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PROJECT PERFORMANCE AUDIT REPORT

**THAILAND: NORTHEAST RURAL DEVELOPMENT PROJECT
(LOAN 1198-TH)**

December 27, 1985

Operations Evaluation Department

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ABBREVIATIONS

| | | |
|------|---|---|
| ARD | - | Office of Accelerated Rural Development |
| DAE | - | Department of Agricultural Extension |
| DOA | - | Department of Agriculture |
| DPW | - | Department of Public Welfare |
| ERR | - | Economic Rate of Return |
| NERD | - | Northeast Rural Development Project |
| OED | - | Operations Evaluation Department |
| PCR | - | Project Completion Report |
| PEA | - | Provincial Electricity Authority |
| PPAM | - | Project Performance Audit Memorandum |

PROJECT PERFORMANCE AUDIT REPORT

THAILAND: NORTHEAST RURAL DEVELOPMENT PROJECT
(LOAN 1198-TH)

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Map - IBRD No. 18444R

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PROJECT PERFORMANCE AUDIT REPORT

THAILAND: NORTHEAST RURAL DEVELOPMENT PROJECT
(LOAN 1198-TH)

PREFACE

This is a performance audit of the Northeast Rural Development Project in Thailand, for which Loan 1198-TH was approved on January 27, 1976, for the sum of US\$21.0 million, and closed on August 14, 1984, after cancellation of US\$971,695.

The audit report consists of an audit memorandum (PPAM) prepared by the Operations Evaluation Department (OED) and a Project Completion Report (PCR) dated November 30, 1984. The PCR was prepared by the East Asia and Pacific Regional Office following a country visit in June 1984 and based upon completion reports prepared by project executing agencies. The PPAM is based on a review of the Appraisal Report (No. 721-TH) dated December 31, 1975, the President's Report (No. P-1745-TH) dated January 15, 1976, the Loan Agreement of February 27, 1976, and the PCR; correspondence with the Borrower and internal Bank memoranda on project issues as contained in relevant Bank files have been consulted, and Bank staff associated with the project have been interviewed.

An OED mission visited Thailand in May 1985. Discussions were held with officials of the Accelerated Rural Development Office (ARD), the Department of Agriculture (DOA), the Department of Agricultural Extension (DAE), and the Department of Public Welfare (DPW), the main executing agencies. A field trip to visit the project area and the participating villagers was undertaken and the information obtained during the mission was used to test the validity of the conclusions of the PCR.

The audit finds that the PCR covers adequately the project's salient features, and the PPAM generally agrees with the conclusions. In addition to summarizing the project's objectives and results, the PPAM expands upon the project's unusual design and institutional arrangements, the supervision problems encountered by the Bank and the issues of procurement, use of consultants and participation of the population because of their importance to this as well as to other rural development projects.

A copy of the draft report was sent to the Borrower on October 15, 1985 for comments. No comments were received from the Borrower (see Annex 1).

The valuable assistance provided by the Government of Thailand and the project staff met during the preparation of this report is gratefully acknowledged.

PROJECT PERFORMANCE AUDIT REPORT

THAILAND - NORTHEAST RURAL DEVELOPMENT PROJECT
(LOAN 1198-TH)

BASIC DATA SHEET

KEY PROJECT DATA

| | <u>Appraisal Estimate</u> | <u>Actual or Estimated Actual</u> | <u>Actual as % of Appraisal Estimate</u> |
|--|---------------------------|-----------------------------------|--|
| Project cost (US\$ million) | 45.0 | 51.65 | 115 |
| Loan Amount (US\$ million) | 21.00 | 20.02 | 95 |
| Date Board Approval | - | 01/27/76 | - |
| Date Effectiveness | 05/28/76 | 06/28/76 | - |
| Date Physical Components Completed | 06/30/80 | 09/31/83/a | - |
| Proportion Then Completed (%) | 100 | 100 (approx) | 100 |
| Closing Date | 06/30/81 | 08/14/84 | 163 |
| ERR-roads (%) | 20 | 10 | - |
| ERR-electrification (%) | 12 | 26 | - |
| Number of Direct Beneficiaries (roads) | 800,000 | 750,000 | - |
| Number of Direct Beneficiaries (electrification) | 250,000 | 420,000 | 168 |
| Number of Direct Beneficiaries (water supplies) | 1,000,000 | 1,000,000 | - |

MISSION DATA

| <u>Mission /b</u> | <u>Date (mo./yr.)</u> | <u>No. of Persons</u> | <u>Mandays in Field</u> | <u>Specializations Represented /c</u> | <u>Performance Rating /d</u> | <u>Trend/e</u> | <u>Types of Problems/f</u> |
|-------------------------------------|-----------------------|-----------------------|-------------------------|---------------------------------------|------------------------------|----------------|----------------------------|
| Preparation | 06/74 | 6 | 90 | 2En, 2Ec, L, P | | | |
| Appraisal | 12/74 | 6 | 70 | 4En, 1Ec, 1L | | | |
| Subtotal | | 12 | 160 | | | | |
| Initial Supervision (Form 590 only) | | - | - | - | | | |
| Supervision 1 | 08/76 | 2 | 10 | 2En | 2 | 2 | M |
| Supervision 2 | 03/77 | 1 | 10 | En | 2 | 2 | M |
| Supervision 3 | 10/77 | 3 | 14 | En | 2 | 2 | M |
| Supervision 4 | 04/78 | 1 | 6 | En | 2 | 1 | T |
| Supervision 5 | 09/78 | 2 | 12 | En, Ec. | 2 | 1 | T |
| Supervision 6 | 11/79 | 2 | 15 | 3En | 2 | 2 | M |
| Supervision 7 | 04/80 | 1 | 11 | En | 1 | 1 | M |
| Supervision 8 | 11/80 | 4 | 40 | 3En, Ec | 1 | 2 | M |
| Supervision 9 | 09/81 | 4 | 40 | 1En, 3Ec | 2 | 2 | M |
| Supervision 10 | 05/82 | 2 | 6 | En, Ec | 2 | 1 | M |
| Supervision 11 | 02/83 | 1 | 6 | Ec | 2 | 1 | M |
| Subtotal | | 23 | 170 | | | | |
| Total | | 35 | 330 | | | | |

CUMULATIVE DISBURSEMENTS

| | <u>FY76</u> | <u>FY77</u> | <u>FY78</u> | <u>FY79</u> | <u>FY80</u> | <u>FY81</u> | <u>FY82</u> | <u>FY83</u> | <u>FY84</u> |
|-----------------------------------|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Appraisal Estimate (US\$ million) | 0.1 | 0.9 | 8.5 | 16.0 | 20.0 | 21.0 | - | - | - |
| Actual (US\$ million) | 0.0 | 0.8 | 3.3 | 8.5 | 12.5 | 16.7 | 18.3 | 18.6 | 20.0 |
| Actual as % of Appraisal Estimate | 0.0 | 89.0 | 39.0 | 53.0 | 62.0 | 76.0 | 87.0 | 89.0 | 95.0 |
| Date of Final Disbursement | August 3, 1984 | | | | | | | | |

continued on next page

OTHER PROJECT DATA

Borrower: Royal Thai Government (RTG)

Executing Agencies: Office of Accelerated Rural Development (ARD)
Provincial Electricity Authority (PEA)
Public Welfare Development (PWD)
Department of Agriculture (DOA)
Department of Agricultural Extension (DAE)

Fiscal Year: October 1-September 30

Name of Currency (Abbreviation) Baht (B)

Currency Exchange Rate:

| | | |
|---------------------------|---------|-------------------|
| Appraisal Year Average | 1976 | US\$1.00 = B 19.8 |
| Intervening Years Average | 1977-83 | US\$1.00 = B 21.3 |
| Completion Year Average | 1984 | US\$1.00 = B 22.9 |

Follow-on Projects

| <u>Name</u> | <u>National Agricultural Extension Project</u> | <u>National Agricultural Research Project</u> |
|----------------------------|--|---|
| Loan Number | 1393-TH | 1922-TH |
| Loan Amount (US\$ million) | 28.0 | 30.0 million |
| Date of Board Approval | March 12, 1977 | November 25, 1980 |

/a ARD roads component; other components finished much earlier.

/b These missions were concerned principally with the three major components. The minor agricultural components were supervised independently by agricultural staff from the Regional Mission, Bangkok, on six occasions between April 1977 and April 1980.

/c En = engineer; Ec = economist; L = loan officer; P = public administration specialist.

/d 1 = problem-free or minor problems; 2 = moderate problems.

/e 1 = improving; 2 = stationary.

/f M = managerial; T = technical.

PROJECT PERFORMANCE AUDIT REPORT

THAILAND: NORTHEAST RURAL DEVELOPMENT PROJECT
(LOAN 1198-TH)

EVALUATION SUMMARY

Introduction

The project was part of the Government's efforts to raise the incomes of the rural population of the country and decrease regional disparities. The project was the Bank Group's seventh loan to Thailand for the agricultural sector and the first for rural development.

Objectives

The project's objectives were to provide rural infrastructure, including village access roads, water supply, and electrification to about 400,000 families in the Northeast, one of the poorest regions of the country, and to improve the regional agricultural research and extension services through three small pilot projects. The seven project components were to be implemented by five separate government agencies. As project activities were complementary but not interdependent, no special arrangement for coordination was planned.

Implementation Experience

While the rural electrification component was quickly and successfully completed, the road and water supply components were delayed by procurement difficulties and disputes between ARD, the main executing agency and its consultants and contractors, resulting in three years implementation delay. Two of the three pilot agricultural subprojects led to two large-scale Bank-supported projects: the agricultural extension and agricultural research projects, approved in 1977 and 1980 respectively. When the project was closed, thirty-eight months behind schedule, the total project cost was US\$51.65 million, a 15% cost overrun.

Results

The project contributed to improving the living conditions of the rural population of the Northeast. The economic rate of return (ERR) of the electrification component is estimated at 26% (12% at appraisal) mostly because power transmission lines, financed from other sources, are considered as a sunk cost. The ERR of roads is estimated at 10%, significantly lower than estimated at appraisal (20%) as a result of cost overrun and lower agricultural production than anticipated. The water supply component was less successful than expected due to high salt and iron content of the water.

Sustainability

While the sustainability of project benefits does not pose a problem for the electrification component, that of roads and wells is partly dependent on the contribution of beneficiaries for maintaining the project investments. Although this contribution was planned at appraisal, it has not materialized so far.

Findings and Lessons

The main feature of this project is that, contrary to many Bank-supported projects of this nature, it was designed mostly as a rural infrastructure project and not as an integrated rural development project (PPAM, paras. 20-24). Agricultural components were small in size (12% of actual project costs) and of a pilot nature. No coordination mechanism was established and each project agency worked independently. Despite initial difficulties, the project achieved its targets, mostly because of strong government support and the fact that the project was mainly the continuation of existing programs (PPAM, paras. 25-26). The project experience shows, however, that Bank supervision of this kind of project is essential and more difficult than for standard agricultural projects (PPAM, paras. 27-29).

Difficulties experienced with procurement and consultant matters showed that Bank flexibility and assistance to project executing agencies unfamiliar with these problems is essential and part of its institution-building effort (PPAM, paras. 30-36). The project also demonstrated that the participation of the population in project construction and maintenance is difficult to obtain unless the beneficiaries are involved in the decision-making process at the earliest stage of implementation (PPAM, paras. 37-39).

PROJECT PERFORMANCE AUDIT MEMORANDUM

THAILAND: NORTHEAST RURAL DEVELOPMENT PROJECT
(LOAN 1198-TH)

I. SUMMARY

Background

1. One of the objectives of the Third National Economic Development Plan (1972-76) was to raise the incomes and living standards of the rural population in Thailand and to decrease regional income disparities. The Northeast, containing 16 of Thailand's 70 provinces, has one third of the country's population but only 16% of the gross national product, and has historically lagged behind other regions in terms of economic development and rural standard of living. The regional economy of the Northeast is dominated by agriculture: rice is the main crop, but the production of kenaf, cassava and maize is not negligible.

2. In 1974, the great majority of villages in the Northeast had yet to be reached by modern public infrastructure. A large number of rural roads were impassable in the wet season, resulting in relative isolation of the rural population. Most villages still obtained water for drinking and domestic purposes from ponds and open wells, many of which were unsafe and dried up completely during the dry season. Only 6% of the villages were electrified and the others were dependent on kerosene for lighting and diesel engines for rice milling and cassava processing.

3. Since 1966, the office of Accelerated Rural Development (ARD), responsible for rural works, had constructed a network of 6,000 km of dirt feeder roads and implemented village water supply programs in the Northeast. In addition to ARD, several agencies had been active in the field of village water supply and the Provincial Electricity Authority (PEA) had started a long-term national program of rural electrification.

Project Design

4. The project was the Bank Group's seventh loan to Thailand for the agricultural sector and the first for rural development. The primary objective of the project, to be implemented over five years, was to provide improved rural infrastructure, including village access roads, water supply and electrification to about 400,000 families in the Northeast. The secondary objective, to be attained through three pilot subprojects, was to improve some agricultural services in the region by expanding agricultural extension, strengthening upland crops research and undertaking a development program in land settlement schemes.

5. As approved by the Board in January 1976, the project consisted of:

- (a) the construction of 1,300 km of village access roads;

- (b) the provision of equipment for maintenance of roads;
- (c) the construction of about 4,000 tubewells;
- (d) the electrification of 346 villages;
- (e) research and development of improved techniques for cultivation of upland crops, mainly kenaf and cassava;
- (f) an expanded program of agricultural extension; and
- (g) studies to identify a land settlement project and implementation of pilot projects in two settlement areas.^{1/}

6. Two Ministries (Interior and Agriculture) and five Departments or existing public agencies were responsible for project execution. The roads and water supply components were to be implemented by ARD, while PEA was responsible for electrification, the Department of Agriculture (DOA) for the research component, the Department of Agricultural Extension (DAE) for the extension program, and the Department of Public Welfare (DPW) for the settlement component. No special arrangement for overall coordination was planned. Each implementing agency was expected to appoint a Project Director who would have overall responsibility for supervising and directing the implementation of his respective project components. The villages to be served by the project were to be selected on the criterion of need and no integration of project activities was expected. The villagers were to participate voluntarily in the drilling, operation and maintenance of wells as well as in road maintenance. Consultants were to be hired for the engineering and supervision of road construction, as well as for the preparation of further rural development projects.

7. Total project costs were estimated at US\$45.0 million, of which about 75% was for the rural infrastructure (roads, water supply and electrification) component and 25% for the agricultural (research, extension and settlement) activities. The appraisal economic rate of return (ERR) for roads and electrification, the two components for which economic benefits could be evaluated, were estimated at 20% and 12% respectively.

