Thailand

PROJECT EVALUATION: PLAN/MAHASARAKHAM'S

ODA-FUNDED INTEGRATED RURAL DEVELOPMENT PROGRAM

November 1991

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- Hygiene education
  Rainwater Harvesting / water jars
- operation & maintenance
  appropriate tech - peak use dry season
  appropriate installation - sand clogs pumps
  resources for repair.
  cost sharing can be increased — no payment for ...
- Environmental aspect
  ↑ cattle/buffalo production may ↑ degradation

Part of this was water related. It is a good example of community involvement

1 EXECUTIVE SUMMARY

1.1 Background

PLAN-Mahasarakham has been implementing the Integrated Rural Development Program (IRDP) for the last 5 years through the village level project committees. Each committee consists of leaders chosen by the villagers to handle a particular project. The IRDP, which has been receiving grant money from the UK's Overseas Development Agency since FY 1989, covers on-going projects in the health, community development, and resource and skills development sectors. The objectives of the program were defined in the grant proposal as follows:

- to provide families with drinking water jars
- to provide families with water for domestic and farm use by drilling boreholes, digging ponds or constructing weirs and canals
- to improve the nutritional status of children 0-5 years old through nutrition training and school lunch programs, and
- to improve the means of livelihood of the villagers by setting up rice banks, cow/buffalo banks, savings funds, and other income-generating projects.

The grouping of the projects in the grant proposal seemed to have been made primarily for purposes of the grant proposal. Two of the projects (water jars and school lunch) are only indirectly related to the rest of the projects.

The program objective on malnutrition targets 0-5, and does not include school children (over 5 years old) in the target population although the school lunch program is a major component of the IRDP.

For the period FY 89-91, 62% of the project interventions go to PLAN families. The rest benefit non-PLAN families in the same villages. This figure is a rough estimate based on the APR data. PLAN families (6,000 plus) comprise 34% of the total number of families in 114 PLAN villages. The total number of Mahasarakham villages is 1,502.

This Project Evaluation (PE) was requested by the International Relations Department-IH for donor accountability and institutional learning. The PE which was conducted on 1-15 July, 1991 covered the ODA grant years, FY 1989-91 and focused on local resources build-up and institution building as the main ingredients to village development. These 2 ingredients allow the village leaders to continue operating and thereby sustaining the projects with the use of the material resources accumulated and technical skills acquired.

1.2 Project Results

To date, the IRDP has achieved its output targets. For the period, FY 1989-91, the program constructed 2 rice mills, 13 public ponds, 155 boreholes, and established 8 savings fund groups, 19 rice banks and 32 fertilizer banks. Most of the projects have revolving funds used to purchase or increase the units of output such as water jars, cows and buffalos. In FY 1991, 589 jars were purchased and 50 buffalo banks were established.

The water test results show that less than half (43%) of the samples collected were potable (total of 28 samples). This is partly due to the handling and other water use practices of the villagers. Some water jars are not covered.

The PE has identified to date, short term results that include the use of profit shares for other livelihood projects and for food consumption; the supplementary income provided by the agricultural students from their practical study in crop, fish or livestock production; the employment of the vocational school graduates; and the offsprings from the cow and buffalo banks. The expected impact of the water jar project is not fully realized based on the test results but the project has achieved adequacy of water supply. The impact of the boreholes project is affected by the frequent repairs of pumps particularly during the dry season.

O & M

1.3 Sustainability Assessment

The sustainability assessment used 4 indicators: organization, resource mobilization, participation and operation and maintenance. These indicators are directly linked to the local resources and institution build-up.

1.3.1 Organization

The project committees are generally well organized. The committee members include formal leaders (elected local government officials) and are trained to manage specific project types. The interlocking membership of village leaders and the assistance of public school teachers as advisers enhance leadership skills and thereby help develop the committees.

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1.3.2 Resource Mobilization

To date, PLAN contributions are still the principal means of mobilizing resources to start projects. The revolving fund though is potentially the principal means of mobilization as the project continues and when PLAN eventually moves out of the village. Most project committees require counterpart contribution and/or repayments. These are used to establish revolving funds to help continue project operation and increase project output. Rent payments from the cow/buffalo banks are used to

purchase additional animals. This contributes to the accumulation of local resources, thereby enabling the committees to sustain the project.

1.3.3 Community Participation

The IRDP village participation is mainly by representation through the project committee. The villagers choose leaders to form the committee whose task is to plan and implement projects. Direct participation exists in some groups (e.g., women's savings fund, Zone 2 and a number of cow/buffalo banks) which allows villagers to be involved in resolving project issues. This participation of villagers in project activities encourages them to commit resources (time, money, skills) to sustain projects.

1.3.4 Operation and Maintenance

Generally, project committees are still dependent on PLAN's assistance for the operation and maintenance of their projects. The cow/buffalo banks receive PLAN funds during their first 3 years of operation. The costs for repair and maintenance of the boreholes project are still shouldered by PLAN. This reflects on the lack of commitment on the part of the committees to take responsibility on repair and maintenance and also on their capability to mobilize enough resources for continued operation.

O & M

A number of committees though are able to operate on their own after PLAN's initial assistance. This includes the rice mills, consumer coop stores and some savings fund groups.

2 BACKGROUND

Mahasarakham province is situated in the semi-arid north east of Thailand near the Thai-Lao border. It has an area of 5,292.373 square kilometers with the population of 882,506 in 1,502 villages. As with the rest of the country, it has a tropical monsoon climate with 3 seasons in a year: hot season in March-May, rainy season in June-October and cool season in November-February. The main source of livelihood is agriculture, rice being the main crop which is rainfed.

PLAN-Mahasarakham operates in 114 villages in 6 zones. The average number of households per village is 155 and the average household size is 5. A zone supervisor is responsible for each zone and reports to the program department head. The 40 community workers (CWs) handle a caseload of more than 6,000. Refer to Figure 1 for the organizational chart.

The Integrated Rural Development Program (IRDP) in Mahasarakham is an on-going group of projects that began prior to fiscal year 1987 when Mahasarakham program area was split from PLAN-Khon Kaen to become an independent field office. The IRDP covers 3 PLAN sectors: health, community development, and resource and skills development. PLAN implements an integrated approach to agricultural production through fishery, crop and livestock production activities. Figure 2 shows the different projects of the IRDP. Those projects that are enclosed by broken lines are the agriculture projects that are integrated. They serve as factors or inputs of farm production. The weirs, canals and communal ponds irrigate the farm and supply water for the livestock. The buffalo and fertilizer banks provide resources for land preparation (plowing) and crop cultivation. The cow banks are for livestock production and the individual ponds are for fishery and also for crop production. The health projects (water jar project and school lunch program) are indirectly related to the rest of the projects.

The United Kingdom's Overseas Development Agency (ODA) has been providing financial support to the program since FY 1989. Now on its third ODA grant year, the program has a total expenditure of US$628,000 for the period April 1989 - March 1991.[1] The ODA for this period, provided US$244,809 which is 39% of the total expenditure.

3 PROGRAM GOALS AND OBJECTIVES

Below are the objectives of the program as specified in the approved grant in 1989:

a. to provide adequate potable water (2 liters/day/person) for the target population (2,000 PLAN, 1,200 non-PLAN families) within 2 years of enrollment
b. to provide adequate water for domestic use (50 liters/day/person) for the target population (2,000 PLAN, 1,200 non-PLAN families)

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[1] This period covers 2 ODA grant years. The grant year starts in April and ends in March.

c. to reduce malnutrition in children 0-5 years old to level 3 = 0%; level 2 = <5%; level 1 = <15% within 3 years after enrollment (3,200 PLAN, 700 non-PLAN families)

d. to increase disposable income by 5% per year for target families after 2 years of enrollment.

4 PE PURPOSE AND METHODOLOGY

The International Relations Department (IRD) requested for this PE for donor accountability and for institutional learning. This PE focused on the grant years even though the program's activities began earlier than FY 1989 and concentrated on impact assessment and on sustainability assessment of the program. This mid-term evaluation also reviewed the fiscal and program management and the environmental concerns that were specific to the program.

