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**Groundwater Demonstration Plot
Pukdale, Kabupaten Kupang, Timor
Nusa Tenggara Timur**

**Monitoring Report No. 4
Results of the Re-Survey of
Demonstration Plot Households**

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Executive Summary

This is the fourth report regarding monitoring activities at the 7 hectare groundwater demonstration plot in Pukdale village, Kabupacen Kupang, NTT. The demplot was established by P2AT (groundwater division of the Department of Public Works) in early 1985.

Irrigation has been available to the 23 landowning households in the demplot since June, 1985. For the first time in their experience, farmers were able to produce irrigated palawija (secondary) crops during the dry season. They produced two crops of corn between the months of June and November, 1985 as well as one crop of rain fed rice between December, 1985 and July, 1986. The demplot irrigation system was the sole source of water for the corn crops and it provided supplementary irrigation for the rice crop during the last months of the growing cycle when the yearly rains had ceased to fall.

In order to determine the impact of demplot participation on the beneficiaries, the consultant conducted a survey of these 23 households at the end of the third cropping season. This was a follow-up to the comprehensive socio-economic baseline survey conducted the previous year before the farmers derived any benefit from demplot participation. This report presents the findings of the re-survey. It focuses specifically on discernible and measurable changes in cropping patterns, intensity, and productivity as well as changes in levels and sources of income over the course of the demplot's first year.

The productivity of demplot land increased dramatically with the use of the groundwater irrigation system. The land was used for agriculture throughout the year whereas previously it had been used to produce one crop of rain-fed rice only. During the dry season, the majority of farmers planted high yield corn varieties and followed intensified planting procedures (planting in rows at intervals of 1 x .5 with two seeds to a nole). Productivity in the first and second season respectively reached 92% and 83% of maximum expected yield (40,000 ears/hectare). 43% of the first and 21% of the second season yields were sold as green corn (at a fixed market price of Rp.50/ear to buyers who came to the demplot and harvested the corn themselves). Average sales per hectare amounted to approximately US\$700 and US\$300 for the two seasons. The remainder of the corn was consumed by the households as green corn and dried and stored (to be consumed as a supplement to rice as a staple).

The productivity of rice was greater on demplot land than on farmers' land elsewhere. Yields from demplot parcels averaged 2.6 tons of milled rice compared to 1.2 tons on other land. Both yield levels were significantly higher than those of the previous

year when the average yield on all land owned by demplot farmers was .4 tons. The low productivity in 1984-5 was due primarily to insufficient rainfall.

The primary reason for the higher productivity of rice produced in the demplot in 1985-6 was the fact that farmers planted one to two months earlier there than on their other land, so that their demplot rice crop had the benefit of irrigation throughout the entire growing cycle. Because they were guaranteed supplementary irrigation from the demplot pumping system in the event that seasonal rains were inadequate, farmers did not follow their usual practice of waiting until the rainy season was well underway in late December or January before determining whether seasonal rainfall would be adequate to support a rice crop.

The costs of demplot participation in terms of labor, time, and money were unrealistically low. The reasons for this were:

- 1) P2AT paid all costs of operations and maintenance of the demplot. Farmers paid only a nominal contribution of under US\$10 per hectare each season to the contingency fund established by the demplot water users association. Furthermore, there were minimal agricultural input and labor costs since the majority of farmers did not use fertilizer or insecticide and since labor came from within the participants' households or extended families.

- 2) Water management activities were organized and carried out largely by the demplot overseer from P2AT and by the leaders of the water users association rather than by the members of the organization themselves.

- 3) During the dry season, once the farmers had planted their corn, they did not regularly weed or perform other maintenance tasks. Harvesting was conducted by outside buyers who brought their own laborers to cut the corn.

Estimates of the cost of irrigated corn production (including costs of agricultural inputs and irrigation) range between about US\$175 and \$270 per hectare. The average market value of gross yields per hectare varies from US\$355 (for dried corn) to US\$1775 for green corn.

The cost of rain-fed rice production varies from US\$180 to \$635 per hectare depending upon the method of land preparation (cattle trampling or tractor); source of labor (household, sharecropper, or hired wage laborers from Kupang); and use of agricultural inputs. The average market value of gross yields ranges from US\$186 to \$745.

Average per capita household income in 1985-6 was US\$195, an increase of \$20 over the previous year. Mean income was \$148 which represented a \$30 increase over the 1984-5 level. Average expenditures remained at \$160, although the mean rose \$17 to \$146. The demplot surveys showed that income and expenditures are somewhat artificial, however, and therefore are not the most accurate measures of changes in the standard of living in most households. Rather, it is important to determine how money from increased crop production is utilized and to determine the

extent to which it enables households to expand and protect their productive resources.

Participation in the demplot did not affect significantly the social or financial status of beneficiary households. None of the households expected at the outset of their participation in the demplot that they would make money from this enterprise, so they did not make special plans for the expenditure of increased income. The percentage of total household income contributed by demplot corn ranged between .4% and 65.6%. The mean contribution was 19.7%. In the majority of cases, demplot earnings took the place of money households normally expect to earn from selling rice (which was unavailable in 1985-6 due to the poor harvests the previous year). 35% of the households used their earnings from demplot corn sales to pay for tractor rental for the 1985-6 rice cropping season; and 26% of the households said that their demplot earnings saved them from having to sell off livestock or borrow money from relatives to purchase rice. Other uses of demplot earnings took the form of contributions to extended family members in fulfillment of ritual obligations (13% of the households), small home improvements (9%), purchase of gold (9%), purchase of clothing (4%), and purchase of a tape recorder (4%).

All participants in the demplot are enthusiastic about continuing to utilize the new irrigation system, but they are ill-prepared in terms of agricultural expertise, experience in water management, and estimation of opportunity costs and benefits of demplot participation. The survey showed that all farmers are willing to pay high costs for the production of rice because of the importance attached to producing their own supply of the staple. Thus, the challenge of sustaining the participation of this group of farmers is not that they cannot afford to pay for irrigation. Rather, they must develop an acceptable payment system which they believe is equitable and which they are committed to support.

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1. Introduction

This is the fourth report regarding the development of a seven hectare groundwater demonstration plot in Pukdale village, Kabupaten Kupang, NTT. The demonstration plot was established in early 1985. Since April of that year, the consultant has been monitoring the activities of the demplot farmers and of the implementing agency, P2AT (Groundwater Development Project of the Department of Public Works).

Irrigation has been available to the households since June, 1985. Over the course of the demplot's first year, farmers produced two dry season irrigated palawija (secondary) crops. They also produced one crop of rain-fed paddy rice for which the demplot system provided supplementary irrigation. At the instigation of the P2AT staff, the farmers formed a water users association to manage water distribution and to coordinate agricultural activities. During the first quarter of the consultancy, a comprehensive socio-economic baseline survey of the 23 landowning demplot households was conducted. This was intended to provide background information about the potential beneficiaries that would serve as a benchmark against which to measure the impact of the demplot irrigation system after its first year of operation. The consultant's first report describes the methodologies used in monitoring demplot development and in conducting the baseline survey. The second report presents the findings of the survey and provides general demographic, socio-economic, and agricultural information about the Oesao plain region in which the demonstration plot is located. The consultant's third report traces the development of the demplot over the course of its first year. A qualitative methodology, process documentation, was employed to monitor this development. This approach enabled the consultant to chronicle and describe demplot activities; to

identify the participants involved, in developing the irrigation system and in creating a viable water users association; to describe the interactions between the participants in the project; and to discuss the problems and issues that emerged during the first year of project launch and implementation.

During the final months of the consultancy a re-survey of 100% of the demplot households was conducted. When the consultant undertook her responsibilities in April, 1985, it was intended that the consultancy would last exactly one year. USAID extended this term through July, 1986, however, to conform with the agricultural cycle in Pukdale. Thus, the consultant was able to obtain data on the first three full cropping seasons at the demplot. The present report contains the findings of this re-survey and uses this information to analyze the impact of the demplot on the participants at the end of the first year of the project. It focuses specifically on discernible and measurable changes in cropping patterns, intensity, and productivity as well as on changes in levels and sources of income over the course of the intervening year between the first and second surveys.