Project Execution

8. The rural electrification component was implemented according to schedule. The final achievement was the electrification of 478 villages, 38% above original targets, as a result of the efficiency of PEA and the early construction of the main distribution system financed from other sources.

^{1/} The self-help land settlement program is one of the national welfare programs aiming at settling rural poor families in uncultivated areas, and providing them with land and social infrastructure.

9. Road construction experienced delays in the first three years of project implementation, due to procurement problems, disputes within ARD and between ARD and its consultants and contractors. The contract with the local consulting firm hired for road design and construction supervision was cancelled in 1979 due to alleged irregularities on the part of some ARD staff and consultants. Charges of inadequate work performance also led to several court actions against contractors. These problems were finally resolved when the Bank agreed that the outstanding road construction program would be split into smaller contracts and the supervision of contractors would be carried out directly by ARD. At project completion, three years behind schedule, 1,270 km of roads (98% of the original program) were constructed.

10. After some delay due to procurement difficulties and the late delivery of equipment, the road maintenance program was satisfactorily implemented with 16 maintenance units operating in the four provinces with the longest length of roads and the oldest equipment.

11. The water supply component was adversely affected in the early years by procurement difficulties for rigs because of disagreement over technical specifications and acceptability of the lowest bidders on the part of the ARD evaluation committee. When these initial difficulties were overcome, the water supply program was fully implemented and the appraisal projection of 4,000 wells was met, and even slightly exceeded, with a delay of about two years.

12. The agricultural extension component started well, but was quickly taken over by the Bank-supported National Agricultural Extension Project Phase I (Loan 1393-TH, approved in March 1977). The upland crop research component was successfully implemented and was used as a pilot program for the follow-on National Agricultural Research Project (Loan 1922-TH, approved in November 1980).

13. The study on land settlement in the Northeast resulted in several pilot activities (fish ponds, rubber, small irrigation and fruit trees) to be developed in two representative settlement areas, near the border with Kampuchea. In 1978, a major attack by Kampuchean-backed forces at one of the settlements resulted in the deaths of 25 people and considerable destruction of private and public property.

14. When the project was closed in August 1984, thirty-eight months behind schedule, the total project cost was US\$51.65 million, a 15% cost overrun. The higher cost of ARD components, mostly roads, was partly offset by the lower costs of the extension and research component.

Project Impact

15. The project undoubtedly contributed to improving the living conditions of the Northeast rural population by providing better access and water to villages. On the basis of available data, some of the project's economic benefits have been calculated. The rural electrification component was the

most successful, with an ERR estimated at 26%, compared with an appraisal estimate of 12%, largely because power transmission lines, financed from other sources, are considered as a sunk cost. On the basis of a survey carried out by ARD, the ERR of access roads has been estimated by the PCR at 10%, compared with the appraisal estimate of 20%, as a result of cost and time overruns of the road component and a lower cassava production than anticipated.^{2/}

16. The water supply component only partly solved the critical water shortage during the dry season in some 2,000 villages. Water from deep wells proved to have a high chemical content of salts and iron, and is reluctantly accepted by villagers for drinking purposes. The annual cost of maintenance of locally manufactured handpumps installed by ARD appears higher than expected. While the villagers have generally contributed labor for the construction of wells, there is now little evidence of village participation in the well and pump maintenance.

17. Investments in agricultural research and extension have been smaller than anticipated and their benefits are difficult to measure until the follow-on projects they have generated are completed.^{3/} The benefits of the land settlement component are also difficult to quantify; some activities, like fishponds and rubber, appear successful and well accepted by settlers, while a costly pilot irrigation system proved ill-designed and unprofitable. No Bank-supported project was generated by this pilot settlement component. In retrospect, the Bank involvement in this component appears questionable, as the land development program in Thailand has been consistently supported by many donors with different and confusing development approaches.

18. In conclusion, the project has been successful in its social objective of providing improved rural infrastructure to a large number of poor families in the Northeast. The overall project economic benefits remain difficult to quantify and are essentially due to electrification of, and better access roads to, villages while the water supply component partly failed to provide drinking water to the rural population.

19. The sustainability of benefits due to electrification does not pose any particular problem; that of roads and water supply is highly dependent on adequate maintenance of roads and wells. It was originally foreseen at project appraisal that the villagers would contribute labor for maintenance of roads as well as wells and handpumps. This contribution, however, has not

^{2/} At the time of appraisal, Northeast Thailand was experiencing a cassava boom and it was expected that the expansion would continue. Marketing difficulties for cassava started in 1978 and resulted in a smaller increase of area under cassava than projected.

^{3/} The audit of the National Agricultural Extension Project (Ln. 1393-TH), is scheduled for 1986.

materialized so far, and maintenance remains entirely the responsibility of ARD, whose budget has been restricted by the Government's financial difficulties. The population's freewill participation in maintenance of project investments is also undermined by some government-sponsored programs, like the "Rural Job Creation" that provides remuneration for maintenance works of this nature. Therefore, the question as to whether the project investments will be adequately maintained in the future remains unanswered.

II. MAIN FINDINGS

20. A multiple component project of this nature is not an exception in the long list of rural development projects supported by the Bank. Three main features, however, make this project a special case: its design, its institutional arrangements and the difficulties in Bank supervision of the project as illustrated by the problems encountered with the water supply component. In contrast, other issues related to Bank requirements on procurement and consultants and the issue of population participation in construction and maintenance of works are common to many projects of this kind.

Project Design

21. The project was originally designed as a rural infrastructure project, including essentially rural roads, water supply and rural electrification. In this respect, the project was quite different from other Bank-supported rural development projects in which productive agricultural components normally constitute the most important part of the project and the rural infrastructure is only considered as production support components. This particularity can be partly explained by the fact that the project was one of a series of Bank-supported projects (Improvement of Irrigation, Livestock, Roads) prepared and appraised at about the same time and aiming at improving incomes and living standards in the Northeast. However, the question as to whether agricultural components were to be added to the social infrastructure component of the project was debated and finally decided upon during project preparation and appraisal.

22. The rationale for including a small agricultural component in the project description was that benefits would not arise spontaneously from the rural infrastructure unless some investments in agricultural research and extension would also be included in the project. In fact, the agricultural component (originally 25% of the total project cost) turned out to be even smaller than anticipated (less than 12% of the actual cost). Moreover, its economic justification and its impact on the project outcome appear quite limited at first view.

23. Nevertheless, it is the opinion of this audit that reducing the agricultural components to small pilot sub-projects was the right decision. The project was the first rural development project in Thailand and the Bank had limited or no experience in either rainfed agricultural or the Northeast

region. It is one of OED's main findings that a large number of first Bank-assisted rural development projects in many countries have been too large and too complex, in terms of area size and number of components.^{4/} It is also the Bank's experience that some ambitious rural development projects were not able to achieve significant progress in agricultural development until rural roads were constructed^{5/}, thus permitting access of agricultural inputs and agricultural extension services to villages as well as marketing of outputs. Finally, many PPARs pointed out that rural development programs should start with small-scale pilot projects.

24. This project was definitely less appealing than large integrated rural development programs aimed at improving production and incomes of a large number of rural poor. However, it had the merits of being relatively simple, of providing the rural population with necessary infrastructure for further agricultural development, and of paving the way for two follow-on agricultural research and extension projects. In this respect, the project's achievements, although modest, have not been negligible.

Institutional Arrangements

25. Contrary to many rural development projects of this nature, no attempt was made to set up an organization responsible either for executing the project or for coordinating its seven different activities and five executing agencies. The project included a series of activities, not related to each other and spread over the Northeast according to selection criteria set by each executing agency. Although similar situations have often led to disappointment in some Bank-supported projects, this project does not seem to have suffered from the absence of coordination, mainly because of two positive factors: first, a strong Government commitment and support toward improving the living standards of the rural population in the Northeast in view of the region's strategic and political importance. Second, the fact that most of the project components were the continuation--on a large scale--of existing programs, thus requiring minimal disruption for each executing agency.

26. While this state of affairs had the advantage of minimizing the inter-agency coordination problem common to many rural development projects, it had, however, some adverse effects on project implementation (paras. 27-29) and made Bank supervision particularly difficult. The nature of the project required that Bank supervision be carried out by Bank staff of different disciplines (transportation, water supply and agriculture), which

^{4/} See particularly the following PPARs: Mexico--Integrated Rural Development Project, Papaloapan Basin (OED Report No. 5760) and Haiti--Rural Development in the North (OED Report No. 5775) dated June 28, 1985. See also Tenth and Eleventh OED Annual Reviews.

^{5/} Burkina Faso--Bougouriba Agricultural Development Project (OED Report No. 4547, dated June 15, 1983).

would have been a difficult task had the Bank representation in Bangkok not been partly responsible for project supervision. Despite the assistance provided by the Bangkok office, supervision was sparse in the project's early years, during which many of the procurement, consultant and contractor problems occurred.

The Water Supply Component

27. The need for close supervision on the part of the Bank can be illustrated by the water supply component which, in some respects, was not as successful as claimed by the PCR. While it is true that the critical water shortage during the six-month dry season is partly solved in some 2,000 villages of the Northeast, it is also a fact that the quality of the water of the deep wells is sufficient only for domestic purposes, and not for drinking, because of its high content in salts and iron. The project objective was to provide reliable sources of good quality water for human consumption. As deep wells constituted 86% of the drilling program, it can be said the drinking water problem has not been solved in most of the villages. As a result, villagers are now digging additional shallow wells by themselves and are reluctant to maintain the project's deep wells. In addition, the villagers' shallow wells remain open, are not equipped with handpumps and can easily be polluted.

28. While the saline condition of deep water was well known at project appraisal, and largely confirmed during project implementation, it is surprising that the water supply program mostly consisted of deep wells when shallow wells, dug with bucket augers, are less expensive and more likely to produce water of reasonable potability. Had the problem been recognized during project supervision, consideration could have been given to alternative solutions, for example, wider use of shallow wells or supplying villagers with tanks to collect rainwater, a solution that is now, but belatedly, recommended for villages with drinking water problems.^{6/}

29. A lesson from the project is that a multicomponent project consisting of an expansion of existing programs does not necessarily require coordination of executing agencies, provided (i) the government strongly supports the project and (ii) the Bank adequately responds to higher supervision requirements related to this kind of project.

Procurement

30. The PCR points out that difficulty was experienced in the early years with equipment procurement by all agencies except PEA. OED has found

^{6/} The Region points out that the supply of non-potable water, which could be used for other domestic purposes, usefully complemented the potable sources and thereby extended the flow period of the latter sources further into the dry season than would otherwise have been possible.

that procurement problems are common to all—or almost all—projects which are the first in a particular sector or subsector.

31. Unfamiliarity of executing agencies with Bank procurement procedures has been mentioned in many PPARs. Problems in adjusting to Bank requirements for international competitive bidding (ICB), for translation of bidding documents into English and for adapting local procedures to Bank guidelines are common to many projects in many countries. These difficulties raise the question of whether Bank requirements are realistic and adequately explained to and discussed with the Borrower.

32. It is OED's experience that the construction of simple dirt roads similar to those constructed under this project and scattered all over a large region does not attract foreign contractors who are not interested in this type of work or unable to compete with local firms. On the basis of this experience, two questions arise. First, is it really necessary for the Bank to impose cumbersome ICB procedures to Borrowers unfamiliar with such procedures when it is well known that only local contractors are interested in project works? Second, if the ICB principle is decided upon and accepted by both the Bank and the Borrower, what remains to be done to help the project authority prepare bidding documents and awarding contracts according to Bank standards? As already noted in other PPARs,^{7/} many breakdowns of communication and misunderstandings would have been avoided in a number of projects if the Bank had given the Borrower better information on its procurement rules and procedures. Similarly, many project implementation delays—and subsequent cost overruns—have been due to unfamiliarity of project authorities with Bank regulations on procurement. In this respect, the role of the Legal and Disbursements Departments of the Bank, as well as of Bank Resident Missions, appears essential at the early stage of the project and could greatly contribute to a better understanding between the Bank and the Borrower. By providing information and training to government officials responsible for procurement and disbursement matters, the Bank could facilitate project implementation, particularly when project execution is shared by several agencies, which was the case of this project.

Institution Building

33. One of the project objectives was to strengthen ARD's capacity for constructing and maintaining rural roads and water supply facilities. To achieve this objective, the Bank required that ARD would use contractors for road construction instead of force account, and hire consultants for the design and supervision of civil works. Employment of contractors was expected to avoid the high capital cost of replacing construction equipment while the use of consultants aimed at having ARD staff released from construction activities and devoting more time to maintenance.

^{7/} See particularly Madagascar First Village Livestock and Rural Development Project (OED Report No. 5403 of December 28, 1984).

34. Problems related to consultants and contractors have been the main source of difficulties during the early project years. While ARD's reluctance and delays in recruiting consultants, followed by intractable disputes on consultant performance, were partly due to personal and political rivalries within ARD, the main problems were ARD's lack of familiarity in dealing with consultants and the feeling of many ARD staff that the assistance of the consultants was not necessary. Poor relationships between ARD and road contractors during the first two years also reflected ARD's resistance to the Bank's requirements regarding the new construction approach as an alternative to the traditional force account system.

35. The fact that the crisis was resolved and the pace of implementation improved markedly when the consultant contract was terminated after two years suggests that the use of consultants was not necessary and that ARD was able to do the design and supervision work in the first place. On the other hand, the use of contractors for road construction undoubtedly proved beneficial as it permitted ARD to increase its maintenance effort and reduce its investments in equipment.

36. The project illustrates: (i) the need for the Bank to be flexible when a decision on the use of consultants proves ill-founded and (ii) the risk of implementation delays and problems when the Bank requires that traditional construction systems be changed. The project also shows that assurances obtained at negotiations and explicit loan agreements are not sufficient to ensure that conditions on employment of consultants and contractors are fulfilled. As for procurement matters, there is a need for the Bank to help project authorities unfamiliar with consultant and contractor problems, which shows again the importance of Bank supervision for first projects in a sector or subsector.

Participation of Population

37. Voluntary participation of villagers in well drilling, as well as training of villagers in operation, maintenance and repair of village water supply works were two covenants spelled out in the Loan Agreement. Villagers were also expected to participate in road maintenance. In fact, some degree of contribution in work was reported during well development, but villagers' participation in maintenance of wells and roads has not materialized and training programs in pump maintenance have started only recently.