4.1 Project Site Visits (PSV)

The PE Coordinator visited different sample projects and interviewed the project beneficiaries, project committees and CWs on the details of implementation such as repayment schemes, project preparation, resource mobilization, decision-making processes, operation and maintenance, linkages with local organizations, etc. These visits covered all 6 zones. Below are the number and type of projects visited:

School Lunch Programs: 4 schools
Water Jars: 3 villages
Boreholes Project: 4 villages
Rice Banks: 3
Rice Mills: 2
Consumer Coop Stores: 2
Savings Fund Groups: 2
MK Agricultural College
Youth Program: 2 villages
Buffalo Banks: 2
Cow Banks: 2
Fertilizer Bank: 1
Ponds: 4
Public Ponds: 4
Weirs: 2
Cloth Weaving: 2 villages
Silkworm: 1 village

4.2 Review of Project Documents

The PE Coordinator reviewed the FO documents related to the program that include the SAGE report, SPOs, PDOs, APRs, PAFs and others.

4.3 Water Tests

Bacteriological water tests were conducted by the Mahasarakham Provincial Hospital to check if the water from the jars is potable. The program staff collected the water samples from jars with initial assistance by the PE Coordinator. At least 2 villages from which the samples were

collected were taken from each zone. The sample collection though was non-random. The laboratory technician (Ms. Sompit) used the 7-test tube method for the first batch of 8 samples and the 10-test tube method for second (10 samples) and third batches (10 samples) to estimate the MPN of coliform per 100 ml. The Provincial Hospital could only accomodate a maximum of 30 samples. Refer to Attachment 1 for the details of these methods.

5 CENTRAL THEME OF THE PE

The 2 major ingredients to village development are institution building and local resources build-up.

Institution building refers to the FO's efforts to establish and strengthen a local organizational structure (project committee) that will be responsible in carrying out PLAN-initiated projects and eventually village-initiated projects to benefit a target population.

Local resources build-up is the accumulation of resources (monetary, technical/skills, other assets) within the village to be used as inputs to the planning, production (implementation) and/or operation and maintenance of projects and project output.

Each ingredient reinforces the other. While the project committees implement projects to achieve the expected output, the implementation process itself enhances the committees' capabilities to manage projects, thus contributing both to local resources and institution build-up.

These 2 ingredients can be tied to the impact and process goals of the FO as stated in its SAGE Report. Impact goals which are related to local resources build-up include: improvement of economic capability, increase in the level of health and provision of educational support. Process goals which basically refer to institution build-up include: improvement of leadership, improvement of linkages with other agencies, local and external, and maximization of village participation.

The implementation review (including fiscal and management reviews) of the IRDP components was done in terms of these ingredients. The review covered the implementation changes that have been made since the start of the program and used the key question in reviewing each component: Is the project effective in contributing to the build-up of local resources and the project committees?

The PE examined the program output to date and determined the physical infrastructure built (water resources, rice mills), assets accumulated (cows, buffalos), and skills acquired (vocational graduates).

For sustainability assessment, the key question was: Is the project committee capable of providing mechanisms to mobilize resources, train its members, encourage participation in

decision-making, etc.? This assessment used 4 sustainability indicators: organization, resource mobilization, participation and operation and maintenance.

6 IMPLEMENTATION REVIEW OF THE PROGRAM COMPONENTS

Project Committees. The IRDP projects are implemented in the village through the project committees. A project committee is a group of village leaders chosen by the villagers to manage a specific project activity. It consists of a chairman, treasurer, secretary, and other committee members. Each committee usually handles one project but in some cases, it handles 2 or more projects. Formal leaders (elected local government officials) are also chosen by the villagers to be part of the project committee.

Program Design. The group of projects included in the program is not actually integrated as the title suggests. The grouping of these projects apparently was made primarily for grant proposal purposes. What is integrated is the farming approach introduced in the villages that combines fishery, livestock and crop production activities with supplementary livelihood projects such as rice banks, coop stores, etc. to increase household income.

Some of the SPO objectives which are the bases for the project activities are not practically measurable due to the kind of indicators to measure for impact assessment (e.g., 50 liters/day/person for domestic water use, or increase disposable income by 5% per year).

Fiscal Review. Table 1 shows the IRDP budget and actual expenditures for FY 1989-91. The cost overruns and underruns were due to budget modifications during the course of implementation. In FY 1990, under Grain Storage (16.11), part of its original budget was transferred to Animal Husbandry (16.13). Also in FY 1991, under Animal Husbandry, expenditures were incurred more than the budget because the target groups needed more cows and buffalos.

6.1 Health Sector Projects

6.1.1 Water Jar Project

Rain is the main source of drinking water in the PLAN area and the water jar project is implemented to provide rain water containers to households through the purchase or construction of water jars. One jar is given per household. Beneficiaries are selected by the project committee based on the family size (2 liters/day/person), the family's number of existing water jars, and its ability to put up a counterpart fund. PLAN finances the total cost of the jar (600 bahts/unit)[2] and then the household beneficiary pays his counterpart portion (half the unit cost of the jar) to the project committee either

[2] $1.00 = 26 bahts as of July, 1991.

in advance, i.e., before delivery of the jar, or upon delivery. The counterpart payment goes to a revolving fund used to purchase or construct additional jars that have a capacity of 2,000 liters each. A filled up jar supplies drinking water to a family of 6-7 for about 3 months.[3] Based on the project site visits, some project committees use the revolving fund to provide emergency cash loans to village households. These loans are repaid within 10 months with a monthly interest rate of 2% (e.g., Wai Noi village in Zone 7). The committee treasurer collects the payments and keeps the books of account. It is up to the project committee, with the concurrence of the villagers involved in the project, what to do with the fund. Usually the fund is used to get more jars. It seems that the fund is used for other activities when all the target households in the village receive adequate supply of drinking water.

Although the project contributes to asset accumulation, it has a relatively short term life since it is limited to the provision of jars. There is no system operation involved and maintenance (cleaning) is the sole responsibility of the individual households.

6.1.2 School Lunch Program

The program objective in this sector is to reduce malnutrition of children 0-5 years old and does not include school age children, >5 years old although the school lunch program which is the sector's major component in the IRDP targets children >5 years old. Other IRDP activities under this sector include nutrition training for village mothers on appropriate feeding methods and backyard gardening to supplement the family's food stock. These indirectly target children 0-5 years old.

The school lunch program is a project of the Ministry of Education geared towards improving the nutritional status of school children. The school prepares lunch for the children 2-3 days a week for a minimal fee (e.g., 1 baht). Some schools offer free lunch at least one day a week. PLAN supports this activity by donating cows and buffaloes for the school's livestock production which is part of its fund-raising drive. The school raises and sells the cows and rents out the buffaloes and the proceeds from the sale and rent are used to finance its lunch program. Other sources of funding come from the Ministry of Education (for the start-up fund) and from donations by the villagers. Some schools put up a consumer coop store, engage in vegetable gardening, poultry raising, etc. to support this program.

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[3] Each village household has 1-2 existing water jars and the additional jar that it gets from PLAN provides adequate water supply particularly during the hot season (March-May). The 2,000 liter jar supplies 3.2 liters/day/person for a family of 7 for 3 months. This is above the targetted (standard) 2 liters/day/person for potable water. Two jars therefore are enough containers for the supply of rainwater for a family of 7 since it can replenish the water during the rainy season. Using this standard requirement, a family of 7 needs 5,040 liters a year or 2.5 water-filled jars.

Thrice a year, the teachers weigh and measure the children to determine if there have been improvements in their nutritional status. This is a requirement by the Ministry.

This project is not a direct (supervised) project of the FO, although the CWs visit the schools to check on the project. The FO has a stake on the project since the school children partly come from PLAN families and PLAN contributes to fund drives.

The schools that implement lunch programs do not submit regular reports to PLAN about improvements of weights of school children, any increase in the number of week days that lunch is served, status of their cow/buffalo raising, etc. The CWs have to go to these schools to collect such data when PLAN needs them. Regular reporting is necessary for monitoring and evaluation purposes. This is also for general accountability purposes -- to determine the financial exposure of PLAN to projects handled by groups other than the project committees.

