

LAM NAM OON: AN IRRIGATION AND AREA  
DEVELOPMENT PROJECT IN THAILAND

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by

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The views and interpretations expressed in this report are those of the author and should not be attributed to the Agency for International Development.

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## INTRODUCTION TO THE MUSCAT REPORT

The Office of Evaluation defines area development projects as those consisting of more than a single intervention within a specific, manageable geographic area. Concern about area development on the part of this office began as a result of our work in evaluating irrigation projects, which often by their nature were geographically focused and which also had nonirrigation components. Major irrigation programs often required the development of a specialized bureaucratic system to manage water effectively, but such administrative systems have also been designed to coordinate the other elements associated with irrigation such as rural infrastructure, education, and health. Our activities have expanded beyond irrigation-related area development, but irrigation is a component of many area development projects.

This approach led to the conceptualization of area development as either integrated or unintegrated rural development. Integrated projects might involve formation of a parastatal organization, or some coordinating mechanism located either in the capital city or at some appropriate rural site. Unintegrated projects might be a series of sequential or parallel interventions in the same area, likely under the control of more than one ministry or agency. This rather simple approach to categorization of area development was based more upon the types of projects AID was supporting than on a review of the theoretical literature.

The evaluation of Lam Nam Oon is a special case for a number of reasons. AID impact evaluations normally take place either after the completion of the project or after the completion of a significant and defined project stage, at which time the effects of the project on the intended beneficiaries can be assessed. In this case, the downstream aspects of the project are not yet complete, although the major dam on which the present project was based was finished in the 1960s. AID normally would defer an impact evaluation under these circumstances, but the Office of Evaluation considered that enough might be learned about the organizational structure of this area development project at this stage to warrant review. Lam Nam Oon is an interesting example of an area development project. Staff members of the various ministries involved meet as a coordinating group at the project site.

In conjunction with a Mission mid-term evaluation, the Office of Evaluation requested Dr. Robert Muscat, veteran AID economist and author of one of the salient volumes on Thai development in the 1960s, to undertake this assessment as part of a

worldwide effort to explore the results of AID programs in area development. Contrary to normal Office of Evaluation practices, this report, therefore, is not a team effort but is rather the view of a sensitive and experienced observer of the Thai and development scenes. This report, therefore, is being published as a Working Paper of AID's Office of Evaluation, a category that enables the Office to disseminate interesting, provocative, or imaginative studies that fall outside the normal scope of the Impact Evaluation series. Upon completion of AID's review of the area development category, the Office feels that this study will contribute to our understanding of the dynamics of both area development and irrigation projects.



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## SUMMARY

### Background

Northeast Thailand contains about a third of the country's population, has poor water and soil resources, and has long been the lowest income region of the country. Since the 1950s the Royal Thai Government (RTG) with international donor assistance, has invested extensively in the region's infrastructure, including efforts to develop the Northeast's limited irrigation potential. In the wet season, glutinous rice is the main crop, grown largely for home consumption; production of maize and other upland crops has increased substantially in the last two decades. In the dry season, cropping is impossible without irrigation.

### The Lam Nam Oon Project

Construction of the Lam Nam Oon (LNO) project began in 1967. The project is designed to provide water to about 43,000 acres during the dry season (and supplementary water to raise paddy field flood levels, if necessary, in the 74,000 acre project area), benefiting about 12,500 families who own and work the small farms of the project area. In 1967 AID loaned the RTG \$3.5 million to assist in construction of the dam and water distribution system. In 1977 AID provided a second loan of \$4.5 million to help complete the construction and finance technical assistance. As reformulated in 1977 the project has two related goals: (1) to improve the standard of living through provision of water for double cropping and (2) to develop and demonstrate an innovative approach to decentralized, locally based integrated rural development. The total cost of the irrigation system is projected at around \$60 million.

### Irrigation

The construction of the irrigation system is virtually complete, although for most of the project the final on-farm distribution channels remain to be built. Between the limited development of the on-farm distribution network, and the nonfunctioning of a large fraction of the canal outlets (due to deterioration, faulty design, and deliberate locking due to the absence of farm connecting distribution channels), only about 20 percent of the area intended for dry season irrigation has actually received water after four seasons of system operation.

Inadequate maintenance is reflected in scattered signs of physical deterioration of main canals and outlets.

Dry season irrigation under Northeast conditions requires water management of a sort that has not previously been practiced in Thailand and for which trained personnel are extremely limited. Equitable and efficient water distribution in part of the project area will depend on which of the technical options being tested at LNO is ultimately applied. In the rest of the area, it will also depend on how the RTG solves the problem of building the on-farm distribution channels, a task hitherto left to the farmer to do, without assistance. In other Northeast irrigation projects nearer to completion than LNO, farmers have actually cultivated considerably less land than could be productive in the dry season, given the available water. In LNO, it appeared that farmers would also have utilized less water than was available if it were not for firm guarantees by project management that the water would actually be delivered when needed during the growing season, and that the government would buy all rice and groundnuts produced, at prices set prior to planting. Available evidence suggests that contrary to the conventional wisdom that Northeast farm labor is underemployed in the dry season, and should therefore have no alternatives to using any water provided by the project, farmers do have other income earning opportunities. Income that farmers earn from cultivating with irrigation must therefore exceed income they earn from these other activities to cover the higher level of risk from cultivation. Irrigation was also found to provide one unforeseen benefit--high returns from fish ponds on individual farms--and to offer promise of another--cultivation of grass or fodder crops for commercial raising of buffalo--now that rising fuel prices have begun to improve the economics of draft animals compared with the economics of tractors.

#### Integrated Rural Development

Although the integrated rural development activities have been operating only 2 to 3 years, they have made definite contributions to the achievement of the irrigated production attained, and have developed some management characteristics unusual for RTG field bureaucracy. Compared with "full scale" area development projects in other countries, administered by powerful semi-autonomous authorities, the LNO inter-ministerial mechanism has only coordinating responsibilities and modest project funds other than regular ministry budgets. Despite this apparent lip service to the concept of integration, the coordinating mechanism has resulted in significantly greater planning and operational cooperation than is normally the case in the provincial workings of the sharply vertical RTG bureaucracy.

### Recommendations

The evaluation team made numerous technical recommendations on research and the need for adequate maintenance and rehabilitation. Adoption of improved planning techniques and completion of the original integrated rural development staffing arrangements would increase the effectiveness of the coordinating mechanism. Higher priority should be accorded development of fish ponds and buffalo production.

### Lessons Learned

1. Where an AID-assisted project is designed to show how to overcome systemic problems (in this case, a history of long irrigation project gestation and weakness of on-farm delivery), the project should be important enough to draw high-level political attention willing to make the necessary changes, and the AID role should be large enough to give AID a voice commensurate with the difficulties to be faced.
2. In retrospect, the initial economic analysis of LNO appears to have been over optimistic, and the economics of the project questionable. Given the major effect of delay in the initiation of the benefit stream, a more realistic review of timing assumptions is essential in irrigation project appraisal.
3. Contrary to the natural tendency to move toward strengthening the authority of rural development administrative mechanisms, the modest but undeniable accomplishments of the LNO arrangements point to the advantages of limiting the introduction of organizational changes in the face of powerful bureaucratic traditions.
4. The farmer organization (planned but weakly implemented) has proved less important than the price and purchase support arrangements (not originally anticipated) for inducing production response. It is important to get an accurate picture of the economic context of a project that depends on specific economic behavior on the part of the beneficiaries. Also, projects with long gestation periods, during which beneficiary behavior may change in response to changing economic conditions, should have greater flexibility for adjustment of budget and other components than has been the case with LNO.

5. The final returns on LNO are not yet in. In hindsight, however, it is clear that the poor economic situation does not support the well-intentioned notion that marginal returns should be accepted from a large proposed investment merely because the investment will be located in a backward region that government and donors are anxious to help.

## PREFACE

As described in Appendix B, this impact evaluation was performed as part of a regular Agency for International Development (AID) mid-course project evaluation, not independently after project completion, as impact evaluation studies are usually performed. This impact study was written by a single author, based on his work as an economist in the evaluation, and not by a three- or four-person team as is normally the case with impact studies. Additionally, the author was able to draw on a larger group of evaluation participants and consultants than is normally involved in an impact study. The author believes this arrangement was useful for both the impact and mid-course evaluations and should be applied in other cases.