A final summary description of the consultancy will be presented as an additional (fifth) report. It will recapitulate the consultant's monitoring activities, summarize lessons learned, and offer recommendations regarding the development and monitoring of future demplots to be established by USAID and the Department of Public Works. The recommendations will be based not only on the consultant's observations and survey data from Pukdale, but also on the comments of the farmer participants in the project and of Mr. Hari Suwito, the P2AT staff member who has overseen demplot development since April, 1985.

Description of the re-survey

Like the first survey, the re-survey took the form of an open-ended interview guided by a series of written questions. (A copy of the instrument is contained in Annex A.) As with the initial instrument, this one should be read as an interview guide

rather than as a rigid questionnaire. The questions covered the intervening year between the time of the original survey and the re-survey. The instrument used for the follow-up was shorter and more concise than that employed in the initial survey. Nevertheless, like the first, the second survey instrument sought to elicit complicated and/or potentially sensitive economic and agricultural information from a variety of perspectives in order to obtain a thorough set of data.

Prior to each interview, the consultant reviewed the results of the initial survey as well as notes she had made regarding each family throughout the year of monitoring their activities. This enabled her to assess the validity of the respondents' answers to the survey questions and to ask relevant supplementary questions to clarify and expand the information provided. The questions focused on:

- 1) demographic issues - changes in household composition, in educational status of household members and in social status; extent (and cost) of travel outside of the region, of entertainment of visitors from outside the region, of participation in weddings, funerals, and other ritual events, and of health problems;

- 2) agricultural activities and production levels - list of each crop planted (and type and numbers of trees); and for each crop planted: amount and location of land planted; type, source and cost of seeds, fertilizer, and insecticide used; description of any infestation problems; type and cost of labor used at each stage of cropping cycles; mode, cost and method of payment for land preparation (e.g., cattle trampling or tractor); gross yield; net yield after labor and credit shares deducted; disposal of harvests; and gross income;

- 3) livestock management - types and numbers of all livestock owned, reasons for changes in herd/flock size, location of and individuals involved in marketing, income from sales, barter arrangements, veterinary or other expenses incurred, and plans for acquiring/selling more livestock;

4) sources of income - sources, types, and amount of income from on- and off-farm enterprises and employment (in addition to that covered in #2 and 3 above); conditions and amount of credit or loans; and sources and amount of gifts or financial assistance;

5) expenditures and budget management - decision making about disposal of earnings; amount of regular and extraordinary expenditures (in addition to those covered in #1, 2 and 3 above) including: food, household supplies, clothing, education costs, taxes, costs of membership in water users association, village levies, contributions to church and family, improvements to the household, luxury items, and so on; and

6) comments on demplot experience - concerns about the future, complaints about any aspect of first year's operations and management, and suggestions for improvements.

Administration of the re-survey

The P2AT staff member assigned to oversee all aspects of demplot activity and monitoring throughout the year, Mr. Hari Suwito, accompanied the consultant to each interview. Based on his familiarity with and understanding of agricultural practices and other aspects of household activity, he assisted the consultant in asking follow-up questions to clarify answers that he regarded as incomplete or inaccurate. In 21 cases, the interview was conducted with the male head of household and his wife (or, if widowed, an adult daughter) in their home. In two cases interviews were conducted with adult sons of demplot landowners in the parents' home. In these cases, the older men were working in gardens in other parts of the village and were unavailable (despite our attempts to fix appointments with them) during the period in which the re-survey was conducted. The interviews were conducted at the end of the rainy season rice harvest (June and July).

The final section of the interview (#6 above) was used as an opportunity to discuss privately each participant's perceptions

of the development of the demplot. The respondents were asked to express any concerns about the demplot's future in general and about their participation in the project in particular. They also were asked to describe any problems they had encountered over the course of the year; to suggest for improvements of any kind that could be made to facilitate irrigation management and operations; and to offer their ideas about the development of other demplots in the future. Some of the respondents specifically mentioned the cost of participation in the demplot. With those who did not do so, we asked whether or not they would be willing and able to pay their share of costs incurred in operating the demplot irrigation system in the future when P2AT is no longer doing so.

The farmers' responses to questions about the future of this and other demplots are summarized in this report. They will be discussed in more detail in the consultant's final report.

II. Agricultural Activities

Pre-demplot cropping patterns

Throughout the Oesao plain region in which Pukdale is located, the primary sources of subsistence and income are rice and corn farming and animal husbandry (mainly pigs and cattle). The consultant's second report provides a detailed description of land and livestock holdings and farming activities of households in Pukdale as a whole and in the demplot in particular. Therefore, this information is not repeated in the current report, but rather is summarized briefly below.

The general agricultural pattern is that households produce one crop of rain-fed rice each year for home consumption and, if there is a surplus, for sale. Rice is also used in lieu of (or in addition to) money or cattle for obligatory contributions to the local Protestant church and to ritual events involving members of their extended families (i.e., weddings and funerals). Ownership of sawah is difficult to determine from existing village and higher level government records. Villages maintain a household property census (Daftar Pemilikan Tanah, Ternak, & Tanaman), however this includes only the land within the village that each household owns. According to the most recent census records in Pukdale (1984-5), 46% of the 340 households in the village own sawah within the village; and the average size of holdings is 1.4 hectares. According to the village secretary, at least 30% of the households in Pukdale own sawah outside of the village; however this data is not available either in the property records of Pukdale or in those of the other villages or the Kecamatan. The secretary estimates that less than 40% of the village households own no sawah at all.

A further complication in determining accurate land ownership and access to productive land is that households headed by

men whose fathers are still living may have de facto ownership of sawah and other land, although their fathers are listed in census records as the actual owners. In fact, the percentage of households in Pukdale that have no access to family-owned sawah is probably less than 25%, based on the village secretary's estimate. Inheritance is patrilineal; that is all property is transferred through males. Customarily, fathers divide their agricultural land between themselves and their adult sons prior to or at the time of their marriage. This provides sons with their inheritance prior to their father's death. Usually sons have outright usufruct of this land and do not incur formal obligations to share its produce with their fathers' households.

Rice production takes place in the rainy season which generally occurs between November and March or early April. Given the uncertainty of rain in the region, farmers wait until there has been one or more heavy rainfalls in November or December to begin planting their seedbeds, transplanting them one month later. Traditionally, land preparation was done by the *rencah* system whereby farmers rent (or use their own) herd of 30 or more cattle or swamp buffalo to trample or "puddle" their sawah to break up the soil. This takes two or more hours per hectare depending upon the size and condition of the herd. Rental payment customarily takes the form of harvest shares (*bagi hasil*) whereby the cattle owner receives one-third of the harvest. As the consultant's second report explains, within the past decade, owners of large cattle herds have begun selling off some of their livestock to purchase tractors which they rent out for land preparation. The cost is Rp. 100,000 to 125,000 per hectare. Generally, tractor owners agree to accept payment in harvest shares only in exceptional cases, such as from an older sibling or other close relative.

The majority of households in the region own garden plots adjacent to their homes in which they grow vegetables (e.g., eggplant, squash, greens, shallots, scallions, and chili peppers) and/or bananas, coconuts, and/or areca palm (betel) trees.

Produce from these plots is consumed and sold. In general, households sell or trade produce in the local Oesao market once or twice weekly in order to obtain foodstuffs (e.g., spices, sugar, small amounts of fish, coffee, and tea); stimulants (e.g., cigarettes, ingredients for betel chewing, palm wine, and, occasionally, beer); and household supplies (especially soap and kerosene). Data available from the most recent village property census (1984-5) revealed that 86.8% of the households in Pukdale village own an average of .38 hectares of garden land adjacent to their homes; and 39.7% of the households own garden and orchard plots averaging .63 hectares in other parts of the village. Every household owns a minimum of .10 hectares of garden either adjacent to their home or elsewhere.