6.2 Community Development Sector Projects

6.2.1 Leadership Training

This project aims to improve the leadership abilities of village leaders particularly the project committee members. The activities under this project consist of training and field exchange visits to villages where development projects are successful. These activities are carried out with the involvement of other NGOs, government agencies, monks, and others. Topics include project planning and implementation of PDOs, administration of PDO funds, accounting skills, concept of self-reliance, cooperative management, networking among villages, etc. This project is closely linked with a specific project type, e.g., training of a savings fund group or field visits of a cloth weaving group.

There is no documentation on how the FO measures the training effectiveness. The project staff referred to successful group projects as those which have been in operation for a number of years where profits are achieved and benefits are provided to the members, etc.

This project enhances the project committee's organizational skills which add up to institution building.

6.2.2 Coops/Credit Union

6.2.2.1 Consumer Cooperative Store

PLAN's role in this project is limited to the training of the committee members handling the store, and to financial assistance in the construction of a store

building. This training is conducted through field trips to villages with successful consumer cooperative stores. PLAN usually does not finance for the stock of merchandise.

Each member deposits a share or number of shares which are used to buy the merchandise. At the end of the year, the profits are distributed to members and each store sets its own profit sharing[4]. In Sok Klong village in Zone 2, the profits of the consumer cooperative store are distributed as follows: 40% goes to the common fund, 45% is equally distributed to the members, 10% is distributed to the members based on the number of shares and the total value of purchases for the year, and 5% is equally distributed to the 4 village auditors.

This coop store in Zone 2 illustrates the use of the profits to increase the common fund (40% of the profits) and to maintain the local technical resources (auditors).

6.2.2.2 Savings Fund

The purpose of forming a savings fund is to make available to village households an alternative credit source with a relatively low interest rate. This is to supplement their budget for their individual livelihood, farm or livestock projects.

Member requirements for the savings fund vary from one fund group to another. In Sok Klong village in Zone 2, the women's savings fund which was formed in January, 1991 requires its members to deposit at least 10 bahts per month with a member share (initial deposit) of 100 bahts. The maximum loan is 3,000 bahts with a monthly interest of 3% payable within 3 months. A guarantor is required for any loan application. Interest income is intended for the establishment of a buffalo bank. PLAN donated 10,000 bahts to finance the training of the committee members and for the production (printing) of savings books and manual. The training consisted mainly of field trips to a village/s with successful savings fund. The 7-member committee handles the fund and is composed of a president, vice-president, treasurer, secretary and 3 members. A volunteer consultant or adviser provides technical assistance. This adviser is either a commune (tambon) official or a public school teacher.

In Ban Huanathai village in Zone 2, an older savings fund formed in September, 1988 by an all male membership, is managed by a 15-member committee. The

[4] The field trips introduce the project committee to the profit distribution patterns of other villages. The local technical resources (e.g., public school teachers) and the CWs assist the project committee in determining the particular terms of distribution that it is going to adopt.

committee meets every month and a general membership meeting is set twice a year. Initial member deposit is at least 10 bahts and maximum deposit is 300 bahts. There is no requirement for a monthly deposit. The maximum loan is 500 bahts with an interest rate of 3% per month, payable within 5 months. Interest income or profits are distributed as follows: 50% equally distributed to members, 25% distributed based on the member's actual number of shares or amount of deposits, 10% for committee salary, 10% for the savings fund and 5% for operating costs.

The fund money is not deposited in a bank. Repayments are immediately loaned out.

There is a 98% repayment level for this Ban Huanathai savings fund. Membership increased from the original 100 in 1988 to 181 in 1991. Initial fund was 1,350 bahts and as of 8 July, 1991, the fund increased to 151,619.20 bahts.[5] The committee intends to integrate all the revolving funds of other projects such as those of the buffalo bank, rice bank, rice mill, etc.

6.2.2.3 Fertilizer Bank

Fertilizer is an input of production to increase farm yield. This project is implemented to give bank members access to low priced fertilizer. Each member has to deposit at least one share valued at 100 bahts. The fertilizer bank committee buys fertilizer in bulk at a wholesale price and then resells it to members at a price lower than the prevailing market price but the sale ensures a profit margin. Members pay for the fertilizer within a year without interest. Profits are then distributed among the members (70%) and a portion (30%) is retained in the bank as retained earnings (e.g., Ban Huanathai fertilizer bank, Zone 2).

The FO has been encouraging fertilizer banks to use more of organic fertilizer and has cut off assistance to those which use chemicals.

especially if drug is available!

[5] This amount which is relatively high refers to the total fund loaned out plus the interest payments due. The PE Coordinator was not able to ask how this large fund was earned since only 10% of the profits are taken as retained earnings. Does this fund include PLAN contributions provided during the 3-year period? Does this already include repayments from other projects?

6.3 Resource and Skills Development Sector Projects

6.3.1 Grain Storage (Rice Bank)

The rice bank is mainly used as a food stock from which bank members can borrow (or buy) for home consumption payable in rice or in cash with a 20% interest per year. Each member is required to deposit 10 buckets of rice although a member can already borrow even with a deposit of a bucket of rice (1 bucket = 9 kg. = 28-30 bahts). Other rice banks loan out rice as seedlings for planting. Rice banks have specific loan periods that lasts from 5-7 months in a year, usually during the planting and harvest months.

6.3.2 Animal Husbandry

Members to a buffalo or cow bank are those who are most in need of working animals for the farm. Membership varies among different banks. Some charges membership fees, others do not.

6.3.2.1 Buffalo Bank

The buffalo banks have either a rent (only) scheme or a rent-to-purchase scheme. In the first scheme, rent only, the buffalo bank member borrows a mother buffalo from a bank committee for farm use. He pays a yearly rent of 1,000 bahts plus an interest of about 3 buckets of rice or cash equivalent (roughly 8.5% per year). When the mother buffalo produces an offspring, he keeps the offspring, and returns the mother buffalo to the committee when the offspring is old enough for farming (4 years old). A buffalo has a work life of 20 years and a mother buffalo can produce an offspring every year. The renter has to give the additional offspring to the project committee. In the other scheme which is rent-to-purchase, the yearly rent for 5 years is considered an installment for the purchase of the mother buffalo which costs 5,000 bahts. When the buffalo produces an offspring, the offspring is included in the purchase with an additional payment of about 2-3,000 bahts which is the value of an offspring.

The yearly rent goes to the revolving fund used to purchase additional buffaloes or in one village, used to open a rice bank.

This is a clear example of asset accumulation, renters being able to own the mother and keep the offspring, and that repayments are used to purchase additional buffalos.

$$
\begin{array}{r}
576 \\
26\overline{)15000} \\
130 \\
\hline
200 \\
182 \\
\hline
180 \\
\end{array}
$$

6.3.2.2 Cow Bank

A cow bank is similar in concept to the buffalo bank, the only difference is that cows are primarily intended for livestock production not as input for farm production, i.e., not for plowing the fields.

The project committee selects the poorest households as cow recipients. They first prepare a shortlist of villagers and then choose from this shortlist the actual recipients. In Zone 1 (Leung Fack and Non Somboon villages), the cow and buffalo banks require members to pay a membership fee, 50-100 bahts each. These fees are used to purchase cows and buffalos in addition to PLAN's donation. Members form themselves into small groups. Each group which consists of about 6 members choose from among them the first recipients of cows or buffalos. Whenever there is available cow or buffalo returned or purchased, the group selects again for the next recipient/s.

6.3.3 Irrigation (Borehole Project)

The boreholes are for non-potable domestic use and for supplementary agricultural water supply. These are implemented either for a group of households (communal) or for an individual household. PLAN finances the drilling and installation of pumps which are contracted out with the local agency, the Promotion of Appropriate Technology.

$60-80

For boreholes intended for individual households, 10-17% of the unit cost is repaid to the project committee. The specific rate is decided by the villagers. The unit cost is about 15,000 bahts excluding labor (Wai Yai village, Zone 7). There is no repayment for communal boreholes.