38. The project is not an exception in respect of poor population participation in project work maintenance. The main reasons often noted in some PPARs are that (i) the population is seldom involved in the decision-making process and has little say on the type and location of project investments, and (ii) the beneficiaries do not easily accept maintenance of works executed by the Government as their responsibility. In the case of this project, the population, if consulted, would probably have favored a larger number of shallow wells and disagreed with ARD's decision to construct so many deep wells with salt and iron problems.

39. Some PPARs have noted, however, good participation of the population in constructing and maintaining project works. The common feature of these successes was the involvement of the population in the decision-making, the contribution in work or in kind to investment construction, and the setting up at an early stage of village committees for operation and maintenance of project works.^{8/}

^{8/} In a rural development project in Haiti, before pumps were installed at well heads, the beneficiaries were required to pay a lump sum which was allocated for maintenance purposes (see PPAR on Haiti Rural Development in the North, OED Report No. 5775). See also on the subject of population participation: Burkina Faso Second Rural Development Fund, OED Report No. 4541 and Thailand Population, report under preparation.

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YUKINORI WATANABE
DIRECTOR OPERATIONS EVALUATION DEPARTMENT
INTBAFRAD
WASH DC 20433 USA

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NORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198T-TH)

PROJECT COMPLETION REPORT

November 1984

Projects Department
East Asia and Pacific Regional Office

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THAILAND

NORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)

PROJECT COMPLETION REPORT

I. INTRODUCTION

1.01 The Northeast Rural Development Project (NERD) was the Bank Group's first rural development project in Thailand and also the first non-irrigation project for the agricultural sector. Financed by Loan 1198 -TH (US\$21.0 million), the project was designed to assist in accelerating development in the economically less advanced Northeast Region through construction and improved maintenance of village access roads, village water supplies, and rural electrification in priority locations. It also included three, smaller, agricultural components in support of upland crops research, extension, and pilot projects for land and water development in two settlement areas.

1.02 The project was appraised in December 1974. Negotiations were carried out in October 1975 and the loan was approved by the Board in January 1976. The Loan Agreement was signed in February 1976, and declared effective in June 1976. The loan was closed on August 14, 1984, leaving an undisbursed balance of US\$971,694.79 which was cancelled.

1.03 This report is based on findings of Bank supervision missions and a review of Bank files.

II. FORMULATION

Origin

2.01 The possibility of a rural development project in the Northeast region was first raised within the context of Bank-Royal Thai Government (RTG) dialogue during economic missions to Thailand in 1970-71. Initial proposals from the Ministry of Interior, in June 1973, centered on rural infrastructure including village roads, water supplies and minor irrigation, to be undertaken by several agencies of that Ministry including the Office of Accelerated Rural Development (ARD), the Department of Local Administration, the Public Works Department and the Department of Labor, using force account and their own equipment. An additional component, for rural electrification, was proposed by the Provincial Electricity Authority (PEA) in March 1974.

Preparation, Appraisal, Negotiations and Approval

2.02 Bank-financed local and foreign engineering consultants carried out preliminary preparations of the roads and water supplies components through the latter part of 1973. A Bank preparation mission in June 1974 identified the following components: (a) an ARD village access roads component for 2,000 km of laterite roads to be undertaken partly through force account and partly

by contractors; (b) a village water supply component to be carried out jointly by ARD and the Rural Health Division of the Ministry of Health, designed to provide potable water to 2,148 villages containing nearly 1.3 million persons; and (c) a village electrification component for 27,000 rural households in 330 villages to be undertaken by PEA. In the remaining half of 1974 Bank-financed consultants continued project preparation of the roads and water supplies component, working closely with ARD staff, while PEA staff revised their earlier proposal. Appraisal took place in December 1974. There were no issues requiring resolution at the decisions meeting held in January 1975.

Target and Goals

2.03 The project was targeted towards some 400,000 farm families, or about 2.5 million people in the Northeast, Thailand's poorest region. The primary goals were to increase the incomes and amenities of these people through infrastructure improvements including village access roads construction, road maintenance in four provinces, potable water from wells or ponds and small dams, and rural electrification. Secondary goals, to be attained through the three smaller, agricultural components, included expanding agricultural extension as a pilot activity in four provinces, strengthening upland crops research, and undertaking pilot scale improvements in two Department of Public Welfare (DPW) settlement schemes.

Sectoral Context

2.04 The Northeast has historically lagged behind other regions in terms of economic development and rural living standards. Prior to 1960 subsistence rice-based agriculture was dominant, but with the extension of regional highways and feeder roads followed by the introduction of export crops to the region, especially kenaf, cassava and maize, the farm economy has become semi-commercial, at least in those areas with reasonable access to markets. Village access roads were intended to promote further this favorable trend, while better domestic water supplies and an extension of the electricity distribution network into the rural areas were expected to have major economic and social benefits.

Project Description

2.05 The project as finally appraised consisted of:

- (a) construction of about 1,300 km of village access roads by ARD;
- (b) strengthening of maintenance programs by ARD for existing rural roads in four provinces through provision of equipment;
- (c) construction of about 4,000 tubewells for village water supply, and the construction and rehabilitation of small dams and ponds by ARD in areas where groundwater is unusable;
- (d) rural electrification of 346 villages by PEA;
- (e) research and development of improved techniques for cultivation of

- (f) upland crops by the Department of Agriculture (DOA);
an expanded program of agricultural extension in four provinces by the Department of Agricultural Extension (DAE);
- (g) studies required to identify and formulate a land settlement project, and implementation of pilot projects for land and water development and infrastructure improvements (roads and water supply) in selected DPW settlement areas.

2.06 A table of key indicators (Table 1) below, provides a comparison of achievements with original targets.

Table 1: KEY INDICATORS

| Activity | Appraisal estimate | Actual |
|---------------------------|--------------------|---------|
| Village access roads (km) | 1,300 | 1,222 |
| Settlement roads (km) | 100 | 63 |
| Wells | 4,000 | 4,379/a |
| Village electrification | 346 | 478 |
| Households | 50,000 | 64,600 |
| Population | 300,000 | 420,000 |

/a Included 3,439 deep (drilled) and 940 shallow (augered).

III. IMPLEMENTATION

Start-up

3.01 The project was declared effective on June 28, 1976, four months after loan signing, when all documentary and legal conditions had been satisfied. Several project activities, including selection of consultants for design and construction supervision of the roads, were underway several months ahead of effectiveness. The chosen consultant was TEC/SMEC consortium,^{1/} and included one of the local companies previously engaged (in May, 1973) for the preliminary preparation of the ARD access roads and village water supply components. During contract negotiations with these consultants the Bank expressed concern at what were judged to be excessively high cost estimates submitted by TEC/SMEC, and urged that ARD negotiate cost reductions, or enter into negotiation with the second ranked firm if a satisfactory arrangement could not be reached.

3.02 The first supervision, carried out two months after effectiveness,

^{1/} Thai Engineering Consultants Co. Ltd of Thailand and Snowy Mountains Engineering Corporation of Australia.

commented favorably on initial implementation progress, particularly in regard to preparation of tender documents and bid invitations for the PEA rural electrification and ARD well drilling components. On the other hand, concern was expressed at the delay being experienced in finalizing negotiation with the road consultants, owing to disagreement over man-month inputs and costs.

Revisions and Design Changes

3.03 At appraisal the engagement of design and construction supervision consultants and construction contractors, a standard practice successfully applied by other RTG agencies including the Department of Highways and the Electricity Generating Authority of Thailand, had been introduced for the roads component for reasons of efficiency and economy. However, in the course of their engagement working relationships between the consultants and ARD became strained because of factional differences within ARD between staff responsible for the project and others. The arrest of two senior ARD staff in March 1979, on charges of malfeasance in office, brought about a further deterioration in working relationships between ARD and consultants which culminated in a termination of contract after 23 months of operations in November 1979 (para. 3.19). Thereafter, the Bank agreed to direct supervision of contractors by ARD staff, who were then judged to be competent for the task, a judgment which was substantiated in the final implementation phase.

3.04 A significant change in the organizational concept for the extension component took place between appraisal and effectiveness. At appraisal it was intended that progressive farmers, serving as farmer foremen, would be the link between the professional staff of the extension service and farmers. In their place a large cadre of vocational school graduates were recruited as fulltime extension agents and stationed in villages, at a distribution ratio of one extension agent to 1,000 farmers. This change was a consequence of strong efforts being made by the Bank at that time to introduce the training and visit (T and V) system of agricultural extension in many borrower countries, and led to this component becoming a pilot project for two subsequent agricultural extension loans to Thailand, the first of which became effective a little over one year after Loan 1198T-TH became effective.

Implementation Schedules

3.05 There was considerable variation between agencies in regard to their ability to keep to appraisal implementation schedules. All the ARD components (roads construction, road maintenance and village water supplies) experienced start-up delay, largely due to procurement problems (paras. 3.14-3.17) which persisted for about three years and which were compounded by legal problems in the case of several road construction contracts (paras. 3.22-3.23). Selection of the first three road construction contractors took more than one year. These problems ultimately delayed completion of all three components by two to three years.

3.06 The PEA rural electrification component was implemented according to schedule, without serious procurement problems. Progress with the DOA upland crop improvement component was slow in the first two years pending the appointment of a research program advisor and a change in project management.

3.07 The DAE extension component started off well and was quickly succeeded by the first National Agricultural Extension Project, which provided additional personnel and finance to meet the T and V system requirements of DAE in the four project provinces.

3.08 A study of the DPW settlements in the Northeast had been carried out by consultants between appraisal and effectiveness, and this report spelled out several pilot improvement activities to be carried out at two representative settlements. In spite of the specific development recommendations provided by this report, implementation of the settlements component experienced a delay of about one year, pending the arrival of two advisors.

Reporting

3.09 Adherence to Bank's reporting requirements showed considerable variation between agencies. PEA regularly submitted comprehensive quarterly reports filled with statistical tables and work progress summaries. ARD provided copies of their design and construction supervision consultants reports on a regular monthly basis throughout the approximately two year consultancy period and similar quarterly reports on an irregular basis thereafter. DAE also supplied copies of their civil works design and construction supervision consultants monthly and quarterly reports to the Bank, supplemented by short general summaries of agricultural conditions and extension progress within the project area on a monthly basis. DOA provided annual summaries on research activities which showed a considerable improvement in quality through the four year life of that component, while DPW submitted very informative quarterly reports to which their consultants made substantial contributions.

3.10 In general, reports compiled by, or with the assistance of consultants, were of higher quality and more candid than those produced solely by agency staff, in part because of unfamiliarity with the English language.

3.11 Project completion reports were submitted by ARD and PEA covering rural roads, road maintenance, village water supply and rural electrification. These reports were useful, but all of them especially those prepared by ARD, could have been much more valuable as ex post project evaluation documents had the agencies been provided with more detailed guidelines by the Bank. More useful, relevant and readily comparable data could then have been generated with the same amount of effort.

Costs

3.12 Project cost was US\$51.70 million as compared with an appraisal estimate of US\$45.06 million. An aggregate cost overrun of US\$10.6 million for the ARD components, mainly on account of the delays in road construction (para 3.18), was offset by aggregate savings of US\$6.7 million in the research and extension components (paras. 4.10 and 4.11). The electrification component performed close to appraisal estimate, while the settlements component exceeded projections by US\$1.7 million.

3.13 In the event, the RTG provided US\$31.7 million, some US\$7.6 million more than planned at appraisal. The Bank loan totalled US\$20.03 after US\$0.97 million of the US\$21 million loan was cancelled.

**Table 2: ACTUAL PROJECT COST SUMMARY
(US\$'000)**

| Agency | Component/Item | Appraisal estimate | Actual | | |
|--------|--------------------------------|--------------------|---------------|---------------|-----------------|
| | | | RTG | Bank | Total |
| ARD | Civil works | | | | |
| | (a) Access roads | | 12,060 | 7,849 | 19,549 |
| | (b) Water supplies | | 8,258 | - | 8,258 |
| | Vehicles, equip. and materials | | 420 | 5,113 | 5,533 |
| | Consultants | | 248 | 1,584 | 1,832 |
| | Administration | | 2,394 | - | 2,394 |
| | Subtotal | <u>27,000</u> | <u>23,380</u> | <u>14,186</u> | <u>37,566</u> |
| PEA | Civil Works | | 501 | 201 | 502 |
| | Vehicles, equip. & materials | | 2,282 | 3,399 | 5,681 |
| | Admin. including force account | | 1,848 | - | 1,848 |
| | Subtotal | <u>7,000</u> | <u>4,431</u> | <u>3,600</u> | <u>8,031 /a</u> |
| DOA | Civil works | | 171 | 133 | 304 |
| | Vehicles & equipment | | 87 | 532 | 619 |
| | Technical assistance | | - | 278 | 278 |
| | Operating costs | | 568 | - | 568 |
| | Subtotal | <u>5,900</u> | <u>826</u> | <u>943</u> | <u>1,769</u> |
| DAE | Civil works | | 722 | 188 | 910 |
| | Vehicles & equipment | | 78 | 420 | 498 |
| | Consultants & training | | 17 | 97 | 114 |
| | Operating costs | | 229 | - | 229 |
| | Subtotal | <u>4,300</u> | <u>1,046</u> | <u>705</u> | <u>1,751</u> |
| PWD | (Inclusive cost) | <u>860</u> | <u>1,990</u> | <u>594</u> | <u>2,584</u> |
| | Total | <u>45,060</u> | <u>31,673</u> | <u>20,028</u> | <u>51,701</u> |

/a \$6,967,000 is cost net of interest during construction.

Procurement

3.14 Difficulty was experienced in the early years with equipment procurement by all agencies except PEA. Engagement of consultants and appointment of civil works construction contractors also gave rise to many problems, due to unfamiliarity with Bank procedures and lack of experience in dealing with consultants on the part of most agency staff.

3.15 All agencies encountered problems in adjusting to Bank requirements for international competitive bidding (ICB). Language difficulties contributed to this problem, but RTG insistence on local procurement regulations being followed in the case of ICB, although they were contrary to Bank guidelines, were in part responsible for initial delays. These problems were common to several Bank projects in Thailand under implementation in the mid-1970s. They have since been largely overcome by the issuance of revised RTG instructions for ICB. Translation of the Bank procurement guidelines into Thai also benefited procurement processing in the final years.

3.16 Procurement of well drilling equipment by ARD encountered long delays, amounting to almost three years, first because of disagreement over technical specifications on the part of the ARD evaluation committee which led to a retender, and second, because of disagreement in acceptability of the lowest bidders offer which was subsequently withdrawn, and finally, because of the need for modifications to the equipment by the contracted supplier before acceptance.

3.17 Disagreement between borrower and Bank over specification for motorgraders led to a compromise with an equal number of 80 and 125 horsepower models finally being procured.