The general pattern of agricultural activities prior to the introduction of the demplot involved the use of household labor for work in gardens and orchards and outside laborers for all or some tasks associated with rice production. Throughout the year, men and boys from village households tend the livestock and gardens located away from their homes. During the period of the household surveys, 75% of the male heads of household spent nearly every day each week away from their homes, often sleeping in make-shift shelters near their gardens. Women and children usually tend the gardens adjacent to and near their homes. They are also responsible for pigs, chickens, and other small animals that are kept there.

During the rainy season, 100% of the demplot households generally employ outside laborers or use sharecroppers to perform some or all tasks associated with rice production. Wage laborers usually come from the neighboring kecamatan of Kupang Tengah and are ethnically Timorese. Sharecroppers tend to live in the Oesao plain area. They are more likely to be Rotinese (like the Pukdale farmers), and often are members of the landowner's extended family. In general, household members (adult men and women and teenaged children) do most of the work on the sawah located near their homes (including that which comprises the demplot). Thus,

household members plant and transplant seed beds, weed, fertilize, apply insecticide, and manage water distribution for sawah near their homes. Harvesting generally is done by outside laborers who are paid in paddy rice. At the current market rate, their daily wage is the equivalent of Rp. 850 or 2.5 kilograms of milled rice. For work in sawah elsewhere, sharecroppers or laborers generally are enlisted to assist in all phases of rice production. The usual payment to sharecroppers is one-third of the total harvest. For wage laborers who do specific tasks such as transplanting or weeding, they are paid the equivalent of Rp.20,000 to Rp.30,000 per hectare. (See the consultant's second report for a more detailed description of this system.)

The seven hectare area that comprises the Pukdale demonstration plot was traditionally used to produce one crop of paddy rice during the annual rainy season. It was left fallow during the dry months to serve as a grazing area for livestock (primarily cattle and goats). This land, however, was not generally regarded as a primary source of subsistence or income. Indeed, as the initial survey of the 23 landowning households revealed, the land they own in the demplot is not their only sawah property and does not comprise a major portion of their holdings in the majority of cases. For 22 (96%) of the households, their land in the demplot is one of two or more sawah holdings they own in Pukdale and/or in neighboring villages. Table 1 below summarizes the sawah holdings of each demplot household. It shows the amount and percentage of the total that is represented by the sawah holdings outside of the village as well as the amount and percentage of the total that is represented by each household's demplot holdings. Table 2 further summarizes the information about demplot holdings by showing the relationship between demplot and total sawah properties owned by each household. As it indicates, the demplot holdings of over 61% of the households comprise 10% or less of their total sawah property.

Table 1

Sawah Ownership of Demplot Households

HH #	Total sawah owned (ha.)	Sawah outside Pukdale (ha.)	Sawah outside as % of total	Demplot Holdings	Demplot holding as % of total
1	20.00	8.50	43 %	.60	3 %
2	6.00	1.00	17 %	.38	17 %
3	1.26	.50	40 %	.76	60 %
4	3.13	3.00	96 %	.13	4 %
5	1.25	1.00	80 %	.25	20 %
6	.75	.50	67 %	.17	23 %
7	1.00	.25	25 %	.20	20 %
8	4.00	1.50	38 %	1.25	31 %
9	8.00	5.00	63 %	.20	3 %
10	2.00	1.00	50 %	.15	8 %
11	1.50	.50	33 %	.20	13 %
12	4.00	3.50	88 %	.13	3 %
13	5.00	2.50	50 %	1.50	30 %
14	2.00	1.50	75 %	.06	3 %
15	5.00	2.00	40 %	.10	2 %
16	2.50	.50	20 %	.15	6 %
17	1.50			.18	12 %
18	2.00	1.00	50 %	.15	8 %
19	4.75	2.75	58 %	.25	5 %
20	4.60	2.00	43 %	.14	3 %
21	2.62	1.00	38 %	.20	9 %
22	3.10	2.00	65 %	.14	5 %
23	8.12	4.00	49 %	.10	1 %

Table 2

Relationship between Demplot and Total Sawah Holdings

<u>Demplot holdings as % of total</u>	<u># of households</u>	<u>% of households</u>
1 - 10 %	14	61 %
11 - 19 %	3	13 %
20 - 31 %	5	22 %
60 %	1	4 %
Total	23	100 %

Previous irrigation experience

In general, the farmers' previous experience with dry season agriculture was limited to the small garden vegetable plots adjacent to their homes or near springs or rivers, as described above. Water for home gardens is drawn by bucket from shallow (3 to 6 meter) household wells. All demplot households have such wells and approximately 80% of them provide water year-round. There is no accurate figure for the entire village, but the village secretary estimates that 75% of the households in the entire village have their own wells.

Only two demplot members had had previous experience with pumps. One man, the son of one of the demplot landowners, has a certificate from a three-month course in diesel mechanics he took several years ago in Kupang. He was selected by the P2AT staff in conjunction with the village head to become the operator of the Pukdale demplot pump. In addition, one demplot farmer owns a diesel-powered centrifugal pump which he obtained through a Bank Indonesia credit program about five years ago. He uses it primarily to pump water from a shallow river bed to a .01 hectare plot on which he grows chili peppers; however he has never attempted to irrigate crops on a larger scale.

At the time the consultant began her work at Pukdale, another demplot farmer purchased a small portable kerosene-powered Honda pump which he intended to use on an unused WHO drinking water well located on his demplot property. (The consultant's previous reports explain that this well was drilled under the auspices of a WHO-UNDP drinking water project six years ago. A pump was never provided and the well has been capped since that time.) This pump was used on the WHO well to supplement water from the demplot pumping system. This second pump was utilized throughout the first five months of demplot operation for two reasons: 1) the P2AT pumping system broke down frequently and 2) because it produced only five to ten liters per second which was insufficient to meet the irrigation needs of the entire demplot. (See the consultant's third report for a detailed explanation of pumping system problems.) The owner of this portable pump (household #1) owns a total of 20 (non-contiguous) hectares of sawah. He intends to use the pump to irrigate corn, peanuts, and mung beans on part of this land in the future if the P2AT system in the demplot provides an adequate supply of water in the future.

New cropping patterns

With the introduction of the demplot irrigation system, owner households expanded rather than changed their agricultural activities. The consultant's Monitoring Report No. 3: Process Documentation chronicles the development of the demplot in detail. As it explains, for the first time farmers produced irrigated palawija or secondary crops (two crops of corn between the months of June, 1985 and January, 1986) in addition to one rain-fed rice crop (between January and July, 1986).

Decision-making: The formal decision about what crop(s) to plant at the demplot was taken at an early meeting of the water users association (P3A) in June, 1985. In fact, however, an initial discussion of cropping strategies had taken place prior

to the farmers' meeting. This discussion occurred at the local BPP (Balai Penyuluhan Pertanian or local agricultural extension center which is located about a kilometer away from the demplot) between Mr. Hari Suwito (the P2AT staff member who was assigned to oversee demplot development) and the local agricultural extension coordinator (PPM). They decided that green corn was the most logical choice for the farmers' first experience with irrigation. Their reasons were: 1) people throughout Oesao already grow corn (which is usually dried on the ear and kept for consumption as a staple); 2) green corn is a popular snack food and is easily marketable; 3) there is little labor involved in corn production. At the time, the PPM offered to help obtain seeds, fertilizer, and insecticide as well as to provide advice and assistance at the demplot. No assistance of any kind was provided, however; so the burden of all aspects of agricultural extension fell to Mr. Suwito of P2AT. (See the consultant's third report for a detailed discussion of such problems of intersectoral coordination.)

The PPM and Mr. Suwito explained their choice of corn as the first demplot crop at meeting of the P3A. They suggested that all demplot land be planted in the same crop to facilitate water distribution and to determine easily the production potential of that crop. Furthermore, neither of them felt that they could offer good advice about inter- or multi-cropping due to a lack of experience with irrigated dry season agriculture.

The farmers were provided the opportunity to discuss alternative crops. They were interested only in planting those crops with which they had had previous experience in order to minimize the potential risks involved in demplot participation. They also wanted to grow crops that could supplement their household food supply as well as be sold in the local market (i.e., mung beans, peanuts, and corn). Because they viewed the demplot as a government project, they ultimately accepted the advice of the PPM and P2AT representative.