$580 USD

In Zone 6, there were 3 male villagers (technicians) trained to operate the simple rotary drilling machine which PLAN purchased for drilling boreholes. PLAN pays each technician, 1,800 bahts per month for drilling activities and installation of pumps. These drillers are currently working only in Zone 6 where the groundwater situation is not erratic compared to other zones particularly in Zone 3. There is great possibility of extending this drilling to other zones since this machine is the second unit that PLAN purchased. The first drilling machine was purchased for the now phased-out Zone 4 (Kalasin) where it is still being used today. This simple drilling job can be sustained if the project committee which keeps and maintains the machine is able to shoulder the maintenance costs on its own. PLAN still allocates budget for its maintenance expenses. The drillers can also get job contracts from non-PLAN areas if there is no available contracts in PLAN area.

Possibility of unreliable source

In villages where the ground water level is low, frequent repairs of the hand pumps are required due to frequency of use particularly during the dry season. During the dry

Technology must be adapted to scale use.

24
15
120
240
360

65
3
195
120
3900
19500
23400

120
65
600
720
1320
3
3960

season, some pumps are repaired (replacements of rubber rings) twice a month. Also, about twice a year, the boreholes are repaired or cleared of sand particles that enter and block the water from the pipes. These repairs are done by the villagers themselves but the spare parts are provided by PLAN, not by the village group or committee that handles the borehole project (Zone 5).

Poor INSTALAT or INAPPROP TECH ?

Why?

6.3.4 Pond Project (Fishery)

This is the more prevalent type of water project implemented due to the groundwater condition in the PLAN area. There are 2 types of pond: the small individual pond and the large public pond. Both types have 2 purposes: for fishery and for supplementary agricultural water supply. The small individual pond is about 12 x 15 meters in size and 2 meters deep while the large public pond can extend to 65 x 120 meters in size, 3 meters deep with a water capacity of about 10,000 cubic meters. The small individual ponds cost 5,000 bahts each, the cost solely for the mechanized digging done by a contractor. PLAN pays for the digging through the project committee and the household benficiary pays back the committee by installment: 1,000 bahts plus 3% per year for 5 years.

360 m^3

23,400 m^3

Fish ponds operate only half of the year during the wet season, ponds being dependent solely upon rain water. Farmers provide fingerlings for their fish ponds and they plant vegetables and fruit trees around the ponds. Some group projects are implemented to set up a fish hatchery where members can purchase fingerlings.

The public ponds are mainly used for farm and non-potable domestic use. The users or beneficiaries are those households that reside near the pond. They are not required to pay back for the construction of these ponds. Maintenance of these public ponds consists only of cleaning its surroundings and maintaining the fence to keep stray animals away from the water.

6.3.5 Grain Mills (Rice Mill)

The rice mill is one of the livelihood projects initiated by the village people to increase their daily income. The mill is formed through membership shares. Each share costs 50-100 bahts.

The rice mill committee manages the daily operation. The mill is open 7 days a week, at least 8 hours a day. A mill operator is paid a regular wage.

At the end of each period (annually or semi-annually), the profits are shared by members. In Leung Fack village, Zone 1, the profits are divided into: 50% equally distributed by the members, 40% distributed based on the member's total number of kilograms milled for the year, and 10% for maintenance. In Ban Huanathai village, Zone

2, 30% of the profits go to maintenance, 12% is equally distributed to members, and 58% distributed according to the total number of kilograms milled for the year by each member.

This mill in Zone 2 which is older puts more of its profits to maintenance (30%) than that of the new one (10%, Zone 1). This may be due to the deterioration of the equipment. This variation in the distribution of profits shows that what works in a particular village does not necessarily work in another. Zone 2 mill tends to encourage its members to have more kilos of their grains milled because it gives them more profit shares (58%). It gives them only 12% as equal distribution. Zone 1 mill apparently has a more equitable distribution with 50% of its profits equally given to members and a slightly lower share (40%) for the number of kilos milled per member.

The rice mills do not charge for the milling but keeps the rice bran and other by-products which are sold to villagers. For every 3 buckets of rice grain (30 kg) milled, the mill gets 1 bucket of rice bran (7 kg) which is worth about 14 bahts. The Zone 2 mill normally operates on a 24,000 kilos of rice milled per month which yield about 800 kilos of rice bran valued at 11,200 bahts. During the harvest months, the total number of rice kilograms milled per month is higher. These cover for the operation costs and profits shared.

6.3.6 Agricultural Training

6.3.6.1 Mahasarakham Agricultural College Youth Program

This youth program of the Mahasarakham Agricultural College which started in 1988, combines the curriculum of a vocational school and that of the secondary or high school, and covers 5 school years including summer classes. The course is divided into 2 parts: the classroom or theoretical study (1 day/week) and the field or practical study (4 days/week). Under the practical study, each student is given the choice of a specific farm or livestock activity he has to work on. Refer to Attachment 2 for the 5-year course outline. PLAN allocates a sum of 10,000 bahts per student for the 5-year course, about 2,000 bahts each year.

PLAN started to send youth from PLAN area in FY 1990 as part of its training program. Four zones (3, 5, 6 & 7) are involved with 153 students in the program as of 11 July, 1991 (the original enrollees were 170). The 10% drop out rate for the first year is mainly due to migration of students to the cities to find work.

6.3.6.2 Other Training Activities

In FY 1991, the FO dropped the demonstration plot as a project and is now only part of the agricultural training activities to encourage integrated farming. As a project, it created (PLAN) dependency among landless villagers who worked on the plots and it distracted them from engaging in the available non-agricultural activities.

Two components of this demonstration plot are the mulberry cultivation used for the silkworm raising and the fish pond. The pond is considered a model for integrated farming where vegetables and fruit trees are planted around the pond and the pond water is used for crop production and also for poultry and other livestock production.

6.3.7 Employment Opportunity

6.3.7.1 Vocational Training at the Khon Kaen Institute for Skills Development (KISD)

PLAN sends youth to take vocational courses at the Khon Kaen Institute for Skills Development. Courses include welding, carpentry, radio mechanic, diesel mechanic, refrigeration, auto repair, plumbing, dressmaking, etc. The training period is from 3-6 months at the Institute and 2 months on-the-job training. PLAN pays for the tuition, food, books and course materials. Lodging is free at the school.

In FY 1990, PLAN donated 10 sewing machines to the school worth 200,000 bahts. In FY 1991, it donated one PC computer.

In FY 1990, 110 students completed training and about 50% of these graduates are now employed in Bangkok receiving an average monthly salary of 2,500 bahts. These graduates are able to supplement their families' income back in the villages through their remittances. Being gainfully employed outside the village is already a help to their families since they lighten the burden on their families' food stock.

6.3.7.2 Cloth Weaving Project

This is one of the few livelihood projects handled by women. PLAN conducts training to set up the group project through field trips to villages where this type of project has been successful. Group members take practical training in managing the project through discussions with officers of successful group projects. They also take sessions on weaving techniques, dyeing, design and

marketing. PLAN finances the start-up capital of a group for the purchase of production inputs such as thread, dye, etc. This project is intended to operate using a revolving fund.

In Nong Tu village, Zone 5, a weaver receives a wage of 40 bahts for every 1.5 meters of cloth woven. She weaves an average of 2.25 meters of cloth per day which is about 60 bahts in wages (1,800 bahts/month). The cost of production for the project committee for every 1.5 meters of woven cloth amounts to 76 bahts: 36 bahts for the thread and 40 bahts for the weaver wage. The project committee gets a profit of 4 bahts when it sells this cloth for 80 bahts. Therefore, for every weaver, the project group has a profit of 6 bahts per day (2.25 meters x 2.67 bahts), i.e., 180 bahts/month/weaver. With 30 member weavers in this village, the group has a monthly profit of 5,400 bahts.

There are 2 levels of income received here: the wage income received by the weavers and the sales income received by the project committee. For the weavers, the benefits that they get are immediate but for the project committees, there is usually a time lag to get the income from sales. Also, this project is integrated with the dress making activity of the women. Part of the woven cloth is made into bags, shirts and pants and this process adds to the time lag. This may be the reason why the project committee still gets funds from PLAN to buy inputs and why the rate of asset accumulation for the group is low.