Disbursement

3.18 Several procurement problems in the early years, particularly concerning well drilling and road maintenance equipment by ARD caused disbursements to fall behind appraisal estimates. Termination of the road design and construction supervision consultants by ARD halfway through the third year of the project further delayed disbursement for the roads components.

Table 3: SCHEDULE OF LOAN DISBURSEMENTS

| IBRD FY | Cumulative (US\$ million) | | Actual as % of appraisal |
|---------|---------------------------|---------|--------------------------|
| | Appraisal estimate | Actual | |
| FY76 /a | 0.1 | 0.0 | 0 |
| FY77 | 0.9 | 0.8 | 89 |
| FY78 | 8.5 | 3.3 | 39 |
| FY79 | 16.0 | 8.5 | 53 |
| FY80 | 20.0 | 12.5 | 62 |
| FY81 | 21.0 | 16.0 | 76 |
| FY82 | | 18.3 | 87 |
| FY83 | | 18.6 | 89 |
| FY84 /b | | 20.0 /c | 95 |

/a Loan was declared effective 06/28/76

/b Project completed 09/30/83

/c Final disbursements 08/03/84

Performance of Consultants, Contractors and Suppliers

3.19 **Consultants.** A local firm of road design and construction supervision consultants engaged by ARD performed well until their contract was terminated by ARD in November 1979. Termination was based on alleged irregularities on the part of certain ARD staff and the consultant over construction contracts supervised by the consultants. A Criminal Court in December 1981 acquitted the defendants of all charges.

3.20 Road maintenance and well drilling consultancy services, provided by a foreign firm in consortium with the road consultants (para. 3.19), were of a high standard.

3.21 Individual consultant advisors for upland crops research (DOA) and Settlement Planning and Development (DPW) gave excellent service in their respective fields.

3.22 **Contractors.** Relationships between ARD and the first three road construction contractors became very strained in the months preceding the termination of the road consultants contract (para. 3.19). Charges of inadequate work performance and counter charges of delayed payments led to several court actions which in some cases took years to resolve. ARDs unwillingness to accept several completed roads under dispute led to their deterioration due to lack of maintenance. The situation was being rectified at the time of completion review. In retrospect it appears that many of ARDs problems in the early years arose through unfamiliarity in dealing with consultants and contractors and reluctance on the part of some senior ARD staff to accept the Bank's conditions regarding contractual arrangements for design and construction as an alternative to the traditional force account approach.

3.23 The crisis was resolved at the end of 1979 when the Bank agreed to direct supervision of contractors by ARD and to splitting of the outstanding road construction tasks into smaller contracts, which had the effect of opening up the bidding to a larger number of competent local firms.

3.24 Suppliers. The only serious problem attributable to suppliers arose in the case of percussion drill rigs, which initially did not perform to specifications. Modifications carried out by the manufacturer after delivery led to final acceptance within a few months.

IV. OPERATING PERFORMANCE AND IMPACT

4.01 Village Access Roads. Once the procurement and consultant relationship problems (paras. 3.14-3.17 and 3.19) were overcome in the fourth year of implementation, ARD performance in road construction supervision was good, as evidenced by the good construction standard of completed roads and by the timely completion of several roads often earlier than was foreseen in the contract. Annex 1 provides further details concerning engineering aspects.

4.02 Road Maintenance. The road maintenance component successfully demonstrated ARDs ability to upkeep their inventory of roads in the four target provinces according to a flexible program which took account of traffic volume and prevailing road conditions. Experience with this component has demonstrated that the present combination of annual and periodic budget allocations for road maintenance may be insufficient and could be leading to a steady deterioration of the road network which causes funds and equipment time to be diverted from routine maintenance to emergency repairs to the laterite surfacing. Each maintenance unit is thus presently maintaining only about 150 km annually instead of the 250-300 km that could normally be maintained by such equipment.

4.03 Operating experience has shown that the 80 HP motorgraders (para. 3.17) have not proven fully satisfactory, being able only to handle light grading work.

4.04 Village Water Supply. The medium sized percussion rigs performed satisfactorily and much superior to the older, larger drill rigs previously used, while the two bucket augers proved to be exceptionally well suited to the conditions and were found to have a capacity at least double the appraisal expectations.

4.05 Maintenance of wells is a problem. ARD has only recently announced the start of a training program in handpump maintenance for its field social workers, who would also be provided with basic tools and spares. Also, there is little evidence of village participation in the well and handpump maintenance system, as per covenant 3.06 (b) in the project loan agreement. Instead, ARD provincial offices are responsible for preventative maintenance and repair, operating through mobile maintenance units in charge of about 50 wells each. Budget restrictions delay the deployment of these

units, which are able therefore only to carry out repairs after breakdowns have occurred.

4.06 Present annual cost of maintenance of the locally manufactured handpumps installed by ARD is B 2,500 per pump, and should be considered very high if compared to the cost of B 3,800 for a new pump. Fifty percent of the above cost is represented by spare parts, some of which, like the piston cups, have a maximum life of six months. ARD should consider using higher quality parts, imported if not available locally, to reduce maintenance cost and prolong the repair-free life of the pumps.

4.07 In spite of the maintenance problem, the component was definitely successful in helping to solve the critical water shortage during the six month long dry season in some 2,000 villages of the Northeast.

4.08 Experience has shown that acceptance by villagers of water from deep wells for drinking purposes is generally limited, due to its high chemical content in salts and iron. This water is however used for bathing and laundry and allows a reduction in the draw of water from shallow wells that are preferred for drinking purposes. Arising from this experience, consideration is being given to wider use of shallow wells, dug with the aid of bucket augers, which in most areas provide an adequate supply of water at considerably lower cost.

4.09 Rural Electrification. PEA electrified 338 (98%) of their target villages by the estimated appraisal date of 1978, and thereafter electrified an additional 140 villages in 1980, for a final achievement of 478 villages, 38% above original target. The increased target in part resulted from early construction of the main distribution system financed from other sources, but nevertheless represents a commendable achievement. PEA was able to adapt readily to international competitive bidding procedures, and expressed considerable satisfaction with that approach because of the increased competition from reputable international suppliers and the keen pricing of quality products which resulted.

4.10 Upland Crop Improvement. The investment in research under this component can be described as modest when compared with the problems of agriculture in Northeast Thailand. Nevertheless, and in large part thanks to an unusually talented consultant, this component succeeded in laying the groundwork for a cropping systems research program which is being further developed under the bank-assisted National Agricultural Research Project. Local costs for this component were over-estimated at appraisal.

4.11 Agricultural Extension. This component underwent a radical reformulation shortly after effectiveness (para. 3.04), when DAE and the Bank agreed to adopt the Training and Visit System of Extension. This approach required a greatly increased cadre of full-time extension agents in place of the part-time farmer foremen originally envisioned. The increased staffing, equipment, accommodation and training costs in the four target provinces were met from the National Agricultural Extension I project, which became effective in September 1977, only 15 months after NERD became effective. This change

resulted in savings of approximately US\$2.5 million, mainly represented by unexpended salary costs of farm foremen.

4.12 Land Settlements. Several innovative pilot projects aimed at increasing settler productivity were introduced through this component. The most successful with settlers on the two target settlements were fish ponds, cooperative marketing and fruit trees, while observational plots of rubber planted on a trial basis have established well and hold considerable promise as a possible new crop in the Northeast, provided latex yields in the next few years are comparable with the initial satisfactory tree growth. An attempt to introduce improved pasture as a basis for livestock development was unsuccessful, while a costly pilot pump and pipe irrigation system, designed by a local consultant, encountered many problems due in part to overestimation of the supply source and installation of an underpowered pump. The economics of this investment, as currently operated, appear extremely unfavorable.

V. INSTITUTIONAL PERFORMANCE AND DEVELOPMENT

General

5.01 An interesting feature of this project was that, contrary to many rural development projects in recent years, it consisted of seven components each implemented independently by the agencies without the need for any high level coordinating committee or secretariat responsible for integration of the separate activities. The project does not appear to have suffered in any way because of the absence of such an inter-agency organizational structure.

5.02 A basic organizational objective of the roads construction and maintenance components was to assist ARD in moving away from its previous policy of constructing roads through force account towards that of making greater use of local consultants and contractors for such works. Staff released from construction activities would then be able to devote more attention to road maintenance works.

5.03 The decision to engage road design and construction supervision consultants, which was favored by ARD management at appraisal, was not welcomed by many ARD staff during implementation, who felt that such assistance was unnecessary. The termination by ARD of the consultants contract gave ARD staff an opportunity to prove their construction supervision ability. ARD now claims to have an annual design capacity for about 2,000 km of standard roads, which is well in excess of their current construction program. The successful implementation of the road construction program in the final three years of the project is evidence of ARD's potential ability to handle a substantial program of access road construction through local contractors in the future without the assistance of consultants.

5.04 Similarly, the road maintenance component has shown that ARD is fully capable of adequately maintaining existing access roads using force account, provided it has the right equipment and an adequate operating budget.

5.05 The satisfactory results of these components should encourage ARD to extend the use of contractors for construction over its whole system and to shift an increasing responsibility for maintenance to force account.

5.06 The water supply component has been successful in solving the critical dry season water shortage in some 2,000 villages in the Northeast, although the potability of the water from the majority of the deep wells has been a disappointment. Any repeater project in this area should give greater emphasis to shallow wells dug with bucket augers, which are considerably less expensive and more likely to produce water of reasonable potability.

5.07 ARD has failed to set up an efficient wells and handpumps maintenance system. A critical review of spare parts quality and greater efforts to involve beneficiaries in the maintenance tasks is recommended.

5.08 The rural electrification component was implemented on time and without any serious problems. The experience provided both PEA and the Bank with the confidence to proceed with repeater rural electrification loans in 1978 and 1980.

5.09 Similarly, the upland crops improvement and the extension components were instrumental in preparing the way for Bank assistance to DOA and DAE in follow on projects for national agricultural research (1981) and extension (1977 and 1980).

5.10 The land settlement component encountered several unpredictable setbacks, including a major incursion in 1978 by Kampuchean-backed forces at one of the settlements which resulted in the loss of lives, destruction of public and private property and a serious decline in staff and settler morale. This was followed a year later by the accidental death of one of the advisory consultants. A final assessment of the benefits from this component would be premature at this time and will depend on the extent to which the more promising outcomes can be replicated either in other PWD settlements or more generally through the Northeast.

Accounting Reporting

5.11 All payments relative to the project were accounted for by the different departments in their respective books of account which were subjected to the same audit checks by the Office of the Auditor General (OAG) that are applied to all Government transactions. Audit reports as called for under the financial covenants in the Loan Agreement (Article IV, Section 4.02 (b)) and the PEA Project Agreement (Article IV, Section 4.02), were provided by OAG to the Bank for ARD components up to end of September 30, 1982; for DPW up to end of September 30, 1981; and for DAE up to end of September 30, 1979. No certified statement or report were produced for PEA or DOA.

5.12 OAG staff explained that their limited compliance with this covenant was due to the serious shortage of qualified auditors who can carry out audits in accordance with Bank requirements.

Monitoring and Reporting

5.13 No provision for input-output monitoring or completion reporting was made in the appraisal report or loan agreement but records of physical progress, with minor exceptions, proved reliable and all agencies prepared completion reports of varying length and complexity. These reports provided useful summaries of progress and the statistical data presented were helpful in preparing this report.

Covenants

5.14 Except for the auditing covenant (paras. 5.11-5.12), and the maintenance and repair of wells covenant (para. 4.05) the borrower complied satisfactorily with loan and project agreement covenants.

VI. ECONOMIC RE-EVALUATION

6.01 Village Access Roads. This component has an estimated rate of return of 10%, compared with the original appraisal estimate of 20%. The lower than anticipated rate of return is largely a result of higher cost, delayed implementation, reduced passenger and commodity transport cost savings and lower agricultural development benefits.

6.02 The recalculated user benefits were derived from road surveys conducted by ARD covering a total of 33 villages located within the influence zones of 15 roads. Agricultural development benefits were reestimated using recent agricultural area and production figures and actual commodity prices paid in the region.

6.03 The appraisal estimates of generated traffic seem to have been fulfilled. Time savings were considerable, and seem to average about one hour per trip.

6.04 In summary, at full project development economic benefits from the roads component were about 60% of the appraisal estimate, largely because the return from cassava development was less than anticipated at appraisal.

6.05 The estimated cost of this component was US\$19.5 million compared with an appraisal estimate of US\$17.5 million, including physical and price contingencies.

6.06 Given the lack of detailed ex post data on comparative passenger and freight transport costs and an accurate estimate of incremental cassava production generated by the project, a sensitivity analysis was made using different values for these variables. Depending on assumed values, the rate of return varies between 8 and 15%.

6.07 Rural Electrification. The ex post rate of return is 26% as compared with an appraisal estimate of 12% largely because of the inclusion of power transmission lines as sunk costs. Sensitivity analyses were done taking into account a lower value of sunk costs (21%) and lower gross revenues (17%).

6.08 PEA was able to extend electrification to 478 villages, rather than the 346 originally estimated. The level of benefits attained several years after electrification of a given village were slightly lower than anticipated because the conversion from diesel-powered rice mills, water pumps and other equipment and machinery was slower than expected. The consumption of power by residential households was greater than expected, but overall, up to 1980, total electrical energy used in project villages was about 70% of the forecast due to the need for pre-existing diesel plant to be fully depreciated before conversion. Nevertheless overall consumption continues to grow rapidly and conversions from diesel powered equipment to electric motors are accelerating.

6.09 Details of the ex post economic reevaluation are given in Annex 2.

VII. BANK PERFORMANCE

Project Justification and Objectives.

7.01 Prepared originally as a rural infrastructure project, the core activities - road construction and maintenance, water supply and rural electrification - were conceptually straightforward and sound, and the passage of time has in no way detracted from the appropriateness of project objectives, which were to improve economic and social conditions in selected villages in the economically backward Northeast. The criteria developed to identify priority villages were practical and continue to be relevant.

7.02 The three smaller, agriculturally oriented components were added at a late stage in the appraisal process, apparently in response to growing concern at that time with the need to find solutions to the intractable problem of raising agricultural productivity in the region. All three components could probably have benefited from more exhaustive preparation and appraisal, but nevertheless produced some useful results, especially in the extension and research components.

Project Content and Scheduling

7.03 The variety of separate components and large number of agencies involved, none of which had any previous experience of Bank projects, made the task of supervision particularly difficult. In overall numerical terms, Bank staff inputs in field supervision on an individual agency basis were quite sparse, particularly in the early years. A gap of 14 months in formal supervision between September 1978 and November 1979, during which time ARD was in serious disagreement with its consultants and contractors, is particularly noteworthy. It reflects in part the Bank's concern at getting drawn into what was judged to be a politically sensitive internal dispute.