The choice of corn variety was determined by the availability of seeds. About 75% of the farmers had saved seeds both of local and high yield varieties (Arjuna and Harapan). The HYV seeds originally had been provided by the local Department of Agriculture and by members of Pukdale households who live in Java and send seeds home to their families. Mr. Suwito also found a supplier in Kupang who sold HYV seeds at Rp. 200/kilo to farmers who needed them.

The decision to plant green corn as the second crop was made by the P3A members in conjunction with Mr. Suwito. All farmers were satisfied with the previous season's choice green corn and all of them saved enough seed to plant a second crop. As will be discussed in more detail below, producing and marketing this crop was relatively easy and all farmers realized unexpected profits. Mr. Suwito and the leaders of the P3A had begun experimenting with irrigation cycles and wanted to continue to do so in the second season. They attempted to determine an efficient watering schedule based on the minimum water requirement at each stage of the corn cycle and wanted to continue to experiment with the schedule during the second cropping season. Thus, the decision to plant corn as the second crop was easily taken.

Alternative choices of a crop other than rice for the third season were never considered seriously. Farmers customarily planted rice in the demplot land and wanted to continue to do so. The only significant change in the usual pattern was in timing. The farmers usually wait to prepare their sawah (either by tractor or cattle trampling) and to plant seedbeds until there has been adequate rainfall to soften the soil (usually some time in December). Because of the guaranteed water supply at the demplot, farmers there were able to prepare their land as soon as they had finished harvesting their corn. The ground was soggy from the previous season's irrigation and there was a certain supply of water to sustain seedbeds in the demplot. Thus, farmers began planting in the demplot in December and January, ap-

proximately a month before they were able to do so in their plots elsewhere.

With the exception of two farmers, all demplot members used seeds they had saved from previous harvests. These were a combination of HYV such as Cisadane, several IR strains, and C-4. One farmer, the head of the P3A, acquired a HYV with a 90-day growth cycle from another villager with the agreement that they would replenish the supply they used in planting. Although farmers claim that this rice, Cipunegara, has a hard texture and is not as tasty as C-4 and other popular varieties, it is desirable because of its shorter cycle. Theoretically, it enables the farmer to plant palawija earlier in the dry season (in anticipation of producing two irrigated crops).

Nearly 50% of the demplot farmers planted a combination of regular and sticky rice (ketan, or pulut in the local dialect) on their demplot land. While they do not eat sticky rice as a staple (unless it is mixed with other rice), they assumed that their harvest would occur at the time of Lebaran when sticky rice is used to make holiday cakes and demand increases. They estimated that the market price would rise from the usual Rp. 500 to Rp. 1000 per kilogram. (C-4 and other rice produced in the Oesao area sells in Oesao for about Rp. 350 per kilo and between Rp. 375 and 500 in Kupang.) In fact, none of the farmers harvested in time to sell their rice for Lebaran. At the time of the re-survey they had not begun to sell their harvest, but rather were planning to store their rice for consumption and sales as cash becomes necessary.

The decision about the fourth season's demplot crop was determined, in part, by the regional Department of Agriculture office. Pukdale was chosen as one of several villages throughout the Oesao plain to experiment with planting soybeans which were supplied by the government. (The farmers were expected to pay for the seeds; however the method of payment had not been clarified at the time of the consultant's re-survey.) The head of the P3A and at least four other farmers planted soybeans on .01 to

.02 hectare of their demplot land. They were doing so, however, only because this was a government requirement and officials from the Kabupaten level Department of Agriculture office visited the demplot regularly to oversee the care of the soybean crop.

Due to considerable confusion about the extent of the soybean experiment, the demplot farmers did not resolve decisively their fourth cropping schedule. As a group, they tentatively agreed to follow whatever directives they received from the Department of Agriculture regarding soybeans, but they also decided to plant a combination of corn and peanuts or mung beans on part of their demplot land. (More complete information about the fourth cropping season is not available since the majority of farmers were still in the process of finishing their demplot rice harvest at the time of the re-survey and no formal meetings of the P3A were held during this period.)

It is clear that the farmers cannot make educated decisions about cropping patterns without agricultural extension advice. Each meeting in which cropping strategy was discussed, they asked the P2AT staff member, Mr. Suwito, what they should plant; since they assumed that they renew the nutrients in the demplot soil by diversifying the crops planted there. They also expressed concern about the opening of more demplots in the Oesao region with respect to marketing their crops. They assume that other farmer groups will want to repeat the success of the Pukjale demplot by planting green corn; however they fear that the market could be flooded. Thus, at least 5 P3A members have asked that the leaders of P3A groups that are formed at future demplots meet annually to develop a regional cropping strategy.

Planting methods: There was no difference between the procedure for planting rice in the demplot and on land elsewhere. The system used in planting corn, however, was somewhat altered from the usual pattern. Customarily, farmers in the Oesao region plant corn according to the "matahari" (sun) system. This is intended to maximize the amount of sunlight that strikes the

plants. It involves planting the corn in rows that run diagonally east to west. Theoretically the seeds are spaced evenly apart, however farmers do not usually measure the intervals or use string or some other method of guiding them as they plant. Two farmers in the demplot claimed that they use no system whatsoever in their gardens elsewhere, but rather estimate 1 to 1.5 meter intervals between plants.

The PPM and Mr. Suwito of P2AT advised the farmers to plant in parallel rows at intervals of 1 and .5 meters; and they suggested planting two seeds in every hole. This would provide a total yield of 40,000 ears of corn per hectare or a maximum gross of Rp.2,000,000, assuming the price of green corn is Rp.50/ear.

During the first season, less than 50% of the farmers took this advice seriously. They did not plant in orderly rows. In addition, they did not help to facilitate rotational irrigation by coordinating the timing of their planting with the P2AT staff member or the leaders of the P3A. After the first successful harvest, however, they became more interested in following procedures to increase their potential yield. Thus, during the second season, over 80% of the farmers followed the P2AT staff member's advice on planting in rows, spaced 1 x .5 meters apart with two seeds per hole. (There was no difference between methods or procedures for planting rice during the third cropping season at the demplot and those employed at farmers' sawah parcels elsewhere.)

Labor and time allocation

From the farmers' perspective, their participation in the demplot during its first year did not involve unreasonable expenditures of labor or time for themselves or their households. Indeed, one of the principal reasons for the popularity of the demplot was the fact that participants could continue to pursue their normal dry season activities, leaving much of the demplot work to others. This situation was unusual in the sense that the P2AT staff member and the head of the P3A worked in the demplot

full-time helping farmers plant, fertilize, organize water distribution, and so on. Often - especially during the first season when they were more concerned to have a successful harvest than to prepare the farmers for management of the demplot on their own - the P2AT staff member and head of the P3A performed crop maintenance and irrigation tasks on individual parcels rather than wait for the landowners or their representatives to do so.

As has been described in previous reports, male farmers from 87% (20) of the demplot households were occupied throughout some or all of the dry season in other parts of the village tending cattle and garden/orchard land. Women were occupied with home gardens (using water from their household wells), although they were also available to plant, fertilize, oversee children's labor, and collect money from the buyers who came regularly to the demplot to harvest and purchase the corn. At least 50% landowners relied upon relatives (especially adult offspring, sons-in-law, sisters, and brothers) from outside their households to perform all or part of the demplot farming tasks. Arrangements for disposal of the harvest were idiosyncratic, ranging from none to all of the yields going to the individuals who performed the tasks. In 3 cases, adult offspring provided their labor without compensation, using this as an opportunity to contribute to the support of their aged parents.

Owners of large cattle herds were absent from the demplot during at least two months of the dry season because they were tending their herds elsewhere. Labor in their demplot parcels was provided by other relatives, though those individuals were not considered members of the demplot water users association (P3A) and had no formal responsibilities to it.