The AID Mission's main interests were to get an independent judgment and to focus Royal Thai Government (RTG) and Mission attention on the immediate decisions that needed to be made to reach a determination on whether the Lam Nam Oon project is a serious failure or if it will succeed in its basic purpose--to deliver irrigation water to farmers. These decisions would involve both RTG and USAID disposition of the remaining funds and technical assistance under the AID project. As the evaluation was emerging, it was likely to give only minor attention to the integrated rural development aspects of the project. The integrated rural development activities were viewed by the Mission as diverting the time of Mission staff and of the advisory team leader away from the irrigation problem. As indicated in the conclusions drawn here about the production role of the integrated rural development management team, the author believes that the evaluation would have been seriously deficient if it had glossed over the integrated rural development component. In addition, by casting a wide net in an effort to define the range of potential impact and the factors that might limit or enhance that impact other than water, the impact perspective added some dimensions and recommendations that would otherwise have been overlooked (and that, it is hoped, will be of some use). At the same time, the impact evaluation benefited considerably from being able to draw on the extensive technical scrutiny performed by the evaluation team, which would not have been possible with a normally constituted impact evaluation team. Finally, since the evaluation was a joint RTG/USAID exercise, we had the benefit of the insights and "inside" knowledge of the RTG evaluation staff that was invaluable in uncovering a number of points that a normal, separate impact team might have had difficulty doing.

The evaluation team was led by William Schoux, Program Analysis Division Chief in AID's Bureau for Program and Policy Coordination. The team included Charles Stevens, engineering

consultant; William Cox, irrigation specialist from the Soil Conservation Service; Nile Dimick, equipment specialist, and John Blackton, capital projects officer, from USAID/Cairo; Preeda Chantagul, agriculture economics consultant; and Chakrit Noranitiphadungharn, consultant in public administration, and Sara Schwartz, agricultural economist, from USAID/Bangkok. The team was also joined by several Thai Government officials from an interministerial evaluation committee who provided particularly valuable assistance during several days of field interviews with farmers. The team benefited from interviews with numerous officials in Bangkok and at the provincial and local levels. The team visited Thailand from early May to early June 1981.

The author extends his appreciation for the hospitality and cooperation received from Thai officials and colleagues and from the members of the Louis Berger International advisory team, and for the help of all the members of the evaluation team and their consultants. Particular thanks are due to Frank Gillespie, the AID Mission's project officer for Lam Nam Oon, for the extraordinary efforts he made to help assemble the team, arrange logistics and appointments, and provide us with background and Mission perspective, and to Sara Schwartz and Preeda Chantagul for their painstaking work on estimating costs and benefits. Needless to say, any errors of fact or judgment are the author's alone.

GLOSSARY

<u>amphur</u>	county
CDD	Community Development Department
<u>changwad</u>	province
DOAE	Division of Agriculture Extension
IBRD	International Bank for Reconstruction and Development
LNO	Lam Nam Oon
<u>rai</u>	0.4 acres
RID	Royal Irrigation Development
RTG	Royal Thai Government
<u>tambol</u>	district
USAID	U.S. Agency for International Development

21 baht = \$1.00 (1981)

## I. PROJECT SETTING

Thailand's Northeastern region contains about a third of the country's population. With poorer soil and water availability than in the rest of Thailand, the Northeast has long been its lowest income region. Household income is two-thirds that of the Central Plain, and 78 percent of the national average. The area has drawn special attention from the Royal Thai Government (RTG) and several donors for many years, due to its relatively underdeveloped situation. Since the 1950s, the RTG has attempted to develop the region's limited irrigation potential. Extensive investments have also been made in the transportation, power, and communications systems of the region. This infrastructure development ended the previous isolation of the Northeast, and facilitated development of the predominantly small-farm kenaf, maize, and cassava booms that have contributed to the country's overall growth in the past two decades. Reliance for family consumption on wet-season cultivation of glutinous rice, which is the diet staple of the region, remains widespread. Other crops are generally grown on upland areas not suitable for paddy production. In the dry season, cropping is not possible without irrigation.

In this context of looking for ways to increase production and incomes in the Northeast, the RTG began feasibility work in the early 1960s on the handful of potential irrigation sites in the Northeast. Construction of the Lam Nam Oon (LNO) project, located in the Sakon Nakhon changwad (province), began in 1967. At that time it was estimated that the project beneficiaries numbered about 10,000 families; this population is now estimated to have grown to about 12,500 families living in 66 villages. USAID has been involved in the LNO project at two stages. In 1967, a loan was first extended for \$3.5 million to assist in construction of the dam and distribution system. In 1977, a second loan for \$4.5 million, which was not anticipated in 1967, was extended to help finance completion of the construction and inauguration of an integrated rural development program in the project area. At that time, a survey of the area showed that average annual family income was \$622, similar to that in the rest of the Northeast. Size of family (6.6 persons) and farm holding (31 rai) in the LNO area were also typical. Educational attainment was low; 90 percent of heads of household had completed only the fourth grade. Over half of the adult labor force derived income from both on- and off-farm work. About half of farm cash income was derived from the sale of rice and 35 percent from the sale of livestock. Less than half of the farmers reported any outstanding debt.

Over the long gestation period of the project itself, the LNO inhabitants participated in the general growth of the Northeast. Contributing to the development of the LNO area were the expansion of the transportation system, including that within the project area; electrification of the villages; increases in production of upland crops; employment and income generation from the spread of government services and investment programs; and the growth of processing industries. The growth is reflected in the quality of houses (strikingly improved compared with visual impressions of 20 years before), electrification of over half the houses in LNO, increasing ownership of consumer durables (for example, 8 percent of households in LNO own television sets and nearly 25 percent own sewing machines), and the higher levels of educational attainment of the children, averaging 3 years more than their parents.

In some important respects the socioeconomic conditions in LNO compare favorably with rural areas in many other developing countries. There are virtually no landless laborers, very few tenants or sharecroppers, and the distribution of land holdings is not very skewed. Indebtedness is low and institutional credit is available and used. Many of the inhabitants have lived on the same holdings for at least a generation, but there is substantial mobility, especially of young adults, and most markedly in the dry season. There appear to be no serious endemic diseases, although drinking-water contamination may be widespread and nutrition standards among young children, at least in the Northeast generally, are lower than food availability and income levels would seem to warrant.

## II. PROJECT DESCRIPTION

As reformulated in 1977, the LNO project has two inter-related goals. (A resettlement subproject for families displaced by the creation of the reservoir is omitted from this evaluation.) The first is an "improved standard of living" for farm families, as reflected by income, fertility, child mortality, caloric intake, freedom from parasites, increased educational attainment, and ownership of household durables. Second is to "demonstrate in a typical irrigated area in Northeast Thailand an integrated and coordinated approach to rural development which significantly increases agricultural production, and improves the quality of rural life over a broad spectrum." For the irrigation system there were specific construction targets including feeder roads. For the rural development aspect, numerous outputs existed in terms of numbers of families or villages involved in various activities and organizational arrangements. These were largely aimed at agricultural

production, but also included health and family planning, a variety of training programs, and increased fish production. Increased agricultural production resulting from the availability of irrigation was of course a critical target. (Appendix A lists all project targets set out in the Logical Framework section of the Project Paper and their current status. Most of these targets are discussed in the text.)

All of the \$39 million investment made prior to 1977, and a portion of the RTG and USAID inputs under the 1977 project were devoted to the physical construction of the irrigation system. Total construction costs were estimated at \$60 million. Under the 1977 loan, about \$900,000 was allocated for activities that were largely intended to complement the physical investment with research, training, extension, and forms of farmer organization. The technical assistance to be provided by AID was mainly to comprise the on-site residence of two engineers and a rural development planner serving as chief-of-party. The engineers were to provide advisory assistance on many unfinished aspects of the construction, especially on three experimental areas that were testing different forms of water distribution from the system's lateral canals to the individual farms. The development planner was to devote a good portion of time to integrating the operations of a number of RTG departments within LNO. The integrated rural development activities were expected both to contribute to achievement of the irrigation outputs and other targets for the area's beneficiaries, and to develop approaches to coordination of RTG field activities in a framework different from that governing the normal methods, roles, and relationships of the RTG bureaucratic structure. To help facilitate these processes, funds under the AID loan, together with the RTG counterpart, were allocated as supplementary budgets for most of the participating agencies.

As of May 1981, the construction of the irrigation system--as "system" has been defined historically in Thailand--is virtually complete. However, of the 185,000 rai (74,000 acres) designated for inclusion in the distribution system, only about 20,000 rai (8,000 acres) are estimated to be actually under irrigation, for reasons described below. The impact of the project on the crop production of the area began only 4 years ago, and has reached very modest levels, reflecting the small portion of project area actually receiving irrigation water. Some of the "instrumental" outputs listed in Appendix A have been achieved or are on schedule, while others have been overtaken by events or modified. The on-site integrated rural development committee machinery is operating, not as fully as planned, but in ways that contain some interesting lessons and have produced some significant results, as described below.

### III. PROJECT IMPACT: FINDINGS AND IMPLICATIONS

Since the LNO project is still under construction and the integrated rural development aspects have been operating for only about 2 years (the USAID advisory team has been on site for about 1 1/2 years), this examination of impact differs from others in this series that look at completed projects, in some cases several years later. On the other hand, the LNO project has been gestating for an unusually long time. Because the integrated rural development aspects are very recent and little thought has apparently been given to what should be done with these unusual administrative arrangements after project completion, it may be useful to draw some judgments on the record to date. This should enable the RTG to consider what has been learned and what might be worth continuing or adopting in situations where field coordination can spell the difference between success or failure of area development programs.