Project Implementation and Operating Outcomes

7.04 Delays in procurement and consultant and contractor appointment, which could not have been foreseen at appraisal, seriously affected implementation in the early years and were responsible for cost overruns and a two year postponement of project completion. In other respects the project progressed more or less as anticipated at appraisal.

7.05 Except for a change in division responsibility in early 1981, there was good continuity of Bank staff during supervision. The project could probably have benefited from more frequent or concentrated supervision, especially during the earlier years when progress was very slow on the part of most agencies (PEA was an outstanding exception) and Bank staff advice on procurement and contractual issues could have led to earlier acceleration. Again, in the concluding stage, more intensive efforts by Bank staff to outline evaluation and completion reporting procedures could have led to a more valuable final output. The quality of working relationships between Bank staff and implementing agencies was generally good.

7.06 Higher manpower allocations for supervision of multiagency, multicomponent projects appears justified on the basis of this project experience.

Implications of Project Outcomes

7.07 The Bank contribution was particularly important for offering the prospects (through identification and preparation) and later providing the means (through the loan) for ARD to demonstrate the advantages of engaging contractors for road construction and concentrating its own force account works on road maintenance. The introduction of bucket augers for shallow well digging was a further worthwhile innovation attributable to the project.

VIII. CONCLUSIONS

8.01 The project has been successful in its main objectives of improving economic and social conditions among a cross section of the more remote rural population in Northeast Thailand, including a high proportion of poor farmers. These benefits should continue to accrue indefinitely, provided there is adequate maintenance.

8.02 The low ex post rate of return of 10% for the village access roads component as compared with an appraisal estimate of 20% is due to higher economic costs, delayed implementation and reduced transport and agricultural benefits, whereas the higher ex post rate of return of 26% for rural electrification as compared with an appraisal estimate of 12% is due mainly to the current and projected rapid increase in power consumption.

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NORTHEAST THAILAND RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)

PROJECT COMPLETION REPORT

ARD Village Access Roads, Road Maintenance and Village Water Supply

I. Village Access Roads

Introduction

1.01 This component of the project consisted of the construction of 1,300 km of village access roads under the responsibility of ARD in 13 provinces. One of the aims of the project was to assist ARD in moving away from force account construction of rural roads, a practice it has followed since it was formed in the mid-1960s. The intention, therefore, was to employ consultants for design and construction supervision and to use contractors to build the roads. Delays in the implementation of the component, as detailed hereafter, were the main reasons for two extensions of the loan closing date to September 1982 and September 1983.

Design and Supervision

1.02 Negotiations of consultants fees,^{1/} considered excessively high by the Bank as originally submitted, lasted about nine months and represented the first cause of delay in implementation.

Once at work the consultants proceeded expeditiously and the design of all the roads was practically completed at the end of 1978.

The performance of the consultants in design and construction supervision was excellent, as noted by several supervision missions, and as proven by the good standard of construction of finished roads.

1.03 The unfortunate occurrence of a corruption case in the road component that involved certain ARD officials connected with the project and the consultants led to the termination of TEC/SMEC contract in November 1979.

1/ Thai Engineering Consultants (TEC) mainly responsible for design and construction supervision of the village access roads and Snowy Mountain Engineering Corporation (SMEC) responsible for the road maintenance component. TEC/SMEC contract was later extended to include technical assistance for village water supplies.

Although all the defendants were acquitted later in court cases the events seriously affected the implementation of the village roads component, work on which virtually stopped for more than six months.

In September 1979, ARD notified its decision to carry out construction supervision on force account through its Acceptance Committee; the Bank agreed without major objections, notwithstanding its previous attitude towards ARD capability to carry out such task. During the remaining project implementation period ARD performance in construction supervision was remarkably good as proven by the good construction standard of finished roads and by the timely completion of several roads, often earlier than was foreseen in the contract. The termination of the consultants contract had a negative consequence, however, resulting from a reluctance of ARD staff to accept work approved by the consultants; the resulting delays in payments to the contractors (namely for contracts 1, 2 and 3) led to prolonged legal disputes that were settled only at the beginning of 1984.

Construction

1.04 The actual length of roads contracted for construction was 1,270 km as against an appraisal estimate of 1,300 km; at closing date the construction of 1,222 km had been achieved, the uncompleted balance resulting from some design modifications during construction and some sections not considered completed by ARD because of defective works.

1.05 The delay of two years in the completion of the component was caused by early difficulties related to procurement problems. As recommended by the Bank the first 5 contracts tendered were large (about 150 km each) in the hope of attracting international bids, which however were not forthcoming. It took ARD one full year to award contracts 2 and 3; a few months later the outbreak of the corruption case caused the cancellation of bids for contracts 4 and 5 and brought construction operations to a standstill for more than six months.

1.06 When activity was resumed, and with ARD directly responsible for construction supervision, a shift was made from ICB to LCB for the new contracts. The remaining original 6 contracts were split into 21 smaller ones (40-50 km each) that proved attractive to a number of medium size national contractors.

1.07 The outcome of the new arrangement was very positive and major progresses were achieved in 1981 (Table 1) with about 670 km of roads completed in one year. Timing of award of contracts between August and September 1980, was also particularly helpful as contractors were able thereby to make best use of the major road construction season of December to July. This advantage is shown by the fact that most of the contractors completed their works ahead of schedule. Quality of construction was also very good and gave good evidence of ARD capability of successfully supervising small and medium contractors for road construction.

Maintenance

1.08 The prolonged legal disputes on Contracts 1, 2 and 3 have caused maintenance of these roads to be neglected for several years. On the one hand ARD could not include them in its maintenance budget until officially accepted and on the other hand the contractors refused to extend their maintenance beyond the 12 months contractual period. The disputes have recently been settled and the roads, as reported by ARD officials, will be included in FY85 maintenance budget.

1.09 It was originally foreseen at appraisal that the villagers would contribute labour for maintenance of village access roads. This has not occurred for a number of reasons:

- (a) Social and economic conditions have changed since appraisal;
- (b) Villagers actually maintain only lower standard access roads that only give access to their village and for which no government funds are allocated; and
- (c) Competition of other government sponsored programs, like the "Rural Jobs Creation", that provide a remuneration for works of similar nature, including road maintenance.

Project Impact

1.10 The available data do not allow a complete quantification of all the benefits, as discussed in more detail in the economic reevaluation section of the PCR. The scanty information provided by a sample survey carried out by ARD in the areas of influence of eight project roads shows, however, a positive impact in terms of reduction of travelling time, use of large, more efficient transport vehicles, increase in marketed agricultural production and in general better access to social services, namely health and education.

1.11 The project was only partially successful in promoting a substantial shift in ARD from rural roads design, construction and supervision to the use of consultants and contractors.

1.12 Although the project has provided sufficient evidence that local roads can be efficiently and economically constructed by local contractors, it will still take ARD some time to change its way of operating. ARD management seems in fact reluctant to abandon a system that, even in the present time of limited financial resources, still allows ARD to maintain its role of being the major infrastructure constructor at local level and to make maximum use of its numerous staff and large fleet of equipment. The relative low priority assigned to road maintenance, moreover, represents one more constraint to a major shift of staff and equipment from construction to maintenance operations, as foreseen at appraisal.

1.13 ARD is presently building three types of roads, according to the design standards established in 1976:

- (a) ARD Standard Roads, 6 m. wide, with a laterite pavement layer of 20 cm. minimum thickness;
- (b) Type 1 Village Access Roads, 5 m. wide, with a laterite pavement of 15 cm. minimum thickness;^{2/} and
- (c) Type 2 Village Access Roads, 3 to 5 m. wide, with laterite pavement of 10 cm. minimum thickness.

1.14 ARD Standard Roads are considered as the primary local network, while Type 1 and Type 2 are more strictly village access roads. The present length of Type 1 roads in the Northeast is only about 2,500 km., half of which were constructed under the project, as against a total network of more than 11,000 km. of Standard roads (65 m/sq. km.). At the present time, ARD is placing major emphasis on the construction of Standard Roads, claiming it has not attained yet the target density corresponding to a maximum distance of 10 km. between ARD Standard Roads.

1.15 During the last eight years (1975 to 1983) ARD has designed and built on force account some 5,000 km. of Standard Roads in the Northeast. At present 38 ARD provincial offices, out of the 57 existing in the whole country, are staffed with road design and survey units that can each design about 50 km per year; the headquarters office in Bangkok has an additional capacity of 200 km of road design and survey per year.

Land Settlement Roads

1.16 The project also provided for about 100 km of access roads to be constructed or rehabilitated by ARD in selected PWD land settlement areas. Only 63 km were eventually constructed ^{3/}, but they can be considered sufficient, being complemented by an asphalt road between the southern end of Prasart and the eastern side of Ban Kruat, constructed by the Highway Department for security reasons.

1.17 A total lack of maintenance of these roads since their construction, mainly due to PWD budget constraints is a cause for concern. One possible solution would be to hand over the main arterial roads to the Highway Department and promote some form of settlers participation in the maintenance of the lateral feeder roads.

2/ NERD Project Roads were all constructed with a 20 cm. compacted laterite pavement, as specified at appraisal, without provision for different subgrade soil conditions or expected levels of traffic.

3/ 41 km in Prasart and 22 km in Ban Kruat.

II. Road Maintenance

Introduction

2.01 The purpose of this component was to strengthen ARD's capability to maintain its existing road network in the Northeast. The project provided equipment for 16 maintenance units in the four provinces with the longest length of roads and oldest equipment. The four provinces selected by ARD for the project were Udorn Thani, Sakon Nakorn, Nong Kai and Buriram, with a total road network of about 2,000 km. Consultant services were also included to assist ARD in strengthening its maintenance program.

Implementation

2.02 Early difficulties in compiling the procurement list of maintenance equipment caused delays in the start-up of the component. In addition the specifications for the motorgraders, as originally drafted by ARD, restricted the choice to only one 80 HP model and caused objections from several bidders. Upon Bank insistence ARD agreed to modify the specifications and eventually contracted 8 motorgraders of 125 HP, as recommended at appraisal, and 8 motorgraders of 80 HP. Delivery of the equipment to the four provinces was completed only in 1979 and distributed as follows:

| | |
|--------------|-----------|
| Sakon Nakorn | : 5 units |
| Buriram | : 4 units |
| Udon Thani | : 4 units |
| Nong Khai | : 3 units |

2.03 After some initial difficulties due to misallocation of the equipment (some items were assigned to the general pool and some other items diverted to construction works) maintenance operations progressed regularly. Frequency of routine maintenance on each road was planned according to traffic volume and road condition. For each unit an annual maintenance program was established well ahead and actual performance was monitored and compared to the original plans. Quality of maintenance was generally very good and progress was also very satisfactory as shown in Table 2.

2.04 Production of each unit was on average 175 km. per year, including periodic maintenance (regravelling), with some provinces even attaining 300 km/year of routine maintenance with an average of two gradings. In some instances the limiting factor to higher production was not equipment capacity but rather limited operating budget resources.

2.05 The equipment utilization was also very good, with down time for repairs kept to a minimum, which is evidence of timely and competent preventive maintenance. As reported by ARD, only the smaller 80 HP motorgraders have not proven fully satisfactory, being able only to handle light grading, but having to make a significant number of passes to spread loads of laterite dumped for resurfacing, approximately doubling the amount of time required to spread a given amount of material.

Project Impact

2.06 The satisfactory results of the component should encourage ARD to extend the same system to its whole network, by gradually shifting from road construction activity to increasing responsibility for maintenance on force account.

2.07 In addition to the constraints mentioned in the previous chapter, ARD is handicapped in its road maintenance efforts by financial constraints. The annual allocation, as allowed at present by the Budget Bureau, for routine maintenance of Type I roads is only B 8,000 per kilometer (US\$347/km). This is clearly insufficient in real terms, if compared to the B 7,000/km considered adequate at appraisal in 1975. The problem is further compounded by the negligible allocation of funds for periodic maintenance, which does not allow regravelling to be carried out regularly every five years as recommended by the maintenance plans. The resulting steady deterioration of the network is causing funds and equipment time to be diverted from routine maintenance to emergency repairs to the laterite surfacing; each maintenance unit is thus presently maintaining only about 150 km annually, instead of the 250-300 km that could normally be maintained in comparable conditions.

III. Village Water Supply

Introduction

3.01 This component provided for the construction of about 4,000 tubewells for village water supply, and for the construction and rehabilitation of small dams and ponds in areas where groundwater is unusable. It also provided equipment and technical assistance for ARD's Water Resources Center (WRC) in Khon Kaen to expand its capacity for constructing village water supplies throughout the region.

Procurement

3.02 A modification was introduced at an early stage (before project effectiveness) in the list of equipment required. A review of geological conditions in the area had indicated that the small size percussion rigs suggested at appraisal were not suitable for the local conditions. It was therefore decided, with Bank's approval, to replace the 50 small rigs with 16 medium size percussion rigs, in addition to the 10 units already foreseen.

3.03 Specifications and tender documents for the rigs and two bucket augers were prepared by the consultants; procurement of the equipment was performed by ARD on the basis of ICB. ARD lack of experience in procurement procedures, either for ICB or LCB, represented again a major reason for delays in implementation. While procurement of the two bucket augers did not present major difficulties, the drilling rigs needed to be tendered twice since ARD insisted on conforming to RTG rather than Bank procurement rules. All the rigs were eventually delivered to the Khon Kaen Centre between December 1978 and May 1979.

Implementation

3.04 When the first rigs were delivered ARD found that there were several points which did not meet specifications. The necessary corrections and testing took several months and it was only in November 1979 that the 26 rigs were all operational.

3.05 In the meanwhile the existing 8 large ARD rigs were drilling about 160 wells per year as estimated at appraisal. The bucket augers started to operate in 1978 and the first percussion rigs at the end of 1979; full production was attained from 1980 to 1983, as detailed in Table 3. After the initial difficulties had been overcome all the rigs operated in the field satisfactory and only minor adjustments were required. Some trouble was experienced with the trailers on which the rigs were mounted when towed on some of the very rough access roads to villages, and the suggested solution was to mount them on trucks. Due to budget restrictions this was possible only for the two bucket augers, which resulted in increased efficiency and reliability.

3.06 The appraisal target of 4,000 wells was met, and even slightly exceeded, with a delay of about two years in 1983; in total 3,439 deep wells and 565 shallow wells were dug. In the last four years deep wells were being drilled at an average rate of 26 wells per rig per year but their actual production could have been 50% higher if works had not been frequently delayed by lack of materials and fuel. Also the capacity of bucket augers in digging shallow wells had been estimated too conservatively at appraisal at 50 wells per equipment/year. The actual capacity was at least double this rate and in fact they were used by ARD to dig 375 ^{4/} additional wells during the project period with funds from different sources.