The figures above can be used by the project committee to prepare a simple business plan to forecast or project expected returns and map out areas for improvement in the (post) production process (e.g., marketing skills).

6.3.7.3 Silk Worm

PLAN provides training and nets or winnowing baskets for village women involved in this project. These women form a group and each is required to repay for the cost of nets/baskets. The repayments go to a revolving fund used to help other village women purchase materials for their silkworm raising.

Women raise silkworm half of the year during the months when they are not working in the farm. There are 4 crops in a year and each crop is about 700 grams of silk which is about 420 bahts in value (1 kg.= 600 bahts). The annual income for each silkworm raiser therefore is about 1,680 bahts (Ngiew village, Zone 3). This income is comparatively low in relation to that of the cloth weavers although the FO and the project committee may not have recognized this. Having these figures in mind, the project committees can encourage silkworm raisers to increase their crop yield even though they engage in this activity only half of the year. It should be noted that the silkworm is edible and

is a food source for the family. This can be valued and added to the income the women raisers get.

7 PROJECT RESULTS

7.1 Project Results

Table 2 shows the IRDP actual project results or actual units of output for the fiscal years 1989-91, the PE-covered years. These actual outputs were both generated by PLAN contribution and the revolving fund. The physical infrastructure built so far includes 155 boreholes, 2 weirs, 520 individual ponds (FY 91), 13 public ponds and 2 rice mills. Asset accumulation refers to the water jars purchased/constructed, buffalos, cows and the profit shares received by the households. The project committees used their revolving funds to purchase additional jars and used the rent and membership fees to acquire more cows/buffalos. In Leung Fack, Zone 1, the project committee was able to get 7 more cows from rent payments of 26 cows.

7.1.1 Water Test Results

The Mahasarakham Provincial Hospital conducted the bacteriological tests for water samples that were collected from jars. The tests used the 7-test tube and 10-test tube methods to get the most probable number (MPN) of coliform per 100 ml of sample water.

Table 3 shows the results of the 28 samples collected and tested in 3 batches. Only 12 of these 28 samples were potable. The rest exceeded the maximum allowable MPN of coliform/100 ml based on the WHO standard value for drinking water.[6] Three samples showed positive escherichia coli or e. coli which indicates probable presence of excreta in the water.

Hygiene education

There are a number of possible factors that cause contamination of rainwater from the jars. Based on the project site visits, there were jars that were not covered. Only once or twice a year do villagers clean the jars, during the rainy season. Most of the jars do not have taps[7] and it is customary for the villagers to scoop the water with their soiled hands. They do not boil the water. Also, the rainwater collected is stored for months, and the frequency of fetching water from the jars although covered, exposes the water from contaminants such as leaves, dust, etc.

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[6] For the 7-test tube method, the standard value is <2.2 and for the 10-test tube method, ≤10.

[7] The PE did not pursue why some jars have taps while most do not have. Apparently, it is a tradition to scoop drinking water. The villagers do not pour water from a pitcher to a glass. Everybody uses a common cup both for scooping (from a smaller container) and for drinking.

During the project site visits, the PE Coordinator asked some villagers if they had been sick due to the drinking water and they said no. They might have built some form of immunity from the water contaminants. The Field Director was concerned about how to address this situation (test results). One possible measure is to treat the water with chemicals but this may not be acceptable to the villagers who are used to the taste of rainwater and this may be complex to operate since these are individual water jars and not a communal water reservoir to treat. Another measure is to seek technical assistance from the concerned government agency, the Department of Public Health on how to correct such condition.

7.2 Project Impact

To date, the PE has identified short term results of the IRDP projects. These include offsprings of cows/buffalos, the supplementary income the students provide to their families from their practical study under the MK Agricultural College Youth Program, and the employment of the KISD graduates. In Zone 5, 4 offsprings were added to the 21 buffalos (FY 91). Students from the Youth Program while acquiring skills, are able to supplement household income by raising pigs, fish or cattle. In Zone 6, the 3 male villagers trained to operate the rotary drilling machine continue to have local contracts with the households for drilling individual boreholes.

A rough estimate of the actual beneficiaries based on the APR figures of FY 89-91, shows that 62% of the IRDP interventions go to PLAN families.[8]

For the period FY 89-91, using the APR figures, the water jar project benefitted only 29% of the target population of 3,200 households (31% of the 2,000 PLAN families and 26% of the 1,200 non-PLAN families). This is a low percentage if one considers the time frame (i.e., within 2 years of enrollment) stated in the program objective.

Although the water jar project contributes to the build-up of local resources, its expected impact (that of villagers having adequate clean water) is not being realized for 57% of the 28 household water samples collected for potability test.

The PE was not able to gather more solid data to determine the impact of the projects which would have included the following:

- the actual PLAN household/beneficiaries identified by the FC numbers to track down the number of projects each is involved in.

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[8] Sixty two (62%) percent of the APR figures is equal to 25,139 PLAN households. This absolute figure can be misleading because of the overlapping of households in different projects (multiple counting of same households). Households are beneficiaries in more than one project. What is relevant therefore is the relative percentages between PLAN and non-PLAN household beneficiaries.

- a sample of household/beneficiaries with multiple projects (3 and above) to assess any changes in their income or any increase in their household expenditures.
- a sample of households that underwent vocational training and now employed or working on non-farm livelihood projects.
- a report on the nutritional status of children 0-5 years old for households involved in the nutrition training.

So far, the IRDP has yet to fully realize its impact on the target population. It continous though to enable the target population to accumulate resources.

8 SUSTAINABILITY ASSESSMENT

This assessment was based on the project site visits and on discussions with project committees using the sustainability indicators such as organization, resource mobilization, community participation and operation and maintenance.

8.1 Organization

The project committees are either centralized or decentralized. Within a village, these 2 types of organizational structure can exist although decentralized committees are more prevalent. In a centralized structure, one committee handles 2 or more projects in the village (e.g., integrated farming projects, Zone 3). In a decentralized structure, a committee handles only one project. The centralized committee tends to have a longer life span than the decentralized one because of the former's multiple projects that it handles. This implies that the committee members' skills are honed by managing different projects which contribute to local resources build-up.

The decentralized committees though allow more leaders within the village to assume responsibilities therefore they open up to more potential leaders although they may provide administrative exposure only to a particular project type or only to one project. The centralized committees cater to a few leaders but provide a more intensive 'training' ground for their members because of the multiple projects at hand.

The committees exhibit interlocking membership, i.e., village leaders are members in 2 or more committees although with different positions in particular committees.[9] This partly increases the capability of leaders to manage local activities. This implies that there is some form of centralization in decentralized structure but centralization only in terms of individual leaders assuming 2 or more positions in different committees. There is a danger that this concentration of authority to a select few may lend itself to corruption. The zone supervisors indicated that

[9] Interlocking membership exists both in centralized and decentralized committees and this affects the magnitude of participation of the village leaders in both committee types. Although decentralized committees allow for greater participation, interlocking membership actually reduces participation to some degree, more so in centralized committees.

there is peer pressure and village leaders will lose face if that happens.

Both committee types contribute to institution-building although each may have a different degree of impact on village leaders.

The project committees are well organized in the sense that formal leaders (local government officials elected by the villagers) sit as committee members. Also in some project committees, public school teachers serve as advisers. Regarding leadership skills, there have been cases where committees initiate and organize their own projects (e.g., buffalo banks as an offshoot of the savings fund, land preparation activities in Zone 2). The committees actually organize their projects with the technical assistance by the CWs. In Zone 7, the FO encouraged the project committee to do the bidding and negotiations for the contractor to construct the weir. The FD said it took a longer time to finalize the contract but the committee did it itself.

8.2 Resource Mobilization

In most projects, household beneficiary contribution and/or repayments are required. Repayments go to revolving funds used to continue the project operation or to add up to project output, therefore contributing to local resources build-up. Variations in the details of resource mobilization exist among villages within and between zones. Some villages require relatively lower payments or longer repayment period (e.g., pond project, MK11D, Zone 2) and others require membership fees (e.g., cow/buffalo banks, MK3A with 50 bahts/member and MK6 with 100 bahts/member, Zone 1). This shows the flexibility in the implementation of same project types among villages in terms of repayments, distribution of profits and organization (membership fees). This may illustrate to some extent, the adaptability of the committees (leadership skills) to the particular needs and capacities of the villagers. Institution building is seen in this light.