It was not possible to determine exactly the labor requirements for each stage of a cropping season in the demplot given the disproportionate amount of labor contributed by the P2AT staff member and the head of the P3A as well as the different levels of interest and participation in demplot activities among the farmers. Nonetheless, we can estimate time requirements for

certain stages of crop production based on the irrigation distribution schedule that was developed by the P3A leaders and the P2AT staff member.

Time and effort involved in preparing the land for planting the first crop of corn was considerable given the hard, cracked condition of the soil. Little rain had fallen in the months prior to the opening of the demplot, and little area of the demplot had been planted in rice during the previous season. The land first was flooded with water from the demplot pumping system in order to soften the soil. This took 30-50 hours per hectare depending upon the proximity of each parcel to the pump. This process required that the farmers themselves or, more often, one of the leaders of the P3A tend the walls of the irrigation ditches to channel water to its appropriate destinations. Afterwards the farmers (or other workers) spent at least 100 person hours per hectare turning over the soil with a dibbling stick to prepare and plant it.

For the second planting, however, preparation involved only the clearing away of debris from the previous season which was accomplished within about 10 person hours per hectare. Planting with a dibbling stick took up to 100 person hours per hectare. The time requirement for distributing fertilizer was probably about 20 person hours per hectare, although this was difficult to estimate since, in general, this task was performed by women and children who did not work steadily at the job. Only two farmers used insecticide at their demplot parcels. This task took no more than 8 person hours per hectare. Most farmers (or other workers) spent little or no time weeding their demplot parcels. Those who performed the task at all spent less than 50 man hours over the course of the planting season. (Agriculturalists working at the USAID-sponsored Dryland Agricultural Research Station, LP3T, in Sukabitetek, Timor estimate that weeding corn fields by the traditional squatting method practiced throughout the island takes an average of 450 person hours per hectare.) Harvesting was conducted by outside buyers who brought their own laborers

into the demplot to cut the corn. Thus, the only labor requirement on the part of each household was to oversee the harvesting and receive payment. The time involved was variable, depending upon the number of laborers available to cut the corn, but generally took no more than 20 hours per hectare. In general the wife of the head of household was at home to oversee this activity.

According to the schedule of rotational irrigation developed by the P2AT staff member and the leaders of the P3A, each parcel in the demplot was flooded eight times during the course of one season. Theoretically, each farmer should have been in the demplot to manage water distribution to his parcel; however this task often was performed by the leaders of the P3A and the P2AT staff member. The time requirement for this task depends upon the amount of time it takes to flood each parcel (30 to 50 hours per hectare per flooding or 240 to 400 hours for the entire season).

Demplot owners were responsible for keeping the irrigation ditches on their land clean; and for working together to repair fences around the demplot once each planting season. These tasks were accomplished after the village head ordered the farmers to do them. Regular maintenance of the irrigation system and of the demplot in general has not become a routine function for all P3A members yet. If maintenance tasks were routinized by each demplot household, however, they would take an estimated 15 person hours per hectare.

Farmers also were expected to attend meetings of the P3A which were held approximately once a month and lasted roughly three hours each. It was consistently difficult for the leaders of the P3A to assemble the entire membership for meetings. At least 50% of the members were not in the demplot at the times designated for meetings even though they had been personally invited by one of the group leaders. Thus, meetings were delayed for hours while members already present tried to summon the others. At least one-third of the meetings had to be rescheduled

(usually for late evening or Sunday after church when it was more likely that farmers would be in the vicinity of the demplot).

By the second cropping season, the head of the P3A abandoned attempts to hold regular full group meetings. Instead, he held meetings only with the secretary of the P3A and leaders of each sub-group (5 individuals) since it was easier to work with and to assemble the smaller group. It was then the responsibility of these leaders to convey relevant information to the members of their individual sub-groups.

It is clear from the discussion above that demplot households have not fully realized the time commitment involved in sustaining irrigated dry season agriculture. They have not exerted the maximum effort required to sustain high yields (i.e., through fertilizing and weeding regularly); and they have relied heavily on the leaders of the P3A and the P2AT staff member to ensure that water distribution is managed effectively.

Table 3 provides a rough calculation of estimated labor requirements for irrigated corn production in the demplot.

Table 3
Estimated Time Allocation per Hectare
for Irrigated Dry Season Corn Production and Water Management

	<u>person hours per ha.</u>
Clear land	10
Prepare soil and plant (with dibbling stick)	100
Fertilize (twice/season)	40
Apply insecticide	8
Weed	450
Harvest (supervision only)	20
Water management (average)	320
Demplot maintenance	<u>15</u>
Total estimate:	963

Attendance at approximately 4 P3A meetings/season would increase the estimated time required by each farmer by 12 hours, regardless of the size of his parcel.

This estimate is higher than the actual amount of time farmers (or other workers) can be expected to spend on demplot activities. From our observations it is clear that weeding is not (yet) regarded as a crucial activity. Furthermore, the supervision of water flow is not necessarily a full time job. Farmers who live and/or have gardens near their demplot parcels could be engaged simultaneously in other agricultural or household activities

During the first two cropping seasons, all of the agricultural tasks were conducted by both men and women with the exception of applying fertilizer, which was done only by men. In most of the households, children and grandchildren assisted their parents with all agricultural activities. Only male farmers (and/or their sons) attended P3A meetings, however.

Labor and time allocation during the third cropping season when the farmers planted paddy rice differed significantly from one household to another. As has been discussed in previous reports, landowners generally hire outside laborers to perform some or all tasks associated with rice production. Land preparation either by cattle trampling or tractor is conducted by workers hired by the tractor or cattle owners. One hectare can be prepared by either method within two to five hours depending upon the size of the tractor, number of cattle, and condition of the soil. The number of hours required for 1) planting and transplanting and 2) weeding, tending, and fertilizing the sawah varied considerably, although the average was about 150 person hours each for both. Harvesting took 60-100 person hours. Farmers do not calculate wages in terms of time except in the case of harvesting, however. Rather, they pay laborers by hectare (or portion thereof). Harvesters are paid by day. (See discussion of costs of production below.)

Cost of participation in the demplot

Just as the expenditure of time in demplot activities was less than the amount that will be required in the future, the capital costs of participation in the demplot were unrealistically low during the first year. The farmers did not pay for water use since P2AT covered all operations and maintenance costs. Based on operations of the pumping system during its first year, the P2AT staff member who oversaw demplot activities calculated the hourly operating costs per cropping season (during the dry months) as follows:

- fuel (1.5 ltr/hr @ Rp. 242/ltr)	=	Rp. 363
- oil and grease	=	50
- share of operator's salary	=	100
- " " gate tender's honorarium	=	100
- contribution to P3A savings	=	<u>50</u>
Total		Rp. 663

Using the irrigation schedule developed by the P3A and the P2AT staff member, the demplot would be flooded eight times during one cropping season (for green corn), taking 30 to 50 hours per hectare. At this rate the total seasonal cost of operations per hectare is Rp.159,120 - 265,000.

The majority of farmers did not buy seed, fertilizer, or insecticide, since they had them in storage or, in the case of the latter two inputs, they chose not to use them. Had the farmers purchased the necessary amounts of these inputs, the cost per hectare per season would have been:

- seed (25 kg @ Rp200)	=	Rp. 5,000
- fertilizer (260 Kg of TSP & urea @ Rp100/kg)	=	Rp. 26,000
- insecticide (2 ltr @ 3000/ltr maximum)	=	Rp. <u>6,000</u>
Total		Rp. 37,000

Thus, the total estimated cost of production (including irrigation and agricultural inputs) is Rp. 196,000 to 302,000.

Only one farmer (HH# 1) hired laborers to work on his demplot land during the dry season. These were five Timorese men from kecamatan Kupang Tengah who were paid Rp.850 per day for 12 days (or a total of Rp.51,000) to prepare and plant the farmer's .60 hectare demplot parcel during the first demplot season.