3.07 The surface water development works had been dropped from the component at an early stage upon ARD request. Apparently they had been originally included only under pressure from the previous ARD management but had never been fully approved by the appraisal mission because of the poor performance of the many small reservoirs already built in the Northeast.

Maintenance

3.08 It was recommended at appraisal, and included in Section 3.06 of the Loan Agreement, that ARD would have made arrangements for the voluntary participation of the villagers in drilling operations and in maintenance of the wells and handpumps thereafter. Village water committees should have been set up with responsibility for the protection and maintenance of the well and handpump and should have received tools, spare parts and instructions on repair and maintenance operations.

4/ 144 under irrigation development program.
121 under drought relief program.
104 under rural job creation program.
106 under border security program.

A satisfactory degree of participation was reportedly achieved during well development with the villagers contributing with labour and food for ARD drilling teams. However, ARD has failed until now to set up an efficient wells and handpumps maintenance system that would involve villagers participation. The main reasons can be summarized as follows:

- (a) there is no much evidence of any sort of training given to villagers on simple routine maintenance operations; only recently ARD has announced the start of a training programme in handpumps maintenance for its field social workers, who will be also provided with basic tools;
- (b) preventive maintenance and repairs are the responsibility of ARD provincial offices that should operate through mobile maintenance units in charge of about 50 wells each. Budget restrictions delay the deployment of these units, which are able therefore only to carry out repairs after breakdowns have occurred. Delays in carrying out repairs, caused by work overload during the critical dry season, are misinterpreted by the villagers as typical government disinterest.

3.09 Present annual cost of maintenance of the locally manufactured hand-pumps installed by ARD is B 2,500 per pump, and should be considered very high if compared to the cost of B 3,800 for a new pump. Fifty per cent of the above cost is represented by spare parts, some of which, like the piston cups, have a maximum life of 6 months. Consideration should be given to using higher quality parts, imported if not available locally, to reduce maintenance cost and prolong the repair-free life of the pumps.

Project Impact

3.10 The component was definitely successful in solving the critical water shortage during the six month long dry season in some 2,000 villages of the Northeast.

3.11 The most important aspect resulting from the implementation of this component is that acceptance by villagers of deep wells water for drinking purposes is generally limited, due to its high chemical content in salts and iron; this water is however accepted for household uses and allows a reduction in the draw of water from shallow wells that are by far preferred for drinking purposes.

3.12 Consideration is being given to wider use of shallow wells, which in most areas provide an adequate supply of water at considerably lower cost, i.e. B 8-10,000 for a 6-8 m. shallow well dug by bucket auger, compared to B 70,000 for a tubewell of about 40-50 meters depth.

There is in fact still considerable uncertainty regarding the extent and possible changes in salinity of ground water in the Northeast. In conditions where shallower sources can provide an adequate supply this may be preferable, ensuring supplies of satisfactory quality.

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NORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)

PROJECT COMPLETION REPORT

Roads Construction Program
(kilometer)

| | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | Total |
|----------------------------------|-------|------|------|------|------|-------|---------------------|------------------|-------|
| <u>Project Implementation</u> | ----- | | | | | | | | |
| | | | | | | | 1st -Extension - | 2nd Extension | |
| <u>Village Access Roads (km)</u> | | | | | | | | | |
| Appraisal schedule | 100 | 400 | 400 | 400 | - | | | | 1,300 |
| Under construction | - | - | 300 | 295 | 654 | 216 | 193 | 130/a | |
| Actually completed | - | - | - | 114 | 14 | 1,014 | 1,097 | 1,222 | 1,270 |

/a Estimated.

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PROJECT COMPLETION REPORT

Roads Maintenance Program
(kilometer)

| Fiscal Years (October 1st to September 30th) | | ARD standard roads | | | Village Access (Type 1) | Total |
|--|--------|--------------------|----------|---------------------|-------------------------------|-------|
| | | Routine | Periodic | Rehabi- litation | | |
| 1979 | Target | 2,610 | - | - | - | 2,610 |
| | Actual | 2,196 | - | - | - | 2,196 |
| | % | 84 | - | - | - | 84 |
| 1980 | Target | 2,164 | 214 | - | 92 | 2,470 |
| | Actual | 1,683 | 20 | - | 30 | 1,733 |
| | % | 78 | 9 | - | 33 | 70 |
| 1981 | Target | 2,515 | 155 | 15 | 150 | 2,835 |
| | Actual | 2,568 | 139 | 15 | 142 | 2,864 |
| | % | 102 | 90 | 100 | 95 | 101 |
| 1982 | Target | 2,335 | 328 | 16 | 381 | 3,060 |
| | Actual | 2,299 | 342 | 16 | 193 | 2,820 |
| | % | 98 | 95 | 100 | 51 | 92 |
| 1983 | Target | 2,505 | 240 | 20 | 404 | 3,166 |
| | Actual | 2,477 | 209 | 2 | 401 | 3,089 |
| | % | 99 | 87 | 10 | 100 | 98 |

THAILANDNORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)PROJECT COMPLETION REPORTVillage Water Supply Planned and Actual Schedule of Implementation

| Fiscal Years (October 1st to September 30th) | <u>Deep wells</u> | | <u>Shallow wells</u> | | <u>Total</u> | |
|--|-------------------|---------------|----------------------|---------------|--------------|---------------|
| | <u>Plan</u> | <u>Actual</u> | <u>Plan</u> | <u>Actual</u> | <u>Plan</u> | <u>Actual</u> |
| 1976 | 189 | 162 | - | - | 189 | 162 |
| 1977 | 160 | 143 | - | - | 160 | 143 |
| 1978 | 160 | 172 | 50 | 50 | 210 | 222 |
| 1979 | 310 | 274 | 115 | 115 | 425 | 389 |
| 1980 | 650 | 667 | 100 | 100 | 740 | 767 |
| 1981 | 654 | 621 | 100 | 100 | 754 | 721 |
| 1982 | 700 | 700 | 100 | 100 | 800 | 800 |
| 1983 | 700 | 700 | 100 | 100 | 800 | 800 |
| <u>Total</u> | <u>3,523</u> | <u>3,439</u> | <u>565</u> | <u>565</u> | <u>4,078</u> | <u>4,004</u> |
| Additional shallow wells /a | - | - | - | 375 | - | 375 |
| <u>Grand Total</u> | <u>3,523</u> | <u>3,439</u> | <u>565</u> | <u>940</u> | <u>4,078</u> | <u>4,379</u> |

/a Financed from other sources, using project equipment.

THAILANDNORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)PROJECT COMPLETION REPORTEconomic AnalysisTable of Contents

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PROJECT COMPLETION REPORT

Economic Analysis -Village Access Roads and Rural Electrification

1. Overview. Although the project consisted of seven discrete components, economic rates of return were calculated at appraisal for only two components - Rural Roads and Rural Electrification. In terms of cost these were the two largest and the ones for which economic benefits could be most feasibly quantified. In this re-evaluation ex post rates of return were calculated for the same two components whereas the evaluation of the others is done largely in qualitative terms.

2. At appraisal the rate of return for the rural roads was 20% and for rural electrification 12%. The ex post rates of return were 10% for rural roads and 26% for rural electrification. Several additional sensitivity analyses of the rural electrification component were done taking into account sunk costs and lower gross revenues.

3. The lower-than-anticipated rate of return on the roads component is largely a result of higher economic costs, delayed implementation, reduced passenger and commodity transport cost savings and lower agricultural development benefits, whereas the higher ex post rate of return on rural electrification was due mainly to projected rapid increases in power consumption.

Rural Roads

4. Benefits. Benefits are derived from passenger cost savings for normal and induced traffic, transport cost savings for agricultural commodities, and induced agricultural development. All benefits are incremental and are phased according to the realized progress in road construction. Current values were deflated to 1977 constant values using the CPI for northeastern Thailand.

5. The re-calculated user benefits were derived from "before and after" sample road surveys conducted by ARD in 1980 and 1982, covering a total of 33 villages located within influence zones of 15 roads. Agricultural development benefits were re-estimated using recent agricultural area and production figures and actual commodity prices paid in the region.

6. The build-up of benefits was delayed and stretched out due to delays in implementation.

7. Benefits derived from user-cost savings appear to be significantly less than anticipated at appraisal. It was originally estimated that passenger cost savings would be B 0.17/passenger-km but ex post survey data indicates that savings were approximately B 0.07/pass-km. The reasons for reduced

benefits are not fully understood but are believed to be due primarily to a somewhat optimistic original savings estimate and the unanticipated development of monopoly services on a number of roads whereby more of the user cost savings are retained by vehicle operators. Also, no attempt has been made to quantify either time savings or the improved quality of service in general which has occurred as a result of improved roads. Thus, although passenger cost savings seem to be less than originally estimated, additional unquantified benefits are being generated.

8. The appraisal estimates of generated traffic seem to have been fulfilled. Traffic counts on a sample of roads in four provinces show that on a "before and after" basis, ADT of motorized vehicles increased by about 170%. No passenger counts were made but the survey data shows that more people are travelling more frequently and for a greater variety of reasons than previously.

9. Time savings were considerable, and seem to average about one hour per trip. Unfortunately there is no recent data on frequency of travel which would enable the quantification of time saving benefits.

10. The savings in transport costs for cassava (wet root) were originally estimated to be B 2.0/ton-km. Survey results indicate that the transport cost reduction was B 1.0/ton-km or 50% of the appraisal estimate. The reasons for the reduced margin between "without and with" improved roads are partially due to monopoly transport conditions on a number of alignments. It is also likely that high investment costs for new equipment operating on new roads has also affected the cost spread for the short run at least. The sample of transport costs on unimproved roads is small and thus the current estimate of cost savings is only indicative. Also, the recent cost estimates for transport services do not reflect the improved quality of service, mainly with respect to reliability and frequency of trips. On many unimproved roads motorized cargo transport services were strictly seasonal. The user cost benefits as quantified do not capture benefits arising from year-around access.

11. Agricultural development benefits were derived from induced expansion of the area planted to cassava within the road influence zones. Because cassava is a high-volume, low unit value commodity, all of which is marketed, cultivation is not financially feasible unless the crop can be moved to processing centers at low cost. As production from one hectare is in the range of 10-15 tons, large trucks are needed to move the product from farm to factory. Improved roads enabled the trucks to enter areas suitable for production but where the crop had not been previously grown due to transportation restrictions.

12. At the time of appraisal northeast Thailand was experiencing a cassava boom, with the planted area increasing annually by more than 100,000 ha over a four-year period. It was assumed, apparently, that the expansion would continue unabated and consequently the planted area within the road influence zones was projected to increase from 15,750 ha to 50,000 ha. However, the cassava area in northeast Thailand peaked in 1978 by which time less than 10% of the improved road system had been constructed. In the re-

calculation, the cassava area is estimated to have increased from 15,750 ha to 35,000 ha rather than to 50,000 ha. Without the roads it is estimated that the area would have increased from 15,750 ha to 23,000 ha.

13. Actual cassava prices (1977 constant value) were about 40% higher than the appraisal estimate, thus additional benefits were realized from the incremental area of project-induced cassava.

14. In summary, at full project development economic benefits from the rural roads component were about 60% of the appraisal estimate.

15. Costs. Economic costs were derived from financial costs net of taxes and subsidies (border prices). The analysis was made in terms of 1977 constant prices and includes physical contingencies.

16. The price escalation factors used for civil works were adequate to cover the sharp escalation in costs resulting largely from the second global oil crisis.

17. Implementation. Delays in implementation had an adverse effect on the ex post rate of return.

Rural Roads Implementation
% of Network Constructed

| Year | <u>1</u> 1976 | <u>2</u> 1977 | <u>3</u> 1978 | <u>4</u> 1979 | <u>5</u> 1980 | <u>6</u> 1981 | <u>7</u> 1982 | <u>8</u> 1983 | <u>9</u> 1984 |
|-------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Original estimate | 8 | 28 | 32 | 32 | - | - | - | - | - |
| Actual | - | 1 | 7 | 7 | 20 | 41 | 19 | 4 | 1 |

18. In the original economic analysis it was estimated that by the end of project year five a substantial portion of the road benefits would be realized, but the reality was that only 35% of the road network had been completed by that time. From the standpoint of generating benefits, the implementation delay was about three years.

19. Recalculation of ERR. The assumptions used in the revised analysis are listed below.

- (a) Construction Costs. Actual costs were used, including consultant costs but not administration costs. Current costs were deflated to 1977 constant values. A total of 1,222 km of road was constructed at an average constant 1977 economic cost of B 226,400/km.

(b) Maintenance. Routine maintenance was costed at B 7,000/km beginning the year after construction. Regravelling was carried out every fifth year at a cost of B 30,000/km.

(c) Passenger Traffic.

- average passenger journey length: 2/3 length of access road
- present volume over all roads: 88,000 pass-km
- natural growth: 4% p.a.
- induced growth: 25% in year following construction; thereafter, 4% p.a.
- passenger cost savings: B 0.1/pass-km. The calculation of passenger cost saving is shown in Table 5.

(d) Upland Cropped Area

- Area cropped in Year One: 100,000 ha of which 15,750 ha is under cassava.
- Cassava area increases to 35,000 ha with project and 23,000 ha without project.

(e) Cassava Crop Budget

- Clearing costs of B 1,000/ha for cassava land brought into cultivation
- Average distance to market: 7 km along existing track and 9 km on provincial road.
- Freight-cost saving of B 1.0/ton-km (reduction from B 4.4 to B 3.4) after construction of access road. All savings accrue to farmer.

20. The ERR is estimated at 10% given the lack of detailed ex post data on comparative passenger and freight transport costs and an accurate estimate of incremental cassava production generated by the project, a sensitivity analysis was made using different values for these variables. Depending on assumed values, the rate of return carries between 8% and 15%.

Rural electrification.

21. Benefits. Direct benefits were derived from revenues from electricity sales and indirect benefits were calculated for households, shops, rice-mills, power tools and water pumps based mainly on fuel savings, lower operating costs and longer life. The appraisal rate of return was 12%; an ex post evaluation by PEA showed a rate of return of 26% and sensitivity tests done under this study gave rates of return of 20%, 21% and 17%.