The committee treasurer collects the repayments. Although there are no penalties (surcharges) required by most committees, there is the normal interest rate added to the principal or installment payments. Retained earnings or portion of the profits that goes to a common fund help increase capital stock (e.g., savings fund, fertilizer bank).

The incentives in mobilizing resources are in terms of profit sharing. In rice mills, the more kilos of grains milled by the member, the greater profit shares he gets at the end of the year. In consumer coop stores, the higher the total value of purchases made, the higher percentage of profits received.

For the fertilizer banks that use chemical fertilizers, their continued existence is a test on how they manage to mobilize resources without PLAN's financial assistance. This can be an area for review for future assessment.

The mobilization of local resources therefore is a critical component for the sustainability of

projects and project output. The IRDP so far, has taken steps to ensure that revolving or common funds be part of most projects, particularly livelihood projects.

8.3 Community Participation

Villagers' participation is both by representation and by direct processes. By representation process, leaders are chosen by the villagers/members to form project committees. By direct process, all villagers/members participate in project issue discussion and decision-making (e.g., women's savings fund, Zone 2 and some cow/buffalo banks).

Within the households, the IRDP taps family members to participate in the different projects. The husbands/family heads are involved in integrated farming projects, the wives are into non-farm livelihood projects, the youth in vocational/agricultural training and the school children participate in the fund raising activities of the school lunch program (vegetable gardening, chicken raising, etc.). All these activities help build local institutions while family members who are project beneficiaries acquire material and technical resources.

General membership meetings are held once or twice a year but special meetings are held when important decisions have to be made. For rice mills, savings funds and consumer coop stores, profit sharing is a major agendum in the general meetings. It seems that villagers participate more actively (meetings) in non-farm income generating group projects than in infrastructure projects such as ponds, boreholes, weirs because of the incentives of profit sharing.

8.4 Operation and Maintenance

This indicator of sustainability refers both to local resource and institution build-up. This has to do with the availability of technicians (repairmen) and spare parts and also with the capability of the project committees to solve any operation and maintenance problems on their own.

This is an area where the IRDP implementation shows some weakness. There is apparently too much dependence on PLAN assistance by the project committees for particular projects to maintain and continue operating. In Zone 5, the borehole project committees still get assistance from PLAN to buy spare parts (rubber rings) for the hand pumps. Also for the cloth weaving project, the project committee still gets fund from PLAN for the production inputs after PLAN's initial funding to start the project. Although the rotary drilling machine is an innovative way to tap local resources (technicians) and encourage full participation from the villagers in borehole project, the Tambon council that keeps and maintains the drilling machine still receives assistance from PLAN for repair expenses. This reflects lack of responsibility on the part of the local government given the fact that formal leaders are themselves project committee members. This also reflects the committees' capability to mobilize resources for maintenance.

The 2 rice mills operate on their own after PLAN's initial funding while the cow and buffalo

banks continue to receive PLAN funds during their first 2-3 years of operation. These mills allocate monies for the operator's wage and for maintenance costs. Although the cow/buffalo banks are able to continue operation with the additional purchase of cows/buffalos from the rental payments, they still get financial assistance from PLAN to buy more animals apparently to hasten animal dispersal to more households.

9 ENVIRONMENTAL CONCERNS

Environmental constraints affect the type of projects the FO implements in the program area. For water projects, the FO is tapping more the surface water because of the salinity of the groundwater. More ponds and weirs are implemented in areas where it is difficult to drill boreholes or where groundwater is salty. Due to the dry land, more non-farm livelihood projects are implemented to supplement household income during the hot/dry season.

The integrated farming partly addresses the concern on the conservation of natural resources. The fruit trees planted around the ponds contribute to the area's vegetation besides being sources of food. The silkworm raising contributes to reforestation with the planting of mulberry trees whose leaves serve as food for the silkworm.

As earlier mentioned, the FO has stopped providing financial assistance to fertilizer banks which use chemical fertilizers. The use of organic fertilizers is now encouraged. The cow and buffalo banks can be sources of organic fertilizers and can provide input for a possible biogas project or other energy-saving/producing project.

10 CONCLUSIONS

The IRDP is an on-going group of projects that was started prior to FY 1987. The objectives are:

- to provide rainwater containers for drinking and provide water for domestic and agricultural use,
- to reduce malnutrition, and
- to give access to credit with lower interest and improve the means of livelihood of the households.

The program offers an integrated approach to farming which combines activities in fishery, crop and livestock production.

10.1 Implementation Review

Basically what the FO does is implement projects through the project committees which require repayments or counterpart contribution from households to establish revolving funds so that these projects can continue and eventually operate on their own.

The common denominator in all the IRDP projects is the revolving fund which contributes to local resources build-up. Onsite training which precedes all project implementation builds up technical/organizational skills as well as contributes to institution building.

- Although all projects are linked by the revolving funds, the program title can be misleading since these projects apparently were grouped only for proposal purposes. The water jar project and the school lunch program are only indirectly related to the livelihood projects aimed at increasing family income.

- The program objective on malnutrition should have been qualified to target also school children because a major component of the program is the school lunch program which targets school children >5 years old.

10.2 Project Results

Through the IRDP, the villagers are able to accumulate local resources with the implementation of its different projects. To date, the target output is being achieved. Within FY 1989-91, water infrastructure projects have been implemented, different farm 'banks' established and vocational students completed training.

The impact of most of these projects are still to be fully realized but there are already short term results identifiable to date. These include the supplementary income contributed by the Youth Program students, the employment of the KISD graduates, and the use of profit shares for other livelihood projects or for the purchase of more food items.

The impact of the water jar project is not being realized with the water test results although the sufficiency objective has been achieved. What therefore need to be emphasized are the cleaning of the jars and measures to improve the water handling practices of the households.

10.3 Sustainability Assessment

So far, the IRDP has put in place an engine to keep the projects going, i.e., the revolving fund, to build on local resources. The onsite training and the interlocking membership in both centralized and decentralized committees help strengthen local institutions.