In general, since farmers did not pay for water use and did not purchase agricultural inputs, the cost of demplot participation was negligible. The only fixed cost for all participants was a small fee assessed on each household in the P3A. In an effort to create a fund for future contingencies once P2AT no longer funds the demplot, the P3A agreed to levy a fee of Rp.100 on each .01 hectare planted per season. Thus, each farmer made an obligatory contribution to the water users association at the end of each harvest. This amount was nominal, however, amounting to only Rp.10,000 per hectare per season. Given the average demplot parcel size of .18 ha. farmers paid an average of Rp.1800 per season or Rp.5400 for the entire three-crop year.

P2AT did not pay for the operation of the pumping system during the rainy season when the farmers cultivated paddy rice. Since rainfall was adequate, there was no need to provide supplementary irrigation water except in the case of two farmers (9% of the demplot owners) who planted late and did not get the full advantage of the season's rain. In each case, the farmers themselves paid for the fuel required. This cost them approximately Rp.20,000 (for 82 hours @ Rp242hr) and Rp.10,000 (41 hours) respectively. No other operational costs were assessed. (The pump operator is paid a year-round salary.)

The costs of rice production vary significantly according to the labor and land preparation arrangements made by each household. It was not possible to determine the exact costs of rice production on demplot parcels. This was due to the fact that demplot households own and cultivate sawah in other areas in Pukdale and neighboring villages. They often pay wage laborers

and harvesters for the total amount of labor supplied rather than for work done on each parcel. In addition, the farmers did not purchase inputs separately for their demplot land and they did not pay careful attention to the amounts used at each site. In general, however, the costs of demplot rice production were lower than the costs at other sites for the majority of farmers. Because their parcels are small and close to their homes, demplot families supplied their own labor for all tasks except harvesting, thereby eliminating the cost of sharecropping or hiring laborers to plant, weed, and so on.

The following tables show maximum and minimum costs of rice production based on the various methods of land preparation and payment arrangements. It can be assumed that costs of demplot production are closer to the minimum amounts per hectare given the use of household rather than outside labor. Table 4 summarizes the minimum and maximum costs while Table 5 presents a more detailed summary of the costs of each payment and labor option.

Table 4

Minimum and Maximum Costs of Rice Production per Hectare

	<u>minimum</u>	<u>maximum</u>
1. Land preparation	Rp. 70,000	Rp. 280,000
2. Cultivation	40,000	280,000
3. Harvesting	52,500	87,500
4 Inputs	<u>39,750</u>	<u>68,000</u>
Total	Rp. 202,250	Rp. 715,500

Table 5

Methods and Costs per Hectare of Rice Production

	<u>payment in kind</u>	<u>actual cost or (market value)</u>
1. <u>Land preparation</u>		
Cattle puddling (payment = 1/3 harvest) or	200 - 800 kg.	(Rp 70,000 - 280,000)
Tractor rental		Rp 100,000 - 125,000
2. <u>Cultivation/tending</u>		
Sharecropped (payment = 1/3 harvest) or	200 - 800 kg.	(Rp 70,000 - 280,000)
Hired labor - payment in kind:		
- plant	150 - 200 kg.	(Rp 52,500 - 87,500)
- weed/tend	150 - 200 kg.	(Rp 52,500 - 87,500)
or		
payment in cash:		
- plant		Rp 20,000 - 30,000
- weed/tend		20,000 - 30,000
3. <u>Harvesting</u>		
Hired labor (60 - 100 person-hours/ha @ 2.5 kg milled rice/ person-hour)	150 - 200 kg.	(Rp 52,500 - 87,500)
4. <u>Inputs</u>		
- fertilizer (300 kg/ha @ Rp 100/kg)		Rp 30,000
- insecticide (1-2 ltr @ Rp 1000 - 4000)		Rp 1,000 - 8,000
- seed (25 - 30 kg @ Rp 350-1000/kg)		Rp 8,750 - 30,000

The cost of irrigating paddy rice was not calculated since the demplot irrigation system was not used and is not intended to be used as a primary water source during the dry season. The demplot system was used only briefly (approximately 123 hours in all) to supplement rain water for the parcels of two farmers who planted their sawah late in the season. Given this minimal experience using the demplot for supplementary irrigation, it was not possible to calculate future costs of such usage.

Comparing the minimum and maximum costs of irrigated green corn and rain-fed paddy rice production, it is clear that the former is considerably cheaper.

- Minimum and maximum costs of production:
Rp.196,120 - Rp.302,000 - irrigated corn
Rp.202,250 - Rp.715,500 - paddy rice

On the other hand, there is potentially more flexibility in the method of payment for rice production. With the exception of purchasing inputs, all costs of rice production can be paid in kind. This is particularly desirable for farmers who have limited sources of cash and who do not have a surplus of cattle to sell in order to finance rice production. Up to this time, there has been no discussion by the P3A or P2AT staff of establishing a system of deferred payments or payments in kind for demplot water use. This is an issue that should be considered before P2AT relinquishes its financial responsibilities for the demplot.

Table 6 provides a breakdown of agricultural expenditures by category (absolute values are listed in Table 15: Household Expenditures). It shows that the direct cost of demplot participation (paying the demplot harvest fee) is a relatively small percentage of each household's agricultural expenditures (between .6 and 34.8%, with the mean expenditure at 6.8%). With the exception of household's #1 and 7, all expenditures except the demplot fee were related to rice production and other agricul-

tural activities outside the demplot. In the case of household #1, the farmer spent Rp.51,000 (2% of his total agricultural expenses) on labor for preparation of his demplot land for planting corn. Household #7 spent Rp.8400 (5% of the total) on fertilizer for his demplot corn.

TABLE 6
 CATEGORY OF AGRICULTURAL EXPENDITURE AS A PERCENTAGE OF TOTAL 1985-1986 AGRICULTURAL EXPENDITURE

HH#	Demplot Fee	Labor	Inputs	Tractor	IPEDR Tax	Land Purchase
1	0.6	2.5	0.4	35.8	1.8	58.9
2	1.2		24.8	70.7	3.3	
3	8.1	65.4	24.3		2.2	
4	2.9			73.1	24.0	
5	2.7		23.0	69.4	4.9	
6	13.9	13.9	50.0		22.2	
7	5.8		40.9	45.5	7.8	
8	6.8		12.8	72.5	7.9	
9	3.0		24.0	58.8	14.2	
10	27.8		27.8		44.4	
11	5.3		5.3	75.2	14.2	
12	1.3		14.2	78.9	5.6	
13	2.6		76.9		20.5	
14	28.6		71.4			
15	23.1				76.9	
16	2.6		25.1	61.3	11.0	
17	16.7		56.7		26.6	
18	34.8				65.2	
19			9.1	75.8	15.1	
20	11.1				88.9	
21	2.1	16.1	7.9	73.9		
22	18.2		63.7		18.1	
23			90.0		10.0	

Productivity and disposal of yields

Corn:

The productivity of demplot land increased dramatically with the use of the groundwater irrigation system. For the first time the land was used for agriculture throughout the year. Table 7 presents production data from the first two (dry season) cropping seasons. (See Table 18: Household Income for a list of the earnings from green corn for each household.) Productivity was lower than the maximum possible yield (40,000 ears/hectare) which was based on the assumption that farmers would plant at intervals of 1 x .5 meters, placing two seeds in every hole. Actual yields of the two cropping seasons were 92% (36,918 ears) and 83% (33,352) of the estimated maximum yield respectively. The lower yield of the second season was due to the fact that one landowner planted his second crop over one month after the other farmers and much of his yield was lost when the first rains of the wet season fell in November before his corn was ready to harvest. He owns 1.25 hectares located at the point farthest away from the pump (#8). He generously waited until farmers elsewhere in the demplot had received adequate irrigation to prepare and plant their land during the first cropping season before requesting water for his own parcel. Thus, he began his dry season cropping considerably later than all other demplot farmers.

As Table 7 shows, farmers sold less than half of their yields each season (43% and 21%). This was not due to a marketing problem, but rather to household consumption. Green corn is a favorite snack food; and all demplot families consumed some of their harvest in this form (13% the first season and 16% the second). In addition, farmers saved 43% of the corn from their first harvest and 63% from the second harvest (unhusked and dried on the cob) to be consumed as a supplement or substitute for rice in the event of the failure or insufficiency of their 1985-6 rice crop.