We will examine impact issues from the perspectives of the direct beneficiaries and of the benefits to the economy as a whole. The irrigation and integrated rural development aspects will be examined separately, with their interrelationship also considered.

#### A. Beneficiary Impact

Irrigation water should enable LNO farmers to derive the following benefits:

- In the wet season, supplementary irrigation may at times and in some years enable farmers to get higher yields than they would by relying on rain flooding alone. We did not have the information to estimate the insurance value in light of rains insufficient enough to depress yields. An estimated 25 percent of LNO farmers are using the recommended variety of glutinous rice in the wet season. This variety produces twice the traditional variety yield under rain-fed conditions. Limited field trials suggest that irrigation would add another 10 percent. There is no reason not to expect the recommended variety to replace the traditional variety entirely in a short time.
- Glutinous (sticky) rice is grown largely for home consumption. The market for commercial sales is small. Thus, higher glutinous rice yields per rai can translate into higher income only to the extent that a farmer

could now grow his requirements on less land and put the released land into cultivation of another crop, most likely nonglutinous rice during the wet season.

Neither of these benefits has yet been observed. There has been some distribution of supplementary water in the wet season for perhaps 5-6 years. However, this has occurred in a haphazard and uncontrolled manner, because most of the area still lacks the final system of channels required to distribute water from the canals to the fields. Farmers with land along the canals have opened the turnouts without authorization; water released from the reservoir (to lower the water level, not to provide irrigation) flows out the turnouts, filling up borrow pits, and then moves across the paddy fields by flooding, topping up the flooding already produced by rainfall. The volume of supplementary water drawn from the canals in this manner depends on the actions of the farmers contiguous to the canals and turnouts and on the extent to which topography permits gravity feed. The estimates of the number of rai receiving supplementary flooding varied widely and were little more than guesses. It is safe to assume that the farmers who took these actions to supplement their water levels did so with knowledge, from long experience, of optimum water levels over the growing cycle, and derived some yield benefits. Given the conditions described, however, these benefits are unlikely to have been substantial or widespread.

Principal benefits have been anticipated from second cropping during the dry season when field cropping is not possible without irrigation. The number of farmers benefiting and the extent of that benefit will depend on (a) the area that can be irrigated and the nature and efficiency of the water management system, and (b) the cropping patterns chosen by farmers, as well as the costs, yields, and farm-gate prices received. Tests on farm yields have shown the returns farmers can derive from irrigation. The annual return from each rai irrigated and double-cropped is more than twice the annual return in single-cropped, rain-fed areas, taking into account the cost of recommended fertilizer and pesticide, and assuming (conservatively) that groundnuts and rice are the only crops grown.

## 1. Area and Water Management

Several issues have emerged at this point that will have significant effects on the size of the area the system will be able to irrigate, and thus on the number of beneficiaries and on the distribution of benefits among the families.

Of the total project area of 185,000 rai, the system was originally designed to irrigate about 106,000 rai in the dry season. RTG sources contacted during this evaluation believed that the irrigable area had been lowered to 63,000 rai. Senior Royal Irrigation Department (RID) personnel insisted that the 106,000 design figure remained valid and would be attained.

The system faces physical problems. For reasons not easily clarified, maintenance of the canals has been inadequate, a problem plaguing many of the irrigation systems of the Northeast. If not corrected, structural deterioration such as the cracking and collapse of concrete sections lining the canals and the excessive growth of vegetation in the canals will reduce the water delivery capacity. The drainage system is only partially installed and there are signs of salinity, which is a severe problem in another Northeast irrigation system.

Dry season irrigation under Northeast conditions requires water management of a type that has not previously been practiced in Thailand and for which the number of trained personnel is extremely limited. With only 20,000 rai receiving water from the system thus far, compared with the dry season capacity of 106,000 rai, only farm-level water management is required. System management is not needed now; the system contains far more water than can be used by this small fraction of the irrigable area. As the acreage connected to the system grows, however, especially in areas that have channels distributing water to individual fields and not simply to turnouts that flood large areas using field-to-field gravity flow, it will become necessary to plan the distribution of water and its allocation and timing of release to different areas. This will entail hiring, training, and supervising "zone workers," farmers who will operate the gates on over 700 canal outlets. The development of farmer groups, as anticipated in the Project Paper, will also be necessary for the operation and maintenance (and adjudication, if disputes arise over water distribution) of earthwork channels that carry water from the secondary or tertiary canals constructed by and under the jurisdiction of the RID. If water distribution remains largely uncontrolled, the crop and area choices of the farmers nearest the canal turnouts and their unauthorized operation of the turnouts will determine the volume of water available to farmers further away. Thus, it is extremely important for the RID to

develop the capability to manage the system in a way that avoids serious maldistribution of benefits among the project population. Such maldistribution could lead to sharp interpersonal or inter-village conflict over water, where very little conflict now exists under the largely rain-fed regimen.

Equitable distribution and the complexity of water management will also be affected by technical options yet to be tested at the LNO project. Three approaches to water distribution are being applied. The first approach is being followed where the RID has begun to apply the same system it is using in the Chao Phya river basin in Thailand's Central Plain. In the Chao Phya model, large areas are first leveled, then divided into rectangular paddy fields that are larger than the preexisting fields created by the bunds that farmers had constructed under the traditional rain-fed and flooding system. Under this system, known as Land Consolidation, farmers who started out with irregularly shaped or sized parcels, which were often not contiguous, would end up with single, rectangular holdings of the same size. They would then also receive full title to the land, strengthening their ability to borrow from institutional credit sources and enabling them to sell their land if they choose.

The second approach, based on a system developed by the USAID advisory team and designed and constructed by the RID in collaboration with the team, will have its first test in the 1982 dry season. This system, the LNO Model, involves no leveling, distributes water to each field through channels that take narrower bunds than the Chao Phya system, and is designed to allocate the volume of water proportionate to the relative size of the areas served by each distribution channel.

The LNO Model may affect the productivity and distribution of impact among farmers in significant ways. First, because topsoils are thin and poor in the Northeast compared with the Central Plain, leveling in Northeast projects can reduce fertility. In leveling, soil is cut from rising ground and dumped into lower areas for filling. Part of the soil is also scraped to build up the new bunds. Some of the farmers we interviewed in the leveled pilot area complained about loss of soil fertility and about faulty leveling that left them with rises and dips that reduced the area they could actually irrigate in the dry season. Agronomists who have looked at this problem disagree on how long it will take areas with stripped topsoil to regain their fertility. The design consultants considered that 26,000 rai of undulating land would need to be leveled to enable this area to use irrigation water. It is interesting to note that the International Bank for Reconstruction and Development (IBRD) dropped an undulating area out of the Lam Pao project in the Northeast, based on depressed yields in leveled areas in a third Northeast

project receiving Asian Development Bank financing. Second, the narrower bunds take less land out of cultivation. Third, the proportional water allocation system is designed to greatly reduce the amount of water-flow management required. To what extent this system performs as intended remains to be seen. (The evaluation team recommended that the project be extended to include an operations research activity for three dry seasons to evaluate the LNO Model's water distribution performance.)

Finally, since the LNO Model follows existing contours and does not entail large-scale rectangular land shaping, each of its tributary channels would serve a smaller area than the tributaries under the Chao Phya model, thus requiring the organization of fewer farmers for cooperative management and water sharing at the farm level. The extent to which this would mean more effective operation of the system and less likelihood of dispute over water allocation remains conjectural until the different systems have been tried. (Farmers in old, small, irrigation systems in Northeast Thailand have developed effective systems for dispute settlement among themselves. The RID has a responsibility to help farmers form Water User Associations to manage water distribution and provide channel maintenance, but none has been formed or considered necessary, thus far.)

The third approach to water distribution comes under the Ditch and Dike Act and covers the largest part of the LNO areas (84 percent). Under this act, there is no land shaping or change in holdings. The RID is authorized to construct narrower tertiary water channel systems than under the Land Consolidation approach, thereby involving no maintenance roads along the bunds, and to construct these channels only with the assent of the farmers involved. This area was judged sufficiently flat by the design consultants not to need any leveling. Farmers are supposed to construct the channels leading from the canal turn-outs. As noted above, this system is not functioning; the small portion of this area that has received water has relied on field-to-field flooding. The LNO Model could be applied to the Ditch and Dike area. The question of what kind of system will be installed in this area is still quite open.

In practice, the further extension of the Chao Phya Land Consolidation model in LNO is likely to be very limited, not because of any resolution of different views about its technical merits under Northeast conditions, but because of its high cost--\$750 per acre, more than the value of the land--and increasing resistance from the Thai Bureau of the Budget. In contrast, the on-farm distribution costs of the Ditch and Dyke system are \$100-\$150 per acre, and about \$180 for the LNO model. Taking account of the total cost of the dam and canal system, the cost of the Chao Phya Land Consolidation model amounts to about \$2,200 per

acre, the Ditch and Dyke system about \$1,550 per acre, and the LNO Model about \$1,600.