22. The levels of benefits attained several years after electrification of a given village were slightly lower than anticipated because the conversion from diesel-powered rice-mills, water pumps and other equipment and machinery

was slower than expected. The consumption of power by residential households was greater than expected but overall, up to 1980, total electrical energy use in project villages was about 70% of the forecast. Nevertheless overall consumption continues to grow rapidly and conversions from diesel-powered equipment to electric motors are accelerating.

23. In the PEA recalculation of the economic rate of return it was assumed that 95% of the project village residences will be electrified by 1988, compared to around 61% of households initially connected. It was also assumed that by 1995 about 95% of rice mills would be electrified, compared to only 15% which had converted within two years after service had become available. It is largely on the basis of these projections that a rate of return of 26% was obtained.

24. While the rapid increase in residential connections may occur as projected by PEA, as may the residential services demand, the projection of non-residential demand growth may be optimistic, based on past experience.

25. PEA was able to extend electrification to 478 villages, rather than the 346 originally estimated, because 138 km of 22KV 3-phase primary transmission to be financed under the project were already constructed under another project, and the cost savings, about \$1 million, was used for village connections. This is discussed further in the cost section.

26. Costs. The actual project cost \$6.97 million (net of interest during construction) which is reasonably close to the original estimate at appraisal of \$7.2 million.

27. Of the 283 km of 3-phase 22 KV primary transmission line to be financed under the project, 138 km was financed from a different source. The savings thus realized (about \$966,000) was used to extend electrification to an additional 132 villages over the appraisal estimate of 346 villages. The ex post economic analysis undertaken by PEA does not cost the "free" 138 km of primary transmission line. To obtain a more accurate representation of the rate of return on the entire investment required to electrify 478 villages, a rate of return was calculated incorporating the cost of the omitted transmission system. The recalculated rate of return was about 21% compared to the ERR of 26% obtained by omitting partial transmission costs.

28. Implementation. Project start-up was delayed for a year and another delay occurred in 1979.

Implementation
% of Villages Electrified

| Year | <u>1</u> 1976 | <u>2</u> 1977 | <u>3</u> 1978 | <u>4</u> 1979 | <u>5</u> 1980 | <u>6</u> 1981 |
|-------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Original estimate | 42 | 33 | 25 | - | - | - |
| Realized | - | 30 | 41 | - | 29 | |

29. The 1979 delay was mainly due to slow progress in selecting the additional villages to be electrified as a result of savings of transmission line costs. Using 1977 as the base year, project implementation was delayed for one year. Construction was largely completed in three years, as originally estimated.

30. Economic Analysis. PEA undertook detailed financial and economic ex post analyses of the rural electrification component. The financial rate of return was negative and the economic rate of return was 26%. The very low financial rate of return was largely the result of subsidized rates for small residential consumers, who proportionally consumed more project power than was estimated at appraisal. Customers who paid nonsubsidized rates numbered considerably less than anticipated at appraisal.

31. The economic rate of return - 26% - does reflect the actual cost and revenue experience for a 5-year period. The high rate of return seems to be a result of optimistic projections of demand growth in the electrified villages - especially demand by commercial customers who would pay unsubsidized rates.

32. Several sensitivity analyses were run, using the PEA ex post analysis as the base case. These are briefly described below and the net benefit streams are given in Table 7.

- (i) Base Case: reflects actual cost and benefit experience, but future demand projections may be optimistic
- (ii) Gross revenues of base case reduced by 10%; costs not changed.
- (iii) Cost of 138 km primary transmission line, omitted from base case, is included.
- (iv) Transmission line costed, as in (iii) and gross revenues reduced by 10%.

33. The results of the analysis are summarized below:

| | <u>ERR (%)</u> |
|--|----------------|
| (i) Base Case (PEA) | 26 |
| (ii) Gross revenues from (i) reduced 10% | 20 |
| (iii) Full transmission cost included | 21 |
| (iv) Gross revenue of (iii) reduced 10% | 17 |
| (v) Appraisal estimate | 12 |

34. The electrification component rate of return is sensitive to reductions in gross revenues. A cursory analysis shows that a reduction in gross revenues of 20% would reduce the rate of return to around 10%.

THAILAND

NORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)

PROJECT COMPLETION REPORT

Selected Price Indices

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|-----------------------------|------|------|------|------|------|------|------|
| CPI Northeast Thailand | 100 | 108 | 117 | 142 | 160 | 168 | 178 |
| PI Construction materials | 100 | 110 | 135 | 153 | 164 | 170 | 170 |
| PI Machinery and equipment | 100 | 109 | 111 | 121 | 130 | 139 | 143 |
| PI Transportation equipment | 100 | 116 | 126 | 133 | 139 | 145 | 145 |
| PI Diesel fuel | 100 | 102 | 153 | 250 | 285 | 285 | 273 |
| PI Agricultural products | 100 | 102 | 109 | 135 | 148 | 140 | 153 |
| PI World cereals | 100 | 103 | 97 | 107 | 120 | 89 | 99 |
| PI Road construction | 100 | 110 | 130 | 147 | 149 | 149 | 159 |

THAILAND

NORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)

PROJECT COMPLETION REPORT

Cassava Prices (Baht)

| Calendar year | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
|--|------|------|------|------|------|------|------|------|
| Cassava current price (B/ton) | 470 | 370 | 770 | 750 | 460 | 510 | 600 | 770 |
| Deflator <u>/a</u> | 100 | 108 | 117 | 142 | 160 | 168 | 178 | 188 |
| Cassava 1977 constant price (B/ton) | 470 | 343 | 658 | 528 | 288 | 304 | 337 | 409 |

/a CPI N.E. Thailand.

THAILANDNORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)PROJECT COMPLETION REPORTCassava Crop Budget

| | Without | With |
|----------------------------------|--------------|--------------|
| Price; factory (B/ton) /a | 420 | 420 |
| Unit transport cost (B/ton-km): | | |
| proposed road | 4.4 | 3.4 |
| provincial road | 2.4 | 2.4 |
| Total transport cost (B/ton): | | |
| proposed road: 7 km | 31 | 24 |
| provincial road; 9 km | 22 | 22 |
| <u>Total</u> | <u>53</u> | <u>46</u> |
| Average farmgate price (B/ton) | 367 | 374 |
| Yield (ton/ha) | 13.4 | 13.4 |
| Gross value of production (B/ha) | 4,918 | 5,012 |
| Production costs: | | |
| Land prep (tractor) | 713 | 644 |
| Planting materials | 550 | 550 |
| Labor (65 m-d @ B 20) | 1,300 | 1,300 |
| <u>Total</u> | <u>2,563</u> | <u>2,494</u> |
| Net value of production (B/ha) | 2,355 | 2,518 |

/a Average price over development period; 1977 constant value.

THAILAND

NORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)

PROJECT COMPLETION REPORT

Re-calculation of Agricultural Benefits

| Year | Without project | | | | With project | | | | |
|------|-------------------|-------------------------|-------------------------------|------------|-------------------|-------------------------|---------------------------------|------------|--------------------------|
| | Cassava area (ha) | Net production value /a | Land clearing costs B million | Net return | Cassava area (ha) | Net production value /b | Land clearing costs/c B million | Net return | Agricultural benefits /d |
| 1 | 15,750 | 37.1 | - | 37.1 | 15,750 | 37.1 | - | 37.1 | - |
| 2 | 16,065 | 37.8 | 0.3 | 37.5 | 16,200 | 40.8 | 0.45 | 40.4 | 2.9 |
| 3 | 16,400 | 38.6 | 0.34 | 38.3 | 17,250 | 43.4 | 1.05 | 42.4 | 4.1 |
| 4 | 16,700 | 39.3 | 0.3 | 39.0 | 18,600 | 46.8 | 1.35 | 45.5 | 6.5 |
| 5 | 17,000 | 40.0 | 0.3 | 39.7 | 22,500 | 56.7 | 3.9 | 52.8 | 13.1 |
| 6 | 17,400 | 41.0 | 0.4 | 40.6 | 23,600 | 59.4 | 1.1 | 58.3 | 17.7 |
| 7 | 17,700 | 41.7 | 0.3 | 41.4 | 27,800 | 70.0 | 4.2 | 65.8 | 24.4 |
| 8 | 18,100 | 42.6 | 0.4 | 42.2 | 32,100 | 80.8 | 4.3 | 76.5 | 34.1 |
| 9 | 18,500 | 43.6 | 0.4 | 43.2 | 33,700 | 84.9 | 1.6 | 83.3 | 39.9 |
| 10 | 18,800 | 44.3 | 0.3 | 44.0 | 35,000 | 88.1 | 1.3 | 86.8 | 42.8 |
| 11 | 19,200 | 45.2 | 0.4 | 44.8 | 35,000 | 88.1 | 1.3 | 88.1 | 43.3 |
| 12 | 19,600 | 46.2 | 0.4 | 45.8 | 35,000 | 88.1 | 1.3 | 88.1 | 42.3 |
| 13 | 20,000 | 47.1 | 0.4 | 46.7 | 35,000 | 88.1 | 1.3 | 88.1 | 41.4 |
| 14 | 20,400 | 48.0 | 0.4 | 47.6 | 35,000 | 88.1 | 1.3 | 88.1 | 40.5 |
| 15 | 20,800 | 49.0 | 0.4 | 48.6 | 35,000 | 88.1 | 1.3 | 88.1 | 39.5 |
| 16 | 21,200 | 49.9 | 0.4 | 49.5 | 35,000 | 88.1 | 1.3 | 88.1 | 38.6 |
| 17 | 21,600 | 50.9 | 0.4 | 50.5 | 35,000 | 88.1 | 1.3 | 88.1 | 37.6 |
| 18 | 22,100 | 52.0 | 0.5 | 51.5 | 35,000 | 88.1 | 1.3 | 88.1 | 36.6 |
| 19 | 22,500 | 53.0 | 0.4 | 52.6 | 35,000 | 88.1 | 1.3 | 88.1 | 35.5 |
| 20 | 23,000 | 54.0 | 0.5 | 53.5 | 35,000 | 88.1 | 1.3 | 88.1 | 34.4 |

/a Area x B 2,355

/b Area x B 2,518. Benefits phased in one year after road construction.

/c Clearing cost B 1,000/ha

/d Benefits arising from reduced transport costs and earlier and expanded production of cassava.

THAILANDNORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)PROJECT COMPLETION REPORTRe-calculation of Passenger Cost Savings

| Year | Normal traffic ('000 pass-km) | | Normal cost savings /a ('000 B) | Traffic with project ('000 pass-km) /b | | Induced cost savings /c ('000 B) |
|------|-----------------------------------|-------------|--|--|-----------|---|
| | Total | Benefitting | | Total | Generated | |
| 1 | 91,500 | - | - | 91,500 | - | - |
| 2 | 95,200 | 760 | 54 | 95,400 | 190 | 7 |
| 3 | 99,000 | 7,600 | 540 | 100,100 | 1,110 | 39 |
| 4 | 103,000 | 15,150 | 1,080 | 106,000 | 2,950 | 105 |
| 5 | 107,100 | 37,700 | 2,680 | 115,560 | 8,460 | 300 |
| 6 | 111,300 | 84,800 | 6,020 | 131,510 | 20,210 | 720 |
| 7 | 115,800 | 110,300 | 7,830 | 142,290 | 26,490 | 940 |
| 8 | 120,400 | 120,000 | 8,520 | 149,350 | 28,950 | 1,030 |
| 9 | 125,300 | 125,300 | 8,900 | 155,400 | 30,100 | 1,070 |
| 10 | 130,300 | 130,300 | 9,250 | 161,610 | 31,310 | 1,110 |
| 11 | 135,500 | 135,500 | 9,620 | 168,060 | 32,560 | 1,160 |
| 12 | 140,900 | 140,900 | 10,040 | 174,760 | 33,860 | 1,200 |
| 13 | 146,500 | 146,500 | 10,400 | 181,700 | 35,200 | 1,250 |
| 14 | 152,400 | 152,400 | 10,800 | 189,020 | 36,620 | 1,300 |
| 15 | 158,500 | 158,500 | 11,250 | 196,600 | 38,100 | 1,350 |
| 16 | 164,800 | 164,800 | 11,700 | 204,400 | 39,600 | 1,410 |
| 17 | 171,500 | 171,500 | 12,180 | 212,700 | 41,200 | 1,460 |
| 18 | 178,300 | 178,300 | 12,660 | 221,150 | 42,850 | 1,520 |
| 19 | 185,500 | 185,500 | 13,170 | 230,060 | 44,560 | 1,580 |
| 20 | 192,900 | 192,800 | 13,700 | 239,250 | 46,360 | 1,650 |

/a Normal traffic benefitting at B 0.071/pass-km

/b Growth of 25% p.a. in year following construction; otherwise 4% p.a.

/c Generated traffic at B 0.0355/pass-km.

THAILANDNORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)PROJECT COMPLETION REPORTEconomic Analysis
(B millions)

| Year | <u>Passenger cost-savings</u> | | Agricultural Benefits | Total economic Benefits | Total costs |
|------|-------------------------------|---------|--------------------------|----------------------------|----------------|
| | Normal | Induced | | | |
| 1 | - | - | - | - | 11.4 |
| 2 | 0.054 | 0.007 | 2.9 | 3.0 | 32.1 |
| 3 | 0.54 | 0.04 | 4.1 | 4.7 | 21.7 |
| 4 | 1.1 | 0.11 | 6.5 | 7.7 | 53.9 |
| 5 | 2.7 | 0.3 | 13.1 | 16.1 | 106.9 |
| 6 | 6.0 | 0.7 | 17.7 | 24.4 | 58.0 |
| 7 | 7.8 | 0.9 | 24.4 | 33.1 | 19.9 |
| 8 | 8.5 | 1.0 | 34.1 | 43.6 | 10.2 |
| 9 | 8.9 | 1.1 | 39.9 | 49.9 | 10.1 |
| 10 | 9.3 | 1.1 | 42.8 | 53.2 | 18.2 |
| 11 | 9.6 | 1.2 | 43.3 | 54.1 | 12.8 |
| 12 | 10.0 | 1.2 | 42.3 | 53.5 | 10.6 |
| 13 | 10.4 | 1.3 | 41.4 | 53.1 | 9.6 |
| 14 | 10.8 | 1.3 | 40.5 | 52.6 | 13.0 |
| 15 | 11.3 | 1.4 | 39.5 | 52.2 | 18.2 |
| 16 | 11.7 | 1.4 | 38.6 | 51.7 | 12.8 |
| 17 | 12.2 | 1.5 | 37.6 | 51.3 | 10.6 |
| 18 | 12.7 | 1.5 | 36.6 | 50.8 | 9.6 |
| 19 | 13.2 | 1.6 | 35.5 | 50.3 | 13.0 |
| 20 | 13.7 | 1.7 | 34.4 | 49.8 | 18.2 |

Economic Rate of Return: 10%

THAILAND

NORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)

PROJECT COMPLETION REPORT

Economic Analysis: Net Benefit Streams
(Baht '000)

| PEA ex-post (1) | Gross revenue reduced 10% (2) | Transmission fully costed (3) | Transmission costed and gross revenue reduced 10% (4) |
|--------------------|-------------------------------------|-------------------------------------|--|
| (1,406) | (1,442) | (9,960) | (10,000) |
| (30,382) | (31,520) | (32,890) | (34,030) |
| (32,175) | (34,730) | (38,350) | (40,900) |
| 14,654 | 11,480 | 12,030 | 9,460 |
| (16,330) | (19,400) | (17,980) | (21,050) |
| 16,457 | 12,280 | 15,980 | 11,800 |
| 14,475 | 10,270 | 14,080 | 9,870 |
| 18,760 | 13,342 | 18,250 | 12,830 |
| 26,533 | 19,690 | 26,070 | 19,220 |
| 31,424 | 23,030 | 30,920 | 22,520 |
| 37,193 | 27,350 | 36,740 | 26,900 |
| 42,215 | 30,840 | 41,790 | 30,410 |
| 45,831 | 33,550 | 45,460 | 33,180 |
| 46,679 | 33,470 | 46,410 | 33,000 |
| 39,034 | 24,400 | 38,100 | 23,470 |
| 50,412 | 34,540 | 49,790 | 33,920 |
| 59,220 | 41,970 | 58,780 | 41,530 |
| 60,611 | 49,380 | 60,120 | 41,890 |
| 64,208 | 44,700 | 63,710 | 44,400 |
| 69,120 | 48,700 | 68,680 | 48,260 |
| 70,219 | 48,580 | 69,670 | 48,030 |
| 74,484 | 51,540 | 73,820 | 50,880 |
| 81,142 | 56,820 | 80,660 | 56,340 |
| 85,688 | 59,920 | 85,210 | 59,440 |
| 89,146 | 62,050 | 88,650 | 61,550 |
| 92,236 | 64,260 | 92,230 | 63,750 |
| 96,371 | 66,440 | 95,860 | 65,920 |
| 97,754 | 66,270 | 97,120 | 65,630 |
| 103,147 | 64,460 | 102,540 | 69,350 |
| 108,888 | 74,000 | 108,350 | 73,450 |
| ERR: 26% | 20% | 21% | 17% |

THAILANDNORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)PROJECT COMPLETION REPORTRate of Return: Base Case (PEA) Including Transmission Line Cost

| Year | Gross revenues | Investment | OMA | Energy | Total costs | Net revenues |
|------|----------------|------------|--------|---------|-------------|--------------|
| 1 | 0 | 0 | 0 | 0 | 0 | |
| 2 | 360 | 10,020 | 0 | 300 | 10,320 | (9,960) |
| 3 | 11,370 | 42,530 | 440 | 1,290 | 44,260 | (32,890) |
| 4 | 25,510 | 58,790 | 1,730 | 3,340 | 63,860 | (38,350) |
| 5 | 25,710 | 6,920 | 2,890 | 3,870 | 13,680 | 12,030 |
| 6 | 30,740 | 39,600 | 3,570 | 5,550 | 48,720 | (17,980) |
| 7 | 41,730 | 7,970 | 4,390 | 13,390 | 25,750 | 15,980 |
| 8 | 42,060 | 5,380 | 4,870 | 17,730 | 27,980 | 14,080 |
| 9 | 54,180 | 8,150 | 5,210 | 22,570 | 35,930 | 18,250 |
| 10 | 68,450 | 6,470 | 5,520 | 30,390 | 42,380 | 26,070 |
| 11 | 83,970 | 7,210 | 5,920 | 39,920 | 53,050 | 30,920 |
| 12 | 98,420 | 5,240 | 6,300 | 50,140 | 61,680 | 36,740 |
| 13 | 113,780 | 4,450 | 6,670 | 60,870 | 71,990 | 41,790 |
| 14 | 122,830 | 2,830 | 6,790 | 67,750 | 77,370 | 45,460 |
| 15 | 134,070 | 5,300 | 6,990 | 73,370 | 87,660 | 46,410 |
| 16 | 146,260 | 17,160 | 7,160 | 83,840 | 108,160 | 38,100 |
| 17 | 158,730 | 8,360 | 7,740 | 92,840 | 108,940 | 49,790 |
| 18 | 172,500 | 3,330 | 7,800 | 102,590 | 113,720 | 58,780 |
| 19 | 182,300 | 4,910 | 7,950 | 109,320 | 122,180 | 60,120 |
| 20 | 193,060 | 4,910 | 7,980 | 116,460 | 129,350 | 63,710 |
| 21 | 204,250 | 3,170 | 8,410 | 123,990 | 135,570 | 68,680 |
| 22 | 216,400 | 5,940 | 8,730 | 132,060 | 146,230 | 69,670 |
| 23 | 229,400 | 5,890 | 8,960 | 140,730 | 155,590 | 73,820 |
| 24 | 243,180 | 3,320 | 9,150 | 150,050 | 162,520 | 80,660 |
| 25 | 257,700 | 3,360 | 9,300 | 159,830 | 172,490 | 85,210 |
| 26 | 271,010 | 3,380 | 9,486 | 169,500 | 182,360 | 88,650 |
| 27 | 284,810 | 3,420 | 9,640 | 179,520 | 192,580 | 92,230 |
| 28 | 299,350 | 3,450 | 9,810 | 190,230 | 203,490 | 95,860 |
| 29 | 314,870 | 6,160 | 10,020 | 201,570 | 217,750 | 97,120 |
| 30 | 331,880 | 5,410 | 10,260 | 213,670 | 229,340 | 102,540 |
| 31 | 348,910 | 3,550 | 10,460 | 226,550 | 240,560 | 108,350 |

Economic Rate of Return: 21%.

THAILAND

NORTHEAST RURAL DEVELOPMENT PROJECT (LOAN 1198 -TH)

PROJECT COMPLETION REPORT

Summary of ARD Road Building Program /a

| Region | Proposed /b | | Standard roads | | | Type I Roads | | Total Maintained (km) |
|----------------|--------------|---------------|----------------|---------------|---------------------|--------------|------------------|-----------------------|
| | (Roads) | (km) | Built (Roads) | Built (km) | Transferred /c (km) | Built (km) | Transferred (km) | |
| Northeast | 934 | 20,869 | 398 | 10,266 | 1,701 | 2,030 | 109 | 10,486 |
| North | 556 | 12,371 | 171 | 3,789 | 1,131 | 341 | 8 | 2,991 |
| Central & East | 366 | 5,680 | 104 | 1,360 | 44 | 425 | 6 | 1,735 |
| South | 389 | 5,722 | 90 | 1,270 | - | 339 | 9 | 1,600 |
| <u>Total</u> | <u>2,245</u> | <u>44,642</u> | <u>763</u> | <u>16,685</u> | <u>2,876</u> | <u>3,135</u> | <u>132</u> | <u>16,812</u> |

/a Current through May 1984

/b Includes ARD standard and Type I roads.

/c To Highways Department.



MT 1412/ 12431

Office of Accelerated
Rural Development
Sunandha Palace
Ratchasima Road
Bangkok 10300, Thailand

December 13 , 1985

Mr. Yukinori Watanabe
Director, Operations Evaluation Department
East Asian and Pacific Regional Office
1818 H Street, N.W.
Washington D.C. 20433
U.S.A.

Re: Project Performance Audit Report on Thailand
Northeast Rural Development Project
(Loan 1198 T-TH)

Dear Mr. Watanabe,

We are pleased to receive your letter dated October 15, 1985 and the Project Performance Audit Report of Thailand Northeast Rural Development Project (Loan 1198 T-TH). We have reviewed the report and would like to inform you of our opinions as follows:

1. Road Construction

We agreed with the Mission's Report in the case of ERR of the project roads. The reason why the ERR of the roads is less than anticipated was quite clear to the Bank and we want to add that it was mainly due to the policy of our government to minimize the cultivated areas of cassava for more appropriate crops during the project implementation. Then, this indicator can not represent the real benefit. Furthermore, the failure of product selling in foreign market discourages farmers from cultivating. On the other hand, the construction costs as estimated in the appraisal report are lower than the actual construction costs since the costs of R.C bridges and box culverts were underestimated.

2. Village Water Supply

We would like to clarify that the original concept of this component is to solve problems of village water shortage in the dry season where ponds or natural water resources dried out. Deep wells are still crucial in many areas, and serve the purpose. However, The villagers are still accustomed to the habit of drinking water from their own dug wells and their reluctance with the salinity and/or rusty taste deep well water. These problems are being solved by the installation of aerators at the discovered sites together with education to the rural people.

/3. Maintenance.....

3. Maintenance of Wells

We agreed with the Mission's report that the participation of villagers in deep well maintenance may be lower than expectation. Such a situation is widely found in rural areas and is also encountered by other agencies. We are now trying to inspire them to become involved in this activity. Besides, after installation, the deep wells were handed over to the villages and post-cards were distributed to village headmen in order that the damages would be reported to ARD Provincial Office accordingly.

4. Engagement of Consultant

We agreed that the delay of selection of the consultants was mainly caused by the unfamiliar process of selection which we try to proceed in accordance with the guideline procedure of the Bank. We can not accept the idea of personal and political rivalries within ARD as stated in the Report without enough support evidence since rules and regulations have to be strictly observed, and ARD has to proceed any necessary disciplinary measures on apparent deviations.

5. Consultant Services

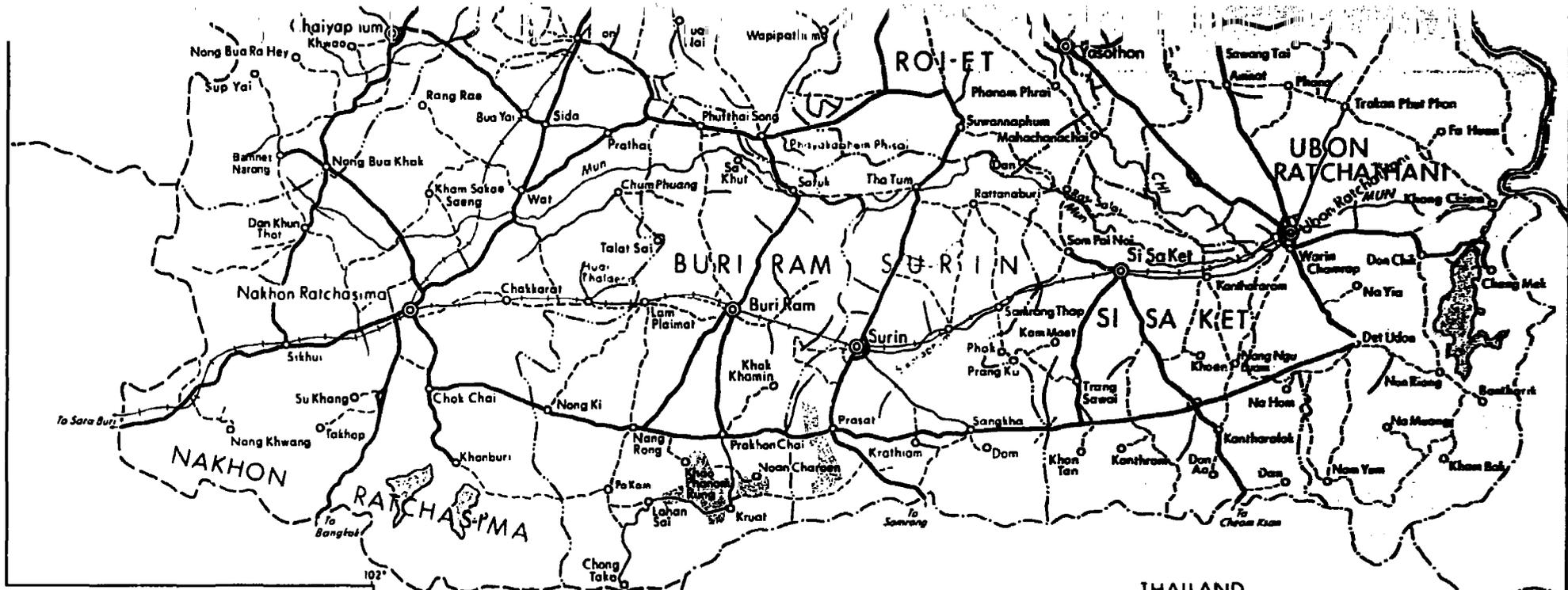
We agreed with the Mission that the Bank's flexibility on consultant services and also close coordination of the Bank on any first project are necessary.

For your final conclusion, we would like to ask for your kind consideration on the facts as explained. We trust that the comments are independant and would be helpful to our future project implementation.

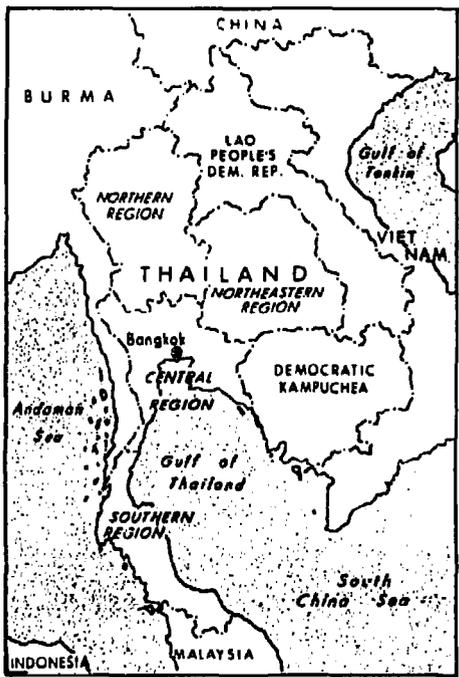
Sincerely yours,



Mr. Dhavae Choorn̄
Secretary General



THAILAND
NORTHEAST RURAL DEVELOPMENT PROJECT
 NORTHEASTERN REGION



CENTRAL REGION
 DEMOCRATIC KAMPUCHEA

This map has been prepared by The World Bank staff exclusively for the convenience of the readers and is exclusively for the internal use of The World Bank and the International Finance Corporation. The denominations used, and the boundaries shown on this map do not imply, on the part of The World Bank and the International Finance Corporation, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries.

- Village access roads components
- Roads maintenance components
- Extension components
- Settlement components
- Existing national highways
- Paved
- Unpaved
- Railways
- Rivers
- Provincial (Changwat) capitals
- Provincial (Changwat) boundaries
- Regional boundaries
- International boundaries