Table 7
First and Second Season Demplot Corn Harvest Yields

<u>Production:</u>	<u>1st crop</u>	<u>2nd crop</u>
Amount of land planted	6 ha	5.34 ha
Total harvested (ears)	221,510	171,170
Average production/hectare (ears)	36,918	33,352
 <u>Market value of yield:</u>		
Market value (green @Rp50/ear)	Rp 11,075,500	Rp 8,558,500
" " " per hectare	Rp 1,845,916	Rp 1,602,715
Market value (dried @15 ears/kg Rp150/kg)	Rp 2,215,099	Rp 1,711,699
Market value dried corn/hectare	Rp 369,183	Rp 320,542
 <u>Actual sales:</u>		
Actual total sold (green @ Rp50/ear)	95,440	35,810
Percentage sold	43%	21%
Total amount of sales	Rp 4,722,000	Rp 1,800,000
Average amount of sales/hectare	Rp 787,000	Rp 337,172
 <u>Consumption:</u>		
Total consumed (ears)	27,760	27,400
Percentage consumed (as green corn)	13%	16%
Total dried for storage (ears)	98,310	107,950
Percentage dried for storage	44%	63%
Total weight of stored corn @ 15 ears/kg	± 6.5 t	± 7, t
Market value of stored corn @ Rp150/kg	Rp 975,000	Rp 1,050,000

Table 8 shows the percentage of individual households' agricultural income contributed by each category of agricultural produce. As it indicates, the contribution of green corn to total agricultural income ranged between 2.4 and 100%; and the mean contribution was 56%.

Table 8
 CATEGORY OF AGRICULTURAL INCOME AS A PERCENTAGE OF TOTAL 1985-1986 AGRICULTURAL INCOME

HH#	Deeplot Corn	Rice	Bananas	Banana Stalks	Betel	Coconuts	Vegetables
1	56.0		6.3			37.7	
2	19.2	19.7	22.8	22.8	3.4	12.1	
3	70.9	5.2		1.5			22.4
4	56.5		36.9			6.5	
5	70.3		13.5			16.2	
6	30.7	13.5	22.1		18.4		15.3
7	100.0						
8	51.6	48.4					
9	33.3	57.2	9.5				
10			100.0				
11	45.8		8.3			1.7	44.9
12	75.0		7.7			5.8	11.5
13	2.4		61.0		12.2	24.4	
14	100.0						
15	21.8		18.2				60.0
16	83.3		16.7				
17	78.0		19.5		2.5		
18	68.2		12.1				19.7
19	100.0						
20	10.5		15.8			73.7	
21	39.9		5.8	50.7	3.6		
22	32.3		32.3		9.6	25.8	
23	32.3						67.7

Table 9 shows the percent of total household income contributed by demplot corn. The mean contribution was 19.7% with a rather dramatic range of 0 to 65.6% among all households. Not surprisingly, it was the head of the P3A (#3) whose corn harvests contributed the highest percentage to total household income. This man devoted himself full time to demplot activities during the dry season and followed the agricultural advice of the P2AT staff member regarding spacing, fertilizing, and so on. The farmer who derived no income from demplot corn is the oldest landowner in the group (#10). He gave full use of his demplot land to various relatives and did not receive any direct benefit from the yield.

Table 9
 Contribution of Demplot Corn Sales to
 Total Household Income

<u>HH#</u>	<u>%</u>
1	11.8
2	11.9
3	65.6
4	33.0
5	29.9
6	3.3
7	12.2
8	28.6
9	16.6
10	--
11	41.0
12	41.9
134
14	30.6
15	8.6
16	2.8
17	27.7
18	19.7
19	18.5
20	10.5
21	23.0
22	9.2
23	31.5

Rice:

Estimates of production levels of rain-fed paddy rice based on information from the initial household survey indicate that farmers expect a gross yield of 600 to 2400 kg. of milled rice per hectare. The survey showed that the 1984-5 rice crop was considerably lower for the households who planted rice that year. (See consultant's Monitoring Report No. 2.) This was due to inadequate rainfall at the beginning of the wet season in November (approximately 50mm.) after which little rain fell until the latter half of December (316 mm.). Since farmers generally make decisions about planting seedbeds in November, many of them were discouraged at the start of the season from planting all or some of their sawah. 39% of the households did not plant rice at all; and of those who planted, 26% planted 20-80% less land than they had in previous years. According to their reports, only six of the demplot households (26%) reached self-sufficiency levels in 1984-5.

By contrast, 100% of the demplot households planted rice in 1985-6. Rainfall in November and December was spread more consistently throughout this period (approximately 154 and 170 mm. over the two months) and farmers felt more confident that the season's rains would support a rice crop. Farmers were particularly confident about planting at the demplot since they were guaranteed supplementary water in the event of rainfall shortages.

Table 10 shows rainfall levels during the rainy seasons (November through April) of 1984-5 and 1985-6 as well as the average levels from the years 1980-5 from the Babao collection station (located approximately four kilometers from the demplot. Of the sources of rainfall information for the Oesao region that were available, this is the most consistently and accurately reported. (See discussion in the consultant's Monitoring Report No. 2.).

Table 10
Wet Season Rainfall Levels Measured at Babao

	<u>Avg. 1980-5</u>		<u>1984-5</u>		<u>1985-6</u>	
	days	mm	days	mm	days	mm
November	8	138	7	43	6	154
December	12	239	20	316	11	170
January	13	342	8	241	23	663
February	16	364	14	314	14	305
March	10	197	6	101	10	155
April	6	84	8	72	6	65

In general, all farmers said that the rice yields on their demplot parcels were greater than those at their other sawah locations. The primary reason for this was that farmers planted their demplot sawah first. They planted seedbeds in the demplot in November and transplanted one month later. Elsewhere, most of the farmers did not begin planting seedbeds until late December and their crops suffered from a lack of rain during the latter half of the crop cycle (after March). In the two cases mentioned earlier, farmers who had planted their demplot crop late were able to supplement their water supply using the demplot irrigation system; however there was no such back-up for land elsewhere.

It was not possible to obtain separate information regarding crop yields at farmers' demplot and other sites in all cases. While most farmers could state the size of the yield at each of their sites, this information was of little use without the additional data regarding labor costs given the significant level of harvest shares provided to outside workers. As previously mentioned, the majority of farmers could not provide an accurate

accounting of the differential labor costs from one site to another because they employed the same laborers and paid them in aggregate amounts for work at more than one location. All farmers stated that their yields were higher on the demplot sawah than at other sites, although we could determine the accuracy of this assertion for only seven households (30%) who had separate accounts of labor and input costs.

Table 11 provides comparative rice production information for the seven households from whom we obtained separate accounts for each of their sawah. The yields from their demplot land are compared 1) to the combined yield from their other sites for the same season and 2) to the combined yield for all sites during the previous (1984-5) season. In all of these cases, the farmers either did not plant or did not realize a harvest in their demplot parcels during that season. The differences between yield levels are significant in every case, ranging from 23% to over 400% greater at the demplot in 1985-6.

Table 12 presents production information for the combined sawah of all demplot owners.