## 2. Cropping Patterns and Net Returns

With a given volume of water available for dry season distribution in any year, the extent of area cultivated and the crops chosen are not independently determined factors. The water requirement per rai for the different crops that might prove viable on these soils varies substantially. If nonglutinous rice proves viable (the dry season in this part of the Northeast may be too short) and if much land is allocated to it, the irrigable area will be at the low end of the range that can be watered by the system, because rice needs so much more water per rai than any other crop.

### Labor Shortage or Rural Underemployment?

The uncertainty that normally attaches to hypothetical cropping patterns in irrigation appraisal and design studies is heightened in the Northeast due to the thin base of agronomic research and the sharp divergence of views on the availability of labor time in the region. Underutilization of the water that is available is reportedly a universal problem of Northeast irrigation projects. Although one still hears the view that the farmers are simply "lazy," more serious explanations point to labor shortages. This view flies in the face of the traditional belief that Thailand shares the widespread unemployment and underemployment that have been observed in many developing countries. Since the possibility that significant numbers of farm families may opt not to cultivate in the dry season despite the availability of water strikes at the heart of the economic justification for such projects and at the expectation that these families will derive benefits from the project's impacts, that question deserves some scrutiny in this evaluation.

The IBRD appraisal (1979) of the Lam Pao and Lam Takhong irrigation projects assumes that there is "severe" underemployment in the Northeast for much of the year and that local labor shortages that might develop after the projects are operational, especially during peak periods in July, August, and November, can easily be met by hiring from surrounding areas. For the benefit-cost calculation, that report uses a shadow rate of 8 baht per man-day compared with an estimated range of 10-25 baht per man-day for market wages.

In its development plans, the RTG puts a high priority on job creation and operates a large-scale employment generation program in the Northeast during the dry season. This program has been operating in the LNO area where it has financed small works in many villages. Amphur (county) officials reported that nearly 3,300 residents, about 75 percent of them male, of the LNO area had worked under the program this past dry season. The average number of work days per participant was about 10. Participants were able to work on random days if they preferred, with anyone free to join until a given project was completed. Nobody was turned away for lack of funds even though the amounts allocated per tambol (district, or group of villages) were fixed. Average earnings were said to be about 42 baht a day, much higher than the IBRD estimate of the daily wage in Lam Pao in 1978, a little under the RID wage of 47 baht a day for unskilled labor on the LNO project, and more than double the 20 baht farmers told us they were paying for daily labor from neighboring farm families. The program's flexibility enabled farmers to earn a day's wage whenever they had a slack day.

That such slack days exist in the dry season is not challenged and was demonstrated under the works program. But given the small size of the program in relation to annual area income (on the order of 1.5 percent) or the resident labor supply (well under 1 percent of total annual man-days), and the amount of the daily earnings, it is significant that there seemed to be no queuing or other indications of labor supply pressure against a limited number of convenient and well paid jobs. This experience is consistent with the conclusions drawn in a recent study of rural employment in Thailand by Trent Bertrand, an IBRD consultant,<sup>1</sup> and by an extensive review of the LNO labor picture performed under the AID advisory contract (which disagreed with the interpretation placed on survey data collected by the author of an earlier study under the same contract). The Bertrand macro-level study concludes that underemployment does not exist in rural Thailand, and that annual hours worked are equivalent to those in industrial economies. The second contractor's study goes further and concludes that labor availability is a key constraint to dry season cropping in LNO. Finally, reference should be made to what is probably the single most careful, empirical study of farm-labor time allocations in the Northeast, done under a United Nations Food and Agriculture Organization project in the

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<sup>1</sup> Trent Bertrand, "Thailand: Case Study of Agricultural Input and Output Pricing," World Bank Staff Working Paper No. 385, April 1980.

province of Kalasin that includes the Lam Pao project area.<sup>2</sup> This study showed that each family typically devotes a large measure of dry season time to a wide array of on- and off-farm (including seasonal migration) income-earning activities. This finding also appeared in the contractor's survey study of LNO. (The team also heard that the recruitment network hiring Thais to work on construction contracts in the Middle East reached as far as Sakon Nakhon, and that some LNO residents had gone to the Middle East and returned wealthier for the experience.)

On balance, the severe unemployment and underemployment that are unequivocally evident in many other countries do not appear to exist in the LNO area. In practice, this means that the returns to labor on and off the farm during the dry season are already sufficiently high that mere provision of water cannot be assumed to induce farmers to cultivate. The income farmers earn from such cultivation must exceed the income they are already earning from a variety of other activities, to cover what may be a higher level of risk from cultivation compared with these other activities.

### Risk and Uncertainty

The difficulty of inducing farmers to switch to dry season cultivation may be greater than is implied by merely comparing net returns from cultivation with the options farmers already have. Three reasons for this difficulty are as follows:

- Irrigated agriculture requires new techniques unfamiliar to most farmers. This increases the risk of low returns, especially if the information and extension systems are not able to train the farmers adequately.
- Dry season off-farm work pays immediate or regular cash wages. Cropping requires investment up front in fertilizer and pesticides, absorbs labor time, and produces at the end of the process a net return that is uncertain at the start of the process, depending on production results and market conditions.

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<sup>2</sup> Work Days: A Daily Record Keeping Study of Irrigated and Rainfed Farmers in Northeast Thailand. Technical Report (Draft) UNDP/FAO- TJA/74/015. Fritz Von Fleckenstein, April 1980; A Sociological Benchmark Survey of Lam Nam Oon Farm Households, George W. Hill, Louis Berger International, Inc., April 1980; Markets and Lam Nam Oon, Jose Vegara and M. Casares, Louis Berger Technical Note No. 4, January 1981.

- Given the long gestation period of the LNO project, farmers are said to be skeptical, or at least uncertain, about the system's reliability for delivering water when needed.

These are difficult obstacles to overcome, and they are compounded by the low fertility of the soils and the uncertainty, due to lack of experience, of what cumulative effects on fertility in either season will result from double cropping and the fertilizer uses recommended. In economic terms, these uncertainties reduce the farmer's perception of the "expected value" of dry season cultivation. (It is ironic that in the wet season the same logic leads to the opposite conclusion. The high expected value of gaining a year's worth of subsistence rice--a low money-value crop--dominates over alternatives that may offer higher income but not the almost assured absence of risk to the family's basic consumption.)

The RTG acknowledged these realities when it launched a price-guarantee program in groundnuts and nonglutinous rice in the 1980-1981 season for LNO. Recognizing the common marketing uncertainties facing the four irrigation projects now being developed in the Northeast (LNO, Lam Pao, Dom Noi, and Nong Wai), the RTG set up a special policy coordination committee on Northeast Irrigated Agriculture Production Marketing in August 1980. The committee was composed of senior officials at the ministry level in Bangkok, with the same departments comprising coordinating committees at the changwad and project levels. For the 1980 dry season, the committee set up production plans for each project. The actual LNO production plan was based on the outcome of discussions between project staff and individual farmers in an area of about 20,000 rai where the RID guaranteed to the farmers that the necessary water would be delivered. The resulting crop distribution was estimated by project staff as follows:

<u>Crop</u>	<u>Rai</u>
nonglutinous rice	3,965
groundnuts	9,078
pumpkins	2,663
melons	787
others	<u>4,016</u>
Total	20,509

Thanks to the efforts of several departments represented on the local LNO Integrated Rural Development Committee (described below), the program was a success. With the RID water assurance accompanied by a package offer to deliver seed and other inputs, and a guarantee that the RTG (through the Farmers Marketing Organization) would buy the groundnuts at 8 baht a kilo and rice at a support price, 2,200 farmers did cultivate. As the evaluation team was leaving LNO, the buying operation had barely begun. It had appeared shaky at several points over the preceding weeks, but vigorous efforts by several members of the LNO management team working as a group and occasionally crossing divisional lines, contributed to its final success.

It is interesting that farmers decided to put 7,000 rai, 35 percent of the area cultivated during the dry season, into non-guaranteed crops. The reasons behind this are one of the aspects of this operation that should be studied soon. Presumably, the farmers did so because of uncertainty over whether the support program would actually work as promised, and because of higher returns expected from cultivating melons and other high value crops.

In summary, the full area that project management had guaranteed could be irrigated, was in fact cultivated. In order to overcome the risk and opportunity cost factors discussed above, the RTG made three interventions that appear to have been critical: a marketing intervention, delivery of the necessary inputs, and personal persuasion by project staff.

Marketing is also cited as a long-run or structural problem that can deprive the farmers of a reasonable return either because of the thinness of the Northeast market for absorbing new LNO dry season produce, or because of lack of competition among merchants (or, put another way, the limited numbers of produce merchants in the area). Thus, even if the price support system continues for a while and succeeds in drawing farmers into a regular dry season regime, there are concerns over the ability or willingness of the private market system to support this production or to pay reasonable incentive prices. A dramatic illustration that supports this view occurred at LNO in the 1979-1980 dry season. Local officials described how a nonglutinous rice support program, in the year before creation of the Northeast Production Committee mentioned above, did not materialize after the rice was harvested, and how the local merchants bought the rice at half the support price, a level that meant losses for many farmers.