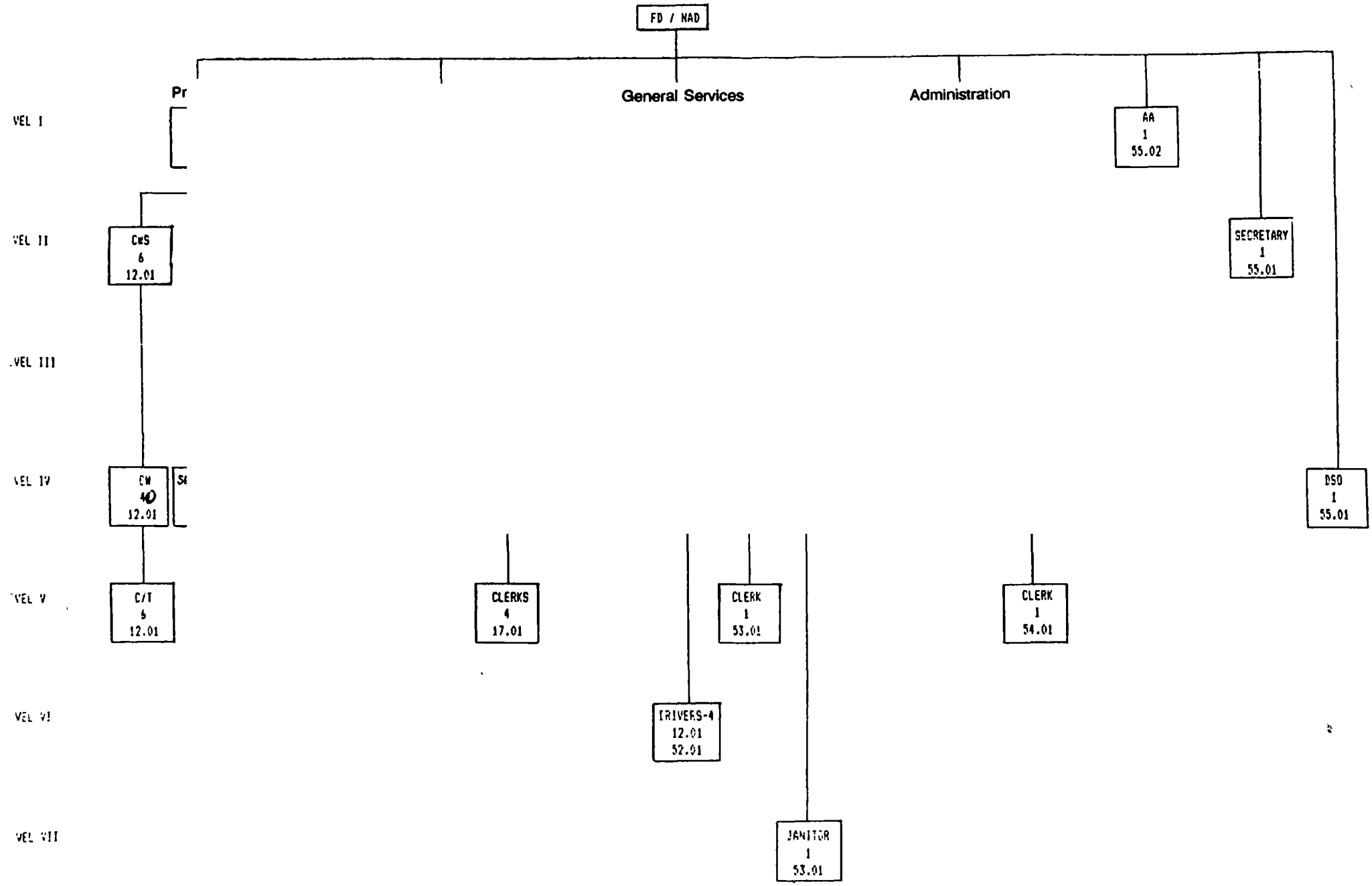
The operation and maintenance of projects are still generally dependent upon PLAN's financial assistance. This reflects on the capability of the local institutions to assume full responsibility and mobilize enough resources for operation and maintenance.

It is clear that the FO continues to financially assist the project committees for the continued operation of the projects although some have managed to operate on their own. At this point, the FO therefore needs to decide until when this assistance to particular project committees or

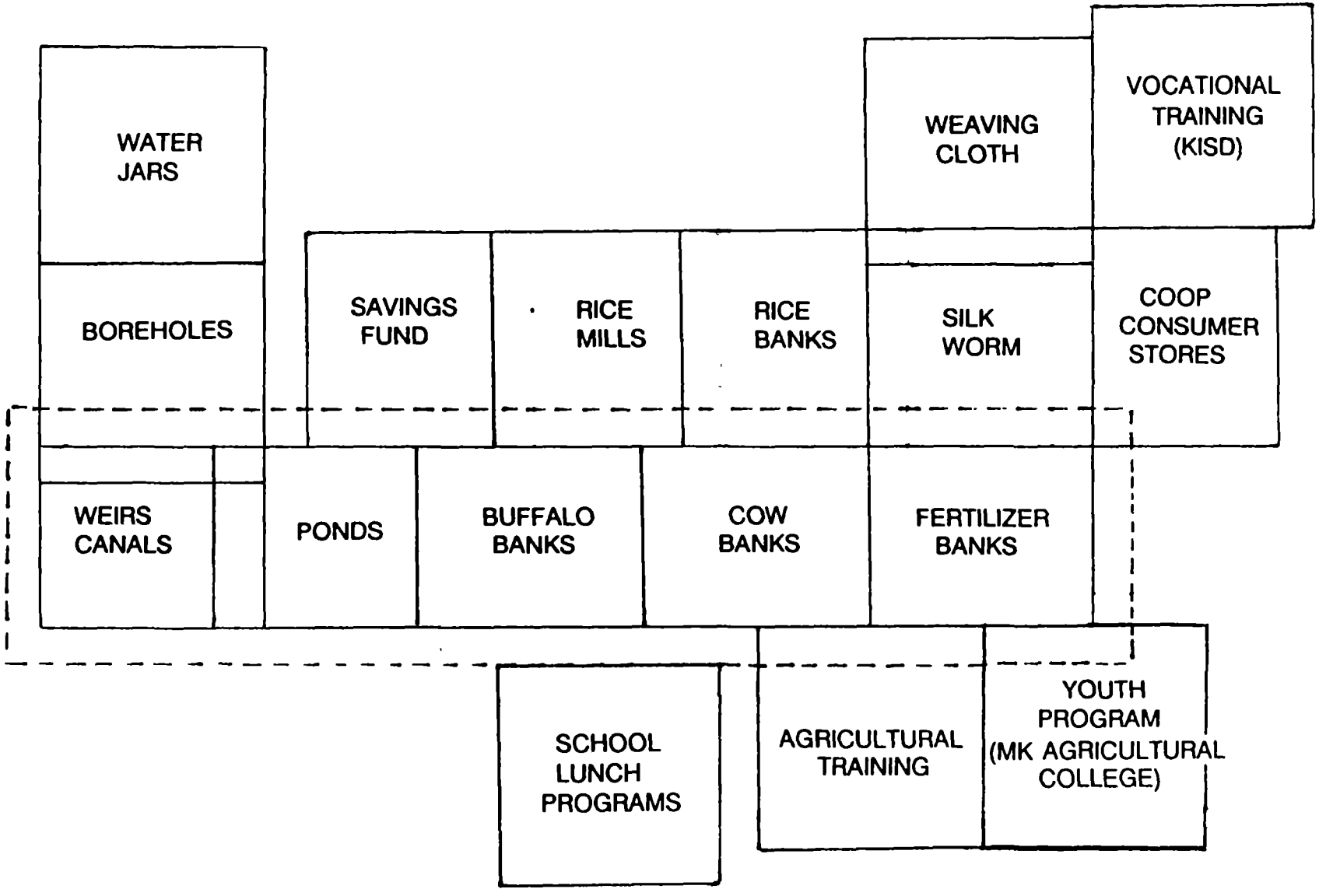
villages lasts and move on to new villages. Village assessment which is crucial in this decision-making must involve the village leaders and must be tied to the initial stages of the projects, i.e., the needs assessment and the preparation of the PDOs.

FIGURE 1

ORGANISATION CHART PLAN/MAHASARAKHAM -- FISCAL YEAR 91



PLAN-MAHASARAKHAM IRDP



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14 july 91

PLAN-MAHASARAKHAM INTEGRATED RURAL DEVELOPMENT PROGRAM
BUDGET AND ACTUAL EXPENDITURES FY 1989-91 (in bahts)

		FY 89		FY 90		FY 91		TOTAL	
PDO #	PROJECT TITLE	BUDGET	ACTUAL	BUDGET	ACTUAL	BUDGET	ACTUAL	BUDGET	ACTUAL
13.11	Nutrition	281000.00	266714.00	214675.00	247391.00	277600.00	299361.00	773275.00	813466.00
13.41	Potable Water	697125.00	756260.00	711000.00	792574.00	1334850.00	1425613.00	2742975.00	2974447.00
15.21	Leadership Trng	250000.00	307222.00	592000.00	371872.00	560000.00	513618.00	1402000.00	1192712.00
15.30	Coop/Credit Union	551500.00	561505.00	472000.00	490729.00	182900.00	190629.00	1206400.00	1242863.00
16.11	Grain Store	138500.00	159133.00	302975.00	33306.00	203375.00	175072.00	644850.00	367511.00
16.13	Animal Husbandry	729000.00	803919.00	2093600.00	2315378.00	3170500.00	3286992.00	5993100.00	6406289.00
16.15	Irrigation	131050.00	70948.00	1215475.00	1210717.00	3067350.00	2944916.00	4413875.00	4226581.00
16.16	Fishery	600.00	77739.00	330000.00	484690.00	529500.00	268046.00	860100.00	830475.00
16.17	Grain Mills	0.00	0.00	130000.00	74382.00	200000.00	98291.00	330000.00	172673.00
16.26	Agricultural Trng	90350.00	89850.00	232400.00	153604.00	150000.00	294819.00	472750.00	538273.00
16.28	Demonstration Plot	65000.00	104913.00	300000.00	291060.00	0.00	0.00	365000.00	395973.00
16.33	Employment Opport.	351900.00	330751.00	1349800.00	1130537.00	2172000.00	2091777.00	3873700.00	3553065.00
	Total/FY	3286025.00	3528954.00	7943925.00	7596240.00	11848075.00	11589134.00	23078025.00	22714328.00
	Exchange Rate/US$	25.00	25.32	25.00	25.67	25.00	25.40		

