically attractive in earning cash through fat sale after 9-12 months. The inclusion of a revolving fund method however, which involved the cash for initial cattle purchase being returned at sale to the project *kelompok*, worked poorly. There were short-term economic attractions to farmers in purchasing lower-priced, but inferior, store animals which performed badly and also in selling fattened animals too early. While these moves provided immediate gains, they greatly reduced ultimate profitability. There was also the temptation for agents to steal cash and one non-government organisation staff member (now dismissed) did just this. Such problems, which were exacerbated through poor non-government organisation supervision, led to the low benefit-cost ratio from several cattle projects of 1.1 (Table 5).

Government initiatives

Official government project interventions in Batu Putih have characteristically been larger and more cash-intensive than those of non-government organisations. They have required a much lower voluntary contribution from communities and the imposition of 'top-down' plans by outsiders. A 1993 project of the local Crops Extension Service (*Dinas Pertanian*) to interplant improved hybrid maize and tamarind trees in one hamlet of Lombok Kecil involved spending US\$15,000, as opposed to US\$1,000

on toilets and US\$2,500 on cattle distribution (Table 5). This project was presented with minimal discussion as a subsidy package, whereby *kelompok* members cleared ground, planted new seeds, and were paid for their work. While there was no repayment, there was little continuing contact after the year of intervention and although many villagers subsequently grew improved corn, most tamarind trees died from maltreatment. The estimated benefit–cost ratio to households was only 1.2 (Table 5) and that to government well below 1.

Yet the new *Impres Desa Tertinggal* (IDT) program, started in 1994 and targeting 20,633 less-developed villages throughout Indonesia (Mubyarto 1994a, 1994b), promised to have more beneficial and continuing impacts. It provided a grant of US\$10,000 per village, and aimed to deal with *kelompok* comprising 20–30 households and undertaking small projects. These households were given credit and training to facilitate planned developments. The credit had to be repaid to *kelompok* following project completion, and was then to be used in further ventures. The scheme in each village was administered by the *Kepala Desa* and village council (*Lembaga Ketahanan Masyarakat Desa*), but also included outside facilitators to help in training and other work.

The IDT program included the villages of Polak Pisang and Hajoran on Batu Putih, and fair progress with small projects involving voluntary participation had been made by early 1995 (Mustapha 1995; Ridwan 1995). Thus at Polak Pisang several *kelompok* had undertaken cattle distribution for fattening. Difficulties had occurred, however, with insufficient food for tethered stock and four animals had died in one instance. It was decided to switch future projects from cattle to garlic production, involving smaller loans to each household and giving speedier returns in 4–5 months. This change, which was encouraged by the progressive *kepala desa*, seemed likely to be profitable.

At Hajoran several *kelompok* commenced cattle fattening, but with lack of feed and problems in cash transactions, chose in 1995 to move to goats with repayments in kind. Goats were smaller and more flexible, feeding themselves mainly on free range so that repayments were more assured. While this switch was rational, its outcome was less clear. The *kepala desa* of Hajoran had less authority, having been opposed in his 1993 election by groups in several hamlets. He was therefore less likely to be effective in his ‘accompanying’ role. Project facilitators were also not incorporated in IDT programs in Batu Putih, thus placing more responsibility on existing government personnel in both villages.

These IDT projects on Batu Putih had similar merits and problems to non-government organisation undertakings. They linked with community groups and tackled small-scale ventures which harnessed local resources and could benefit those concerned. But they too had difficulties in ‘accompanying’ and supervision, which were vital in early stages. Doing these things effectively required time and expertise

by local officials, especially without facilitators. The IDT approach nonetheless seemed promising and could well be more successful than earlier government ventures at this level.

New social technology

The toilet technology had problems in acceptance. Hence despite clear costs incurred at the outset, the ultimately substantial benefits of this unfamiliar practice took time for households to discern. In addition, marked communitywide advantages of toilets and other positive externalities, including broad disease reduction and overall economic transformation, were not initially evident to participants. Given that toilets were profitable, however, these facets of market failure could be held to justify short-term subsidisation by an outside agency.

This study further highlights a need for good social engineering by the non-government organisation. That involves devising incentive-compatible schemes which realistically appraise, contain and direct the behaviour of participating agents. Hence although communitywide altruism of elite members, government officials and non-government organisation staff should be taken into account, the primacy of personal profit to most persons must always be recognised. Administration schemes must likewise be workable, where aspects such as overcomplex revolving credit funds can seriously threaten successful outcomes.

Social engineering entails effective 'accompanying' by the non-government organisation, both in providing information, and training and liaising with *kelompok* and other players in the social structure. The non-government organisation must constantly monitor communities and *kelompok*, and adjust appropriately within changing networks of relations. These design and 'accompanying' tasks effectively raise project output and lower transaction costs, while intimate rapport with villagers further helps secure longer-run sustainability.

Contrasting toilets with other non-government organisation ventures indicates easier progress with better-known technologies, but once more emphasises the key role of social engineering. Comparing non-government organisation and government initiatives shows that for small village-level projects, the close community liaison of the former has big advantages compared with common official strategy. This approach of 'top-down' improvement with little community consultation and short-term commitment is usually less likely to be successful and sustainable.

Comparing non-government organisation initiatives with the new and more flexible Indonesian government IDT scheme suggests that the latter, with its better adjustment to small local groups, also has potential for establishing relevant and viable projects.

But IDT may once more be seen to depend crucially on social engineering by the official village hierarchy.

Although this case study of toilets relates to one locality, it has wider implications. Community-level liaison and consequent community demand, low external costs due to local labour and resource contributions, ability to undertake small viable operations and long-term sustainability of many activities are shared by other non-government organisation projects. So is the need for effective social engineering and the vulnerability of poorly designed and managed ventures to collapse. Some features are highlighted by other non-government organisation studies (Farrington and Bebbington 1993), although there are few microanalyses of non-government organisation operations.

This study suggests that grassroots non-government organisations can contribute usefully to small initiatives. While problems of social engineering always occur, non-government organisations that cannot overcome these will inevitably disappear from the scene. Effective engineering is indeed crucial in all such development and any agencies—private or government—that do this well merit expansion. Non-government organisation inputs can certainly complement government efforts in village improvement, thus encouraging socioeconomic growth in both Indonesia and other parts of the developing world.

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