The concern over the area's marketing system is not without basis, and if borne out over time would pose serious obstacles to achievement of project impact. On the other hand, there is

concern in the Ministry of Agriculture over the possibility that the RTG could get drawn into a price support program that could become costly and difficult to dismantle. We do not believe these fears are warranted. Repeatedly in the economic history of Thailand, there has been a mutually supportive interaction of supply and demand. As the highway system was extended through the Northeast during the past two decades, rising export demand (mainly for maize, kenaf, and cassava) induced a supply response in widespread areas, while the obviously high elasticity of supply induced rapid penetration by the marketing system seeking out supply of these commodities. Demand and supply fed each other, with competitive middlemen working on small margins. There is no reason to think this scenario will not unfold at LNO. The key requirement is to raise the scale of output and demonstrate the area's production capacity in the dry season. (In the evaluation team's report to the RTG and AID Mission, some suggestions were made on how the price support program could be managed to facilitate its early redundancy.)

### 3. Two Unplanned Benefits

In the project design, benefits from fishing in the reservoir were expected to accrue to some farmers, but were not estimated for inclusion in the benefit calculation. While the Fisheries Department has stocked the reservoir, only a few farmers doing contract fishing for merchants are actually benefiting. More substantial benefits should accrue from the program for constructing on-farm ponds, which was unforeseen in the original project. These ponds depend on irrigation to sustain their water levels during the dry season when no rain falls. One hundred and ten ponds have been constructed so far. At the budget level available under the project, about 50 ponds can be built each year. A one-rai pond is said to cost about 15,000-20,000 baht to construct and can yield fish worth about 15,000 baht a year, six times the net income per rai earned on an experimental farm plot growing rice in the wet season and groundnuts in the dry season under Department of Agriculture supervision.

It is not surprising that the number of farmers wanting ponds is much greater than the Fisheries Department can satisfy, especially because "poor" farmers are charged only the cost of fuel for the construction and given free fingerlings the first year. (The Fisheries Department selects individuals from a list of "poor" farmers submitted by the Tambol Council.) Fish are the major source of animal protein in the Northeast. The evaluation team was not in a position to explore the marketing constraints that limit the feasibility of expanding pond sales, but at this stage the LNO project appears to be far from the point where close calculation would be required to compare per rai or per

man-day yields of ponds with crop cultivation. The team recommended that higher priority be given to pond construction under the project's local currency budget.

Buffalo, which were not considered in the original project design, now warrant attention for two reasons. First, there is evidence of a potential shortage of power for cultivation in the project area, should dry season production expand rapidly. Buffalo holdings are reported to have declined in the Northeast in recent years. Second, recent moves by the RTG to raise domestic petroleum product prices toward international levels have begun to reverse the shift from buffalo to tractor power that has been going on for many years. Buffalo prices are reported to have risen one-third in the area in the past 2 years. Several of the farmers interviewed had recently sold buffalo in the price range quoted at the nearby Livestock Station, had bought younger animals in their place, and were breeding and selling them.

If the rise in demand for buffalo for draft purposes (and meat) holds as a long-term trend, this rise could become a significant development in Northeastern agriculture's participation in the general "structural adjustment" the economy is undergoing in response to the major changes in the world economy of the past several years. For generations, provision of draft buffalo to the rest of the country has been an important source of Northeast income. For LNO farmers, buffalo production could develop as a very significant, unanticipated source of future income growth. Irrigated production of fodder might give the area an advantage over much of the rest of the region.

The Livestock Station reported that it takes about one rai to keep one buffalo. Suitable grasses are tested and available, as is good breeding stock. A major problem was said to be a 30 percent death rate among calves due to liver fluke, a problem that is relatively easy to overcome. As with the fish ponds, the evaluation team was not in a position to explore the potential extent of benefits from buffalo production. Based on team observation, however, it seems evident that buffalo production holds greater potential for LNO farms than is reflected in the resources the RTG and USAID are putting into it.

#### 4. Other Effects--Planned and Unplanned

The project includes construction of feeder and canal service roads that were considered to be very beneficial by the farmers interviewed. They cited the improved market access as foreseen in the Project Paper, reporting that merchants now came

either to the farm or to the villages. One enterprising woman had dropped cropping altogether, turning her farm into an integrated duck and fish pond enterprise; she was looking forward to being included in the Land Consolidation leveling program because of the feeder road that would accompany it, easing her access to the market.

The original project included a small resettlement activity for 150 families whose lands were scheduled to be drowned as the reservoir level rose. The USAID input was a sericulture project. The team did not devote much time to this activity which is now treated as a separate project. It is important to record however, that part of the resettlement area set aside for the reservoir inhabitants had been occupied by families from outside the project area before many of the families to be resettled actually abandoned their drowning lands. The residual ill-feelings over these circumstances continue to be exploited by insurgents operating out of nearby mountains.

Some of the changwad officials interviewed told the team of a potentially troublesome problem that the team was unable to evaluate. They reported that they had received complaints from people outside the project area concerning the disproportionate money and services the RTG was putting into LNO compared with the rest of the changwad. This appears to be a potential problem facing any area development project that concentrates government inputs in a highly visible manner compared with normal, functional programs that are spread so that every jurisdiction gets an equal share. In the case of a small irrigation project, the difference between being inside and outside the command area is unavoidably obvious. It would be especially unfortunate if the LNO project continued to provide benefits as limited as it has thus far, while generating resentment because outside residents continued to observe heavy equipment and other signs of extraordinary government activity.

In the longer run, however, as irrigation actually spreads and dry season production rises to a larger scale, the distinctions between the project area and the surrounding region may blur. An interesting IBRD study of linkage effects between the Muda River irrigation project in Malaysia and its surrounding region concluded that the multiplier effects on the outside area were substantial: for every \$1 of net income increase within the project area, income in the surrounding region rose by \$.75.

The team inquired about possible health problems caused by the reservoir. Health officials reported that thus far the Northeast generally is free of schistosomiasis, while the liver fluke problem affecting buffalo and an estimated 5 percent of the reservoir fish had not appeared among the human population.

B. Impact From the National Perspective

In the 1977 Project Paper, the internal rate of return was estimated at 10.2 percent and the benefit-cost ratio at 1.29, levels the Paper admitted were not very attractive. It was expected that the integrated rural development elements would increase the likelihood that the production results would actually occur; in addition, the nonquantitative aspects of integrated rural development increased the overall attractiveness of the project at a time when rural development was a subject of strong interest at AID. If the production foregone by farms drowned by the reservoir had been subtracted from the gross benefits, the benefit-cost ratio would have been even a little lower. If the Project Paper had assumed a slower, more realistic, rate of expansion in dry season irrigation (it assumed 68,000 rai in 1981 compared with the actual 20,000), the present value, in 1979, of the future income stream would have been significantly lower. If the Paper had used a 15 percent discount rate and 30-year project life as used in the IBRD appraisals of the Lam Pao and Takhong irrigation projects, rather than 8 percent and a 50-year life, the economic return of the LNO project would have appeared unacceptable. If the irrigable area turns out to be substantially lower than the design area (i.e., if the uncertainties the team came across regarding 63,000 rai or some higher figure closer to the 106,000-rai dry season design area reflect a real need to scale the irrigable area downward), the economic benefits of the project would become extremely poor in relation to the capital already invested. At 63,000 rai, for example, the benefit-cost ratio would drop to around 0.4.

If the dry season irrigation area turns out to be close to 106,000 rai, if the least-cost (Ditch and Dike) method is used for the final distribution system, and if the capital cost is adjusted to take into account the cost of rehabilitating the system (raising the original capital cost figure of about \$60 million to roughly \$70 million), the internal rate of return appears more likely to be of the order of 0.65. If the sunk costs are put aside, the returns to the marginal investments still required to bring the system into full operation are much more favorable. At the 20,000 rai level, the operation and maintenance costs are already exceeded by the net benefits.

Of course, the RTG and USAID have long realized that returns to investment in the Northeast would be lower than returns to investment in other parts of Thailand. The relatively backward economic condition of the Northeast stems from realities of location and poor soil that cannot be changed. If as a matter of policy the RTG and USAID adopt projects with relatively poor prospects in a search for opportunities to make some economic

impact on this region, then standard measures of economic return-- which have been developed as methods of comparing prospective returns on alternative investments--should not be used as the yardstick for comparative analysis of the development options.