PLAN-MAHASARAKHAM IRDP
PROJECT OUTPUT FOR FY 1989-91

	FY 1989	FY 1990	FY 1991
HEALTH SECTOR			
Water Jar Project	66 jars	255 jars	589 jars
School Lunch Program	15 schools	8 schools	28 schools
COMMUNITY DEVELOPMENT SECTOR			
Consumer Coop Stores	7 stores	0	5 stores
Fertilizer Banks	15 groups	17 groups	0
Savings Fund	0	0	8 groups
RESOURCE & SKILLS DEV'T SECTOR			
Rice Banks	7 banks	2 banks	10 banks
Buffalo Banks	18 banks	26 banks	50 banks
Cow Banks	11 banks	16 banks	34 banks
Boreholes Project	6 boreholes	50 boreholes	99 boreholes
Weirs	0	2 weirs	0
Ponds Project (Fishery)	40 ponds	194 ponds	520 ponds
Ponds Project (Public)	0	1	12 ponds
Rice Mill Project	0	1 mill	1 mill
MK Agri College Youth Program	0	72 students	81 students
KISD Vocational Training	38 graduates	110 graduates	85 graduates
Weaving Cloth Project	0	4 villages	5 villages
Silkworm Raising	0	9 villages	18 villages

PLAN-MAHASARAKHAM WATER TEST RESULTS

DATE	SOURCE	ZONE	LOCATION	MPN/100 ml COLIFORM	FAECAL COL.	E. COLI
3 July 91	water jar	5	Kok Kork	5.0	5.0	negative
3 July 91	water jar	5	Kok Kork	5.0	5.0	negative
3 July 91	water jar	6	Lub Khwan	5.0	5.0	negative
3 July 91	water jar	6	Lub Khwan	240.0	240.0	positive
3 July 91	water jar	6	Nong Kaen	5.0	5.0	negative
3 July 91	water jar	7	Wai Noi	5.0	5.0	negative
3 July 91	water jar	7	Wai Noi	38.0	38.0	negative
3 July 91	water jar	7	Wai Yai	< 2.2	< 2.2	negative

The above results used the 7-test tube method, MPN/100 ml < 2.2, water is potable

8 July 91	water jar	1	Huanakham	5.0	5.0	negative
8 July 91	water jar	1	Huanakham	13.0	13.0	negative
8 July 91	water jar	1	Nonsa-ard	13.0	13.0	negative
8 July 91	water jar	1	Nonsa-ard	< 2.0	< 2.0	negative
8 July 91	water jar	1	Nonsa-ard	23.0	23.0	negative
8 July 91	water jar	2	Prasat	13.0	13.0	negative
8 July 91	water jar	2	Prasat	2.0	2.0	positive
8 July 91	water jar	2	Sok Klong	< 2.0	< 2.0	negative
8 July 91	water jar	2	Sok Klong	8.0	8.0	negative
8 July 91	water jar	2	Sok Klong	< 2.0	< 2.0	negative

The above results used the 10-test tube method, MPN/100 ml <= 10, water is potable

DATE	SOURCE	ZONE	LOCATION	MPN/100 ml COLIFORM	FAECAL COL.	E. COLI
Aug. 91	water jar	5	Kok Kork	8.0	8.0	negative
Aug. 91	water jar	5	Kok Kork	7.0	7.0	negative
Aug. 91	water jar	5	Non Than	8.0	8.0	negative
Aug. 91	water jar	5	Non Than	23.0	23.0	negative
Aug. 91	water jar	6	Lub Khwan	< 2.0	< 2.0	negative
Aug. 91	water jar	6	Lub Khwan	< 2.0	< 2.0	negative
Aug. 91	water jar	6	Nong Kaen	17.0	17.0	positive
Aug. 91	water jar	7	Wai Noi	13.0	13.0	negative
Aug. 91	water jar	7	Wai Noi	23.0	23.0	negative
Aug. 91	water jar	7	Wai Yai	< 2.0	< 2.0	negative

The above results used the 10-test tube method, MPN/100 ml <= 10, water is potable

MICROBIOLOGICAL EXAMINATION FOR DRINKING WATER

Routine Test

1. Qualitative test for total coliform (Presumptive coliform count)
2. Differential for faecal coliform (Differential coliform count)

Media

1. Lactose broth : single strength and double strength
2. Brilliant green lactose - bile broth 2%
3. EC broth
4. Eosin methylene blue agar (EMB)

Method (7-test tube)

1. Presumptive Test (MPN)
   incubate 35°-37°C, 24 ± 2 hours or 48 hours
   positive result: acid + gas
2. Confirmed Test
   To produce gas, transfer sample from lactose broth (positive tube) to 2% brilliant green lactose-bile broth:
   1st set - incubate 35°-37°C about 48 hours
   2nd set - incubate 44°-45°C about 6-24 hours
3. Reporting
   if 1st set has gas — get the number of coliform using the MPN index table
   if 2nd set has gas — e. coli (subculture from the 2nd sample on EMB)
4. Interpretation
   MPN of coliform/100 ml < 2.2, the water is potable

Method (10-test tube)

1. Presumptive Test
   Incubate at 35°-37°C for 24 hours and examine for gas. The presence of gas indicates a positive presumptive test. Negative tubes are incubated for another 24 hours. The presence of gas then also indicates a positive presumptive test. The absence of gas after 48 hours indicates a negative test.
2. Confirmed Test
   This test is performed on all presumptive test fermentation tubes showing gas. Streak on EMB plate with inoculum from each positive tube. Incubate the plates at 35°-37°C for 24 hours and examine for the presence of faecal coliform colonies. If faecal colonies are present, the confirmed test may be considered positive and the MPN calculated.
3. Interpretation
   MPN of coliform/100 ml ≤ 10, the water is potable

Sources:

Standard Method for the Examination of Water and Wastewater
APHA, AWWA, WPCF, 1971
13th Edition, Washington, D.C. pp. 662-676
(7 test tube method)

Manual of Clinical Microbiology
compiled by the WHO-assisted Project: Strengthening of Laboratory Services
published by the Division of Provincial Health Laboratory Service
Department of Medical Services, Ministry of Public Health, Thailand
(10 test tube method)

MASARAKHAM AGRICULTURAL COLLEGE YOUTH PROGRAM
COURSE OUTLINE

Year 1

Summer (2 Subjects)

Semester 1	Semester 2
Agri in Practice 1	Agri in Practice 2
Thai Language	Mathematics
Health	Health 1
Fruit	———
Soil and Fertilizer	Vegetable
Mushroom Breeding	Pig Raising

Year 2

Summer

- Chicken Raising
- Economic Plant

Semester 3	Semester 4
Agri in Practice 3	Agri in Practice 4
Health 2	Thai Language
Fish Raising	Vocational Training
Plant Science	Social Science
Animal Science	Plant Science
	Animal Science

Year 3

Semester 5	Semester 6
Agri in Practice 5	Agri in Practice 6
Social Science	Thai Language
Science 1	Social Science
Irrigation	Bee Raising
Plant Science	Plant Science

Year 4

Semester 7	Semester 8
Agri in Practice 7	Agri in Practice 8
Mathematics	Science 2
Economics	Building Construction
———	Product Storage

Year 5

Semester 9	Semester 10
Agri in Practice 9	Agri in Practice 10
Mathematics	Science 3
English 1	English 2
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