On the other hand, it is striking to note that if the sums already invested in the LNO project were invested instead in riskless U.S. or Eurodollar financial instruments for the benefit of the LNO area, every LNO family could be deriving an income of \$600 a year. Any such comparisons with national alternatives would be unfavorable to the LNO project. While there is merit in the argument that it would be misleading to evaluate the economics of the LNO project or similar projects in the backward or resource-poor regions of any developing country only in terms of the project itself, it is also clear that relaxing standard criteria of project acceptability can lead to poor utilization of scarce resources. The larger issue is the national development policy approach to dealing with the entire region.

#### IV. INTEGRATED RURAL DEVELOPMENT: FINDINGS AND IMPLICATIONS

As mentioned above, the LNO project was broadened in 1977 from a straight irrigation project to an integrated rural development project. The integrated rural development aspects were seen in the Project Paper as ends in themselves and as vital supports to achievement of the irrigated production objectives:

The project purpose focuses on increase in agricultural production realized from irrigation as well as on other factors contributing to family well-being; provision of social services, including health care and educational opportunities; and participation in Government and community activities which provides the family a voice in decisions affecting their welfare. A further aspect of the project purpose is to strengthen Thai agencies and institutions supporting the project to better administer and coordinate LNO-related activities and thus achieve a truly integrated rural development project.

Again, citing the underutilization of irrigation water in the other Northeast projects, the Project Paper says that the LNO project is designed to demonstrate how the benefits of heavy capital investment to provide for irrigated agriculture can be more effectively and quickly realized....To bring this about the project focuses on a number of key activities: effective RTG organization and project management, a strong community and village family support to and identification with the project....

The project has not demonstrated ways to quickly extend irrigation; on the other hand, the production support program has demonstrated how to overcome constraints that have kept farmers from using irrigation water when available. Although the integrated rural development activities have been operating only 2-3 years, they have made definite contributions to the achievement of the irrigated production attained, and have developed some management characteristics unusual for the RTG field bureaucracy and worth continued study and support.

Compared with full-scale integrated rural development projects in some other countries, the LNO project appears on paper to pay only lip service to the concept of integration. Some of the full-scale projects have established semiautonomous authorities over the area covered, which are vested with considerable power apart from the preexisting political structures whose jurisdictions they overlap, and which control funds, including aid funds, greater than the resources available to the regular jurisdictions. Their power to coordinate or direct is sometimes greater than that normally available to field-level structures of the government. In some cases, the salary scales are also higher than in the regular government, enabling the integrated rural development authority to draw talent away from other parts of the government or country.

By contrast, the LNO project's integrating arrangements are based only on coordinating authority. The usual lines between ministry staff located in the project area and their changwad and Bangkok levels are not disturbed. The extra program funds involved are modest.

The project envisages a three-tiered system. At the national level, authority for project policy and implementation guidance is vested in a national coordinating committee for LNO, comprising representatives from numerous concerned ministries and agencies. The second tier consists of a changwad coordinating committee of the line agencies concerned with the project, chaired by the province governor, and including the senior members of the project-level LNO coordinating committee that comprises the third tier. This last tier was to be composed of the LNO Project Field Director (an RID engineer) and "team leaders" representing each of the line departments involved and supervising departmental activities within the project area. Recognizing the special role to be played by the Community Development Department (CDD) and the Department of Agriculture Extension (DOAE), these two team leaders were also designated as Assistant Field Directors. It was expected that the team leaders and the project's technical and support staff would reside at the site and work in one administrative center (financed under the USAID loan) under the direction of the Project Field Director.

The Director would have primary coordinating responsibility, would monitor and report on all problems and activities, and could report directly to both the Provincial Governor and the national coordinating committee. The three-person USAID consultant team was to advise the field management team and also reside on site.

In practice, only the RID and CDD have appointed full-time resident team leaders who have no responsibilities outside the project. The other departments are represented by the changwad senior officials who wear a second hat as LNO team leaders for their respective departments; thus, the membership of the changwad coordinating committee (with the exception of the Governor) is almost the same as that of the LNO coordinating committee. The national level committee has never met.

Despite the failure of most of the departments to appoint resident team leaders and despite the very limited departure of these arrangements from the ordinary RTG bureaucratic structure--or perhaps because the departure is so limited--the integrated rural development aspect of the project shows signs of commendable progress, partly in directions not foreseen in the Project Paper.

First, there are numerous instances of closer than usual coordination of functional activities, and more extensive coordination is being developed than normally takes place between amphur or changwad and project activities.

Second, the integrated approach has resulted in greater adaptation of activities to a single program objective, for example, the production objectives of the project, than normally takes place. The evaluation team got a glimpse of what has probably been the major challenge and accomplishment of the integrated rural development coordinating committee: the administration of the production support program. Much coordinating committee time was devoted to dealing with the several occasions when the program looked as if it might unravel at both the LNO and Bangkok ends. At times, the committee leadership had to cross bureaucratic lines, using the direct reporting line that had been established under the three-tier arrangement between the LNC coordinating committee and the senior levels of the Ministry of Agriculture. As mentioned earlier, the last steps in the support-buying program were being carried out during the visit of the evaluation team, with the coordinating committee leadership playing a general program management role beyond the formal job responsibilities of their respective departmental positions. There seems little doubt that the production promotion program this past dry season would not have succeeded were it not for the existence and determination of the integrated rural development

coordinating committee. The importance of this achievement for the future impact of the entire project cannot be overstated.

Third, lessons are being learned from the beginnings of integrated planning and operations that may prove useful in the other Northeast irrigation projects and in other areas and projects generally that call for joint working of different RTG agencies. (The strong traditions of separation and of vertical rather than horizontal communication among RTG ministries and departments have often been observed by students of Thai public administration.)

Fourth, there is a high degree of motivation and desire for joint programming among the team leaders, including those from agencies not getting special budgets under the loan and counterpart provisions.

There have also been disappointments. Coordination and adaptation of activities to specific LNO needs have in some important cases been limited by the inability of a team leader who is also serving as changwad senior official for his ministry to depart from the program content laid down by the ministry for country-wide implementation. For example, the Department of Adult Education was able to provide training materials for farmers on groundnut cultivation, but has not developed materials on irrigated agriculture generally because of its reported inability so far to obtain substantive guidance from departments of the Ministry of Agriculture. At the same time, the Department of Adult Education has continued its regular programs that include a wide variety of home economics and commercial skills such as sewing and radio repair. These courses appear to be well attended and teach skills that are undoubtedly useful and marketable. The evaluation team agreed, however, with a point made in the coordinating committee that it would be more useful if the adult education efforts in the villages of the LNO area could concentrate on new techniques of water management that will be needed as the irrigable area expands in the next 2 to 3 years.

Another example is the case of the Department of Agriculture Extension. As explained by the senior changwad extension officer, the DOAE in Sakon Nakhon, as elsewhere, is totally absorbed by the training and other activities (and priorities) set by the ministry within the context of the large IBRD national extension program loan. Since irrigated agriculture in the Northeast can cover only a small fraction of the area, the focus of the program is on rain-fed agriculture. The inability of the DOAE to alter its priorities for the LNO area is reflected in its failure to use the extra budget under the AID loan (plus counterpart) this year; it may also remain unused in the remaining 2 years of the project. The activities and budget under the IBRD

loan are fully absorbing DOAE attention. For DOAE personnel who will rotate during their careers, restriction of their current in-service training to the priorities of the national program makes good sense. For those serving in the LNO area at present, however, this inflexibility will reduce their ability to contribute to the training needs of LNO farmers and to the effective utilization of the water being provided through very considerable public capital expenditure. It was clear to the evaluation team that this problem could not be affected at the level of the LNO coordinating committee. The decentralized coordination model under this project does not have the requisite authority.

The availability of extra-budgetary funds for LNO has enabled the LNO coordinating committee, with assistance from the advisory team, to develop a special annual budget for the project area. This budget was worked out in joint sessions of the team leaders and covers activities of all departments represented on the committee. It includes brief statements of program objectives (for example, numbers of rai targeted for irrigation and cultivation with high-yielding varieties) and related inputs and activities. It is not surprising that this innovation in RTG budget procedures, merely 2 years old and disposing only of extra-budgetary funds that will be available for a short time, has had less impact than was hoped. Two departments that do not receive funds under the loan (livestock and health) agreed to develop budget proposals anyway for inclusion in the joint effort; this local attempt to affect allocations to these departments at the changwad level, based on budget decisions made in Bangkok along national program lines, failed.

As noted above, the DOAE has not departed from its national program or used its portion of the LNO budget. Despite this position, DOAE officials have cooperated in a number of ways with the research and farmer relations activities of other departments on the committee. Whether they will be able to participate in the training activities in on-farm irrigation being developed at the CDD training center being built under the loan remains unclear from the mixed picture of the role of the DOAE thus far.

The evaluation team made some suggestions in its report to the RTG and USAID for strengthening the operations of the integrated rural development committee:

1. The package approach still lacks a well-defined planning methodology for deciding when and where, or in what sequence, to focus on different areas within the project. The advisory team has proposed a method for defining priority areas based on criteria designed to tell where the highest returns will be obtained. Another dimension of planning would carry further the functional coordination being attempted in the integrated budget.

This could be done through (a) actual rather than illustrative inclusion of the livestock and health sections based on reallocation of the unused DOAE funds; (b) participation of these two sectors in the programming of an allocation of a block sum by the RTG Budget Bureau to the LNO project for use by the coordinating committee for joint activities of the participating departments; or (c) programming the activities under the integrated LNO budget to deal more directly with production in the next 2-3 years in a concerted drive to push out the project's still largely latent agricultural production benefits. Starting with the 1981-1982 budget, the RTG is moving from object-class to program budgeting. A block grant to the LNO project would be consistent with this basic change in budget procedure.

2. The on-site location of the CDD team leader has proven highly productive. Free of regular changwad-wide duties, he has been able to devote full attention to the LNO project, to develop direct interaction with LNO farmers, and to give important support to the activities of other departments. All team leaders contacted by the evaluation team reported that the operation of the coordinating committee had led to a process of personal interaction and of substantive exchange and heightened interest and attention to problem-solving in the LNO area that differed significantly from the normal extent of inter-departmental cooperation at the changwad and amphur levels. Still, it appeared to the evaluation team that for those LNO team leaders posted primarily to the changwad, their province-wide responsibilities severely constrained the attention they could devote to the LNO project, and that the effectiveness of the coordinating committee concept would be greatly enhanced if the RTG posted leaders from the other departments to the LNO team as originally envisaged. This recommendation is not made merely to give this interesting innovation in RTG field management a full opportunity to demonstrate its potentialities. It is made primarily because the RTG and USAID have made a large investment in irrigation that appears belatedly on the verge of producing benefits, and because an on-site coordinating committee can play an important role in bringing these benefits to life.

The LNO approach to integration has avoided some of the problems the IBRD has found with its more ambitious rural development projects, where the very strength built into the design of project management was found to cause deliberately poor coordination because local officials resented a new authority. The Bank also found that problems had been caused by attempts to effect institutional change too quickly. The LNO project may err on the side of insufficient authority to require program adjustment suited to LNO's need at this stage of the project's life. But by working within the preexisting field-level government structure, it has been able to avoid generating new conflict while bringing

about some measure of increased coordination and interpersonal working relations that is consistent with Thai bureaucratic behavior and not an ad hoc intervention that would be resisted and possibly accomplish even less.

The brief record of the integrated rural development arrangements--tentative and partial though they are in relation to the project design, and a pale reflection of the thorough-going authorities created under more ambitious area development projects elsewhere--justifies the expectations of the RTG and USAID that an integrated rural development overlay on the LNO irrigation project would facilitate the emergence of project benefits. For the short run, the evaluation team believed that a strengthening of these arrangements along the lines suggested would help the project finally achieve large-scale utilization of the irrigation water, assuming solution of the engineering and marketing problems also addressed by the evaluation. For the longer run, no thought appears to have been given to the permanent management arrangements once the project is fully operational or the extra-budgetary load funds are exhausted. However, the more important question from the point of view of replicability in Thailand is what lessons can be learned that can be transferred to the regular governmental machinery and jurisdictions. Irrigation command areas that can serve as economically viable and definable areas for some form of integrated, area-based, development management represent only about 15 percent of the arable land of the Northeast. Can development management within an entire changwad be adapted to replicate the closer interpersonal operations, joint planning and budgeting, greater flexibility and motivation that the LNO coordinating committee has exhibited, for all its limitations?

It would take a more extensive exploration of Thai public administration than possible under an evaluation of this sort to address the questions of general replicability within the existing machinery. The key factors seem to be (a) organization of the senior officials into a program-oriented, horizontal, coordinating group that meets regularly and is close to the farm population from whom it gets feedback if things don't work; (b) independent responsibility of these officials to allocate some funds for their own local programs and projects; (c) sufficient interaction among the officials to develop high esprit de corps.

#### V. OTHER ISSUES

Local participation within LNO has not developed to an extent that would stand out in contrast to areas outside the project. Some small farmer groups have been formed in areas

where joint operation of irrigation ditches is required. The LNO coordinating committee has discussed development of formal relations with village leaders to explain such issues as the overall project, the benefits expected, and the role of the farmers, but has not decided to act upon these ideas.

As mentioned above, rising energy costs appear to offer profitable opportunities to LNO farmers to raise and sell buffalo.

No detrimental health effects have been observed from the environmental changes caused by creation of the reservoir. The Chao Phya leveling model has been adjusted in one of the RID pilot areas to reduce the extent of tree removal. In the so-called upstream area of the project, the land has only recently been undergoing clearing and settlement operations. Provision of irrigation water may hasten this process of removing trees and bush, but the process appears inevitable as the growing population continues to occupy and clear what little arable land remains uncultivated.

The evaluation team found the recurrent cost problem severe and very difficult to sort out. Maintenance expenditures have been extremely low, with visible effects on canal structures. It was not clear, however, that the inadequate maintenance was due to the general budget stringencies facing the RTG. The RID provided data showing expenditures running well below their budget allocations for the LNO project as a whole. The Project Paper anticipates that farmers will be charged water fees to help defray operation and maintenance costs. Since irrigation is reaching only a small fraction of the area and the primary concern has been to induce farmers to use the water, the RID has thought it unrealistic and inappropriate to start discussing water fees. Even as water availability expands to the design area, one may question the political feasibility or equity of charging Northeast farmers for water as long as Central Plain farmers, who generally enjoy a higher income level, continue to get water free.

## VI. RECOMMENDATIONS

1. The evaluation team made a number of detailed technical recommendations (not included in this report) on steps to research the so-called Lam Nam Oon water delivery system model, the need for adequate maintenance and rehabilitation expenditures, and agricultural research to determine appropriate crops and soil improvement practices.

2. The team also recommended adoption of planning techniques and completion of the original integrated development staffing arrangements to increase the effectiveness of the integrated rural development operations.

3. Higher priority to the development of on-farm fish ponds and buffalo production was also suggested.

4. Finally, the team recommended that the crop promotion and support program be continued, and that 1982 support prices be decided quickly and used as an incentive to induce farmers in Ditch and Dike areas to form appropriate groups for the construction of distribution channels in order to expand the area receiving water as quickly as possible.

The team did not consider termination of AID involvement a realistic or useful option as long as the maintenance problems were addressed and the RID proceeded with a proper test of the LNO model; after an extended construction period, the project does appear close enough to realizing benefits to warrant going the last mile.

## VII. LESSONS LEARNED

1. The actual delivery of water under this project has fallen far short of the time schedule projected in the AID project design. The extended delay in achieving production increases, combined with the increased capital (rehabilitation) costs that will be required to make up for lack of maintenance, have seriously lowered the economic value of this project from the already marginal values projected at the time of project approval. It is clear in hindsight that the rapid rate of system completion and of increases in production and productivity that were used in the Project Paper's economic analysis were unrealistically optimistic given two existing factors: (a) the irrigation department has had a long history of stretching out project implementation, and (b) the long record of small irrigation system maintenance and of farmer use of irrigation water in the Northeast has been highly disappointing. Even considering the often justifiable risk-taking role of AID projects, the general lesson of the LNO experience thus far appears to be a need, where an AID-assisted project is designed (as stated in the Project Paper) to demonstrate how to overcome systemic problems working against achievement of the projected benefits, to ensure two things: first, that the project itself be important enough to draw high-level political attention willing to make necessary changes, and second, that the AID role in the project be large enough to give AID a voice commensurate with the difficulties it will face.

2. In addition, given the major effect on project economics of a delay in the initiation of the benefit stream, (when discounted to year 1 at, for example, a 10 percent rate), a more skeptical, or at least more realistic, review of project assumptions on timing issues is essential in irrigation project appraisal.

3. Contrary to the natural tendency to move toward strengthening the authority of rural development administrative mechanisms, the modest but undeniable accomplishments of the LNO integrated arrangements point to the advantage of limiting the introduction of organization changes in the face of powerful bureaucratic traditions. We saw no evidence of deliberate obstruction or other backlash from the preexisting bureaucracies because of the LNO arrangements. While the LNO model itself is attached to a discrete area project and thus probably not applicable to most of the Northeast, the experience demonstrates potential advantages from decentralized budget planning and the flexible local coordination possible within the Thai administration system. The very limited nature of the organizational changes and absence of any threat to established positions appear to have been a source of strength rather than weakness.

4. In designing the project, it was recognized that the shift to irrigated agriculture would entail fundamental changes in the pattern of farm family activity. To help facilitate these changes, innovations in farmer organization and government technical services were believed to be necessary and sufficient to bring about a rapid transition. As we have seen, the research and extraordinary effort of the innovative services arrangements have been necessary to bring about the farmer response that has occurred. But without the price and purchase support programs they would not have been sufficient. Presumably the designers shared the common view in those (very recent) years that the opportunity cost of farm family time in the dry season was very low. This is not to cast blame after the fact; but it does point out the importance of getting an accurate picture of the economic context surrounding a project that depends on specific economic behavior on the part of the beneficiaries. Even an assumption as established in conventional wisdom as the existence of underemployment should not go unexamined.

5. A related point is the need to build greater flexibility into a project that stretches over a number of years during which beneficiary behavior may change in response to changing economic conditions. As long as the RTG prefers to adhere to the local currency budget distribution set in the loan agreement and the agreement is not renegotiated on this item, the anticipated opportunities in fish and buffalo remain underfunded.

In the next 5 years it will be particularly important to pay attention to the possible effects of the "structural adjustment" policies many countries are introducing involving basic changes in domestic petroleum product prices, export orientation, and general market orientation. Structural adjustment may affect projects in ways not envisioned in the customary delineation of project "assumptions."

6. Whether or not dry season farming turns out to be competitive with other employment options available to LNO farm families, without relying on government price supports, remains to be seen. The author doubts that such support buying will be needed as a supplement to commercial demand or as a prop to keep prices from falling to "artificially" low levels (that is, levels below those in the Central Plain after taking account of additional transport costs) because of thinness or lack of competitive vigor among local merchants, once the scale of LNO output rises to its potential. The question then will be how net returns on these poor soils compare with alternative opportunities, and whether the growth of those opportunities may be constrained for a number of years from slower growth in the economy and in employment generally. Obviously the final returns are not in. However, the record thus far does not support the well-intentioned notion that marginal economic returns should be accepted from a large proposed investment merely because it will be located in a backward region for which that government and donors are anxious to do something. Given the special interest of AID (and many other donors) in focusing on the relatively disadvantaged, and the fact that their disadvantaged status often results from living in areas with relatively poor economic prospects, the LNO case illustrates the troublesome problems posed by this policy objective and by a decision not to adhere firmly to traditional lines of economic returns analysis, particularly in the absence of substantial off-setting social returns.

7. While the logical framework record reflects the delays in LNO project implementation, it was of limited use as an evaluative tool. Several targets were based on actions or new institutional arrangements that have proved to be irrelevant, of questionable value or that were replaced by alternative approaches (and apparently not seriously considered by LNO project management despite their formal targeting in the Project Paper). For example, the framework had foreseen five different forms of farmer organizations (in addition to Water User Associations, which are not mentioned), none of which were actually set up.

Logical frameworks must be realistic; if not, they will serve no useful purpose as a guide to implementation or evaluation, and might be used uncritically as a basis for trivial criticism of host government and AID performance.

APPENDIX A  
LOGICAL FRAMEWORK

LOGICAL FRAMEWORK

The Project Paper contains outputs in the Logical Framework and 27 indicators of achievements of these outputs. The evaluation team attempted to compile data for the record on cumulative actual accomplishments through fiscal year 1980 compared with the originally planned accomplishments. The results of this inquiry are recorded below.

	<u>1980--Cumulative</u>	
	<u>PP Plan</u>	<u>Actual</u>
1. Irrigation system and irrigated agricultural land improvements completed.		
a. Main canal and lateral (km)	305	345
b. Drainage system (km)	120	75
<p>The consultants have recommended that completion of the drainage system be delayed until a study of area, project, and farm drainage is undertaken. Indications of salinization suggest that the drainage system may need a different design.</p>		
c. Land consolidation area (000 rai)	2	4
d. Ditch and Dike area (000 rai)	102	16
e. Number of detailed research plans completed and being applied	3	1

Operational research plans were to be developed for three pilot areas. By the time the consultants arrived, land preparation had been completed on two areas. The consultants decided that reliable, detailed research was

1980--CumulativePP PlanActual

not possible on these areas. The third area (Pilot Area 2) will be the subject of operations research.

2. A road net completed providing for maintenance of the irrigation system and increased mobility, etc.

a. Feeder roads (km)	70	70
b. Operation and maintenance (O & M) roads (km)	230	30

About 30 km of O & M roads have been completed in pilot areas. The original target is questionable. In a large portion of the project area, such roads can only be constructed if farmers agree to yield strips of land alongside channels yet to be constructed. The Pilot Area 2 model would lower the O & M road requirement.

3. On-farm operation and maintenance of the water supply and drainage system.

a. Amount of self-help contributions by farmers to O & M charges (millions of baht)	1.56	0
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The target was based on a much more rapid expansion of the system than has occurred. In any event, the target is now unrealistic as farmers are not as yet expected to contribute (see text).

		<u>1980--Cumulative</u>	
		<u>PP Plan</u>	<u>Actual</u>
4.	A community development program in which villagers actively participate.		
a.	Number of families receiving CDD occupational promotion and other assistance (000)	52	N.A.*
	This activity started late and no records were kept; it is not being implemented in the manner planned. CDD program is operating in all 60 villages of the project area, at about the maximum pace that available funding permits.		
b.	Number of villagers in model village who participate under Saraphi project	55	0
	Percent of total village families	55	0
	It was decided not to introduce the Saraphi project in the project area. Instead, an Integrated Rural Development Training Center is being constructed, an activity not included in original project plans.		
5.	A three-step organization of farmers.		
a.	Number of CDD groups organized (30 members/group)	100	0

\* Not available

1980--CumulativePP PlanActual

To date, groups have only been formed for purposes of receiving training from various agencies in their own specialties.

b. Number of Farmers Associations organized or reorganized--minimum of 30 farmers each	9	0
c. Number of cooperatives organized or reorganized (500 members/group)	2	0
6. A functioning agricultural research and extension program.		
a. Number of farmers accepting and using results of applied research and extension programs	4,500	2,000
Farmers using the groundnut variety recommended for the 1980/81 dry season; 123 farmers participated in various trials during the dry season and 48 during the wet season.		
b. Number of farmers engaged in model-farm village program The Program has not yet started.	111	0
7. Farm input, advisory services, and marketing package provided.		
a. Agrilime in use (mt)	19,500	0

	<u>1980--Cumulative</u>	
	<u>PP Plan</u>	<u>Actual</u>
Agrilime not yet determined to be useful. Testing is being conducted.		
b. Number of farmers assisted by the Marketing Organization	24,800	2,000
1980/81 dry season was first year of RTG intervention in marketing. Number refers to groundnut producers.		
8. Improved services provided for family planning, health, and home economics/nutrition.		
a. Number of village health agents installed	68	26
b. Number of health center workers who have completed advanced training	12	N.A.*
c. Number of families provided with home economics and nutrition assistance.	115	N.A.*
9. Functioning model farmer with active nuclear family achieving spread effect from training and assistance which has been received.		
a. Number of model farmers/nuclear families	1,300	0

Project staff has decided model farmer program is unworkable because of the necessity of coordinated action by too many separate agencies.

	<u>1980--Cumulative</u>	
	<u>PP Plan</u>	<u>Actual</u>
b. Number of farmers who have been assisted by model farmer program and the nuclear family (See 9.a above)	5,200	0
10. Life-long Educational Center.		
a. Number of training classes completed	504	0
Construction of training center is not yet completed.		
11. Increased fish production for food and income purposes realized from fish stocking and training programs.		
a. Reservoir fish density (kg/rai)	25	N.A.*
Fish density not followed but should be high due to large-scale stocking (about 5 million fingerlings) and low level of fishing activity.		
b. Number of Boy Scouts trained in artificial propagation of fish	200	50
c. Number of families receiving fish-culture assistance	400	120

\* Not available

APPENDIX B  
FIELD METHOD

FIELD METHOD

This impact evaluation differs from previous evaluations in this series in two respects: (1) the project is still on-going, so the evaluation is not after the fact; and (2) the impact study was performed in conjunction with a regular agency "mid-course correction" evaluation. The overall evaluation was designed to provide guidance to the Thai Government and USAID on the future course of the project, numerous outstanding policy questions, and the best use of remaining funds for the U.S. technical assistance, equipment, and local currency inputs. The impact evaluation has been drafted separately, drawing on material prepared for the overall evaluation, but with a different emphasis.

The evaluation team core comprised two USAID officials and three U.S. consultants, assisted by two other U.S. shorter term contributors (both from USAID/Cairo) and two Thai consultants (an economist and a public administration specialist). Several officials from the RTG interministerial Evaluation Committee also joined the evaluation team at the project site for varying periods.

The team assembled in Bangkok and spent 1 week reading documentary materials, developing the coordination arrangements with the RTG evaluation personnel, and interviewing other officials and USAID Mission personnel. The team then went to the project site and spent 2 weeks reviewing additional material, visiting the area itself, and interviewing RTG changwad and project personnel and the U.S. advisory team. Four full days were devoted to visits to about 20 farmers in the field. The team prepared a set of questions to discuss with the farmers, reviewed them with their Thai colleagues from the Evaluation Committee, and then divided into small groups in order to keep the farmer discussions as informal as possible and to reach as many farmers as possible.

The team's first draft of its conclusions was reviewed with the senior Thai project management before the team returned to Bangkok for a last week of drafting and for discussion with the full RTG Evaluation Committee and with senior RTG officials concerned with the project.