Table 11

RICE PRODUCTION IN DEMPLOT PARCELS, 1985-1986

HH#	Demplot Land Planted (Ha)	Gross Yield (Kg)	Est. Gross Yield/Ha (Kg)	1985-6 Yield/Ha on other Land (Kg)	1984-5 Yield/Ha (Kg)
4	.16	300	1,875	1,332	-----
5	.27	600	2,222	1,800	720
6	.17	576	3,388	1,334	533
7	.20	480	2,400	900	405
8	1.46	5,342	3,659	2,347	-----
16	.13	522	4,015	1,053	190
20	.14	180	1,286	251	200

Average estimated gross yield/ha on demplot land 1985-6: 2,692 kg

Average estimated gross yield on other land 1985-6: 1,288 kg

Average estimated gross yield on all land 1984-5: 410 kg

Table 12

RICE PRODUCTION 1985-6

A HH#	B HH Size	C Total (ha)	D Gross (kg)	E Market Value* (D × Rp350/kg)	F Yield/Ha (D/C)	COSTS			NET YIELD		
						G Labor (Kg)	H Labor* (G × Rp350/kg)	I Inputs, tractor, Labor*	J Market Value* [E - (H + I)]	K Net Per Capita*	L Est. Profit (J/E)
1	7	12.00	20,000	Rp7.000	1,667	6,750	Rp2.363	Rp1.235	Rp3.402	Rp.486	49%
2	9	4.50	10,800	3.780	2,400	958	.335	.656	2.789	.310	74%
3	7	.89	2,710	.949	3,045	695	.243	.109	.597	.085	63%
4	5	1.16	1,662	.582	1,433	954	.334	.076	.172	.034	30%
5	3	1.27	2,400	.840	1,890	900	.315	.168	.356	.119	42%
6	3	.75	1,350	.473	1,800	990	.347	.016	.110	.037	23%
7	9	.70	930	.326	1,326	440	.154	.093	.079	.009	24%
8	10	2.96	8,862	3.102	2,994	974	.341	.353	2.408	.240	78%
9	4	2.50	3,290	1.152	1,316	290	.102	.170	.880	.220	76%
10	4	1.00	270	.096	270	180	.063	.005	.028	.007	29%
11	5	1.50	1,440	.504	960	690	.242	.107	.252	.050	50%
12	5	4.50	5,400	1.890	1,200	3,600	1.260	.295	.335	.067	18%
13	4	2.50	2,700	.945	1,080	1,665	.583	.030	.332	.083	35%
14	2	.50	700	.245	1,400	467	.163	.005	.077	.039	29%
15	10	2.50	3,000	1.050	1,200	815	.285	.022	.743	.074	71%
16	5	2.15	2,628	.920	1,222	654	.229	.165	.526	.105	57%
17	8	.18	360	.126	2,000	120	.042	.017	.067	.008	53%
18	6	1.50	1,850	.648	1,233	890	.312	. .	.336	.056	52%
19	9	2.50	1,950	.683	780	1,350	.473	.112	.098	.011	14%
20	5	4.00	1,150	.403	288	550	.193	. .	.210	.042	52%
21	6	2.03	1,920	.672	946	582	.204	.229	.239	.040	36%
22	8	2.00	2,670	.935	1,335	1,770	.620	.021	.294	.037	31%
23	5	2.00	840	.294	420	660	.231	.033	.030	.006	10%

* All amounts in Rp1,000,000

In Table 12, Column D shows the total gross yield for each household. Column F, which lists yields per hectare, shows that productivity differed considerably from one household to another. Gross yields ranged from 288 to 3,045 kg. milled rice, while the mean level was 1,335 kg/ha.

Columns G and I show the actual costs of production. Payments in kind to laborers and sharecroppers are converted to their estimated market value (@ Rp.350/kg.) in Column H. The cash inputs into rice production - tractor rental, agricultural inputs, and laborers' wages - are listed in Column I.

Column J shows the estimated net market value of each household's yield. This is divided by size of household in each case to determine the net per capita yield (Column K). While the farmers themselves do not determine the success of their harvests in terms of the market value of their yields, this measure does enable us to determine whether households have reached self-sufficiency. As discussed in some detail in the consultant's Monitoring Report No. 2, families regard an average .5 kg. as the daily per capita rice requirement. At a market value of Rp.350/kg. the daily per capita requirement is Rp.175 or Rp.63,875 annually. At that level, only 10 (43%) reached self-sufficiency in 1985-6. There is not a comparable comprehensive measure for rice production in previous years. Nevertheless, by farmers' own reckoning, nine households (39%) reached self-sufficient levels of production in 1983-4 while only six (26%) were self-sufficient in 1984-5.

Two households, #3 and #8 exceeded the expected maximum the rice production level of 2400 kg. The heads of household are the head of the P3A and his father respectively. In both cases, their families provided all labor except harvesting and they both used adequate fertilizer and insecticide. Both planted the fast-growing (90-day) HYV, Cipunegara on much of their land. They claimed that the success of their harvests was due to the fact that their rice received adequate rainfall throughout the entire

growth cycle since they planted in late December and had the benefit of three months of sufficient rain.

Farmers whose yields were lower than expected rates (#10, 20, and 23) complained of damage by plant hoppers, of a lack of labor to weed and harvest, and of a lack of rain during the final weeks of the growing cycle. Only one of these farmers used fertilizer.

Profit potential of corn and rice:

Considering the estimated market value of green corn (Rp.50/ear @ 40,000 ears/ha.) the maximum gross is Rp.2,000,000. If the corn is dried and sold, the maximum gross is Rp.400,050 (based on a calculation of 2.667 tons/ha @15 ears/kg times the market price of Rp.150/kg.) Using these as maximum and minimum figures, the estimated net profits for irrigated corn can be compared to those for rice. The estimated range of rice yields/hectare of 600-2400 is used here since this conformed to the information provided by all demplot farmers regarding their experience in the past, including those whose yields exceeded the maximum expected amount this year. Given the estimated market value of Rp.350/kg., the range of gross income from rice production is Rp.210,000 to Rp.840,000.

Table 13
Profit/loss Potential for Green Corn and Paddy Rice

	<u>Irrigated green corn</u>		<u>Rain-fed paddy rice</u>	
	1 minimum	2 maximum	3 minimum	4 maximum
a Gross yield	Rp 400,050	2,000,000	210,000	840,000
b Prod. costs	196,120	302,000	202,250	715,500
	(1a - 2b)	(2a - 1b)	(3a - 4b)	(4a - 3b)
c Net	98,050	1,803,880	-505,500	637,750

The range of potential net profits and losses is large if the extreme possibilities are calculated (maximum gross minus minimum production costs as the highest and minimum gross minus maximum production costs as the lowest). While the deficit of Rp.505,500 listed as the minimum net for rice production is extreme, it does indicate that there are theoretically greater risks involved in rice production than in corn; just as there are higher profits possible in green corn production. It is important to note, however, that there was an unlimited market for green corn at the time of the demplot harvests because no other area in the Oesao-Kupang was producing this crop.

III. Social and Financial Status

Participation in the demplot did not affect significantly the social or financial status of demplot households. None of the households expected at the outset of their participation in the demplot that they would make money from this enterprise, so they did not make special plans for the expenditure of increased income.

In fact, in the majority of cases, demplot earnings took the place of money they normally expect to earn from selling rice. 35% of the households claimed that they used their earnings to pay for tractor rental for the 1985-6 rice cropping season; and 26% of the households said their demplot earnings saved them from having to sell off livestock or borrow money from relatives to purchase rice. All households could state specifically how their demplot earnings were used. Their responses are presented in Table 14.

Table 14
Use of Demplot Earnings

	<u>Number of hh</u>	<u>%</u>
Tractor rental for sawah preparation	8	35
Food purchases	6	26
Contributions to extended family	3	13
Small home improvements	2	9
Purchase of gold jewelry	2	9
Clothing purchases	1	4
Purchase of tape recorder	<u>1</u>	<u>4</u>
Total	23	100%

After conducting the baseline survey of demplot households the consultant ranked them according to their ownership of productive resources. Only one household had significant changes in productive property ownership; however there were no major adjustments in the overall household ranking.

The only notable change in productive property occurred in the case of household #1. This family is ranked highest in terms of productive resource ownership. During the past year the family traded one of their three tractors for 20 head of cattle. They also sold 30 head of cattle in order to purchase 2.5 hectares of sawah in Oesao, to pay for repairs on their two remaining tractors and to contribute to the wedding of an extended family member. (See Table 15 for a complete list of household expenditures and Table 18 for sources and amounts of household income.)

12 households (52%) reported that they sold cattle during the year, however these sales did not have a marked impact on their total cattle holdings due to the natural increase in their herds. The only significant overall change in cattle ownership was the case of household #16 in which the 77 year old head of household reported that his herd had been reduced from approximately 450 head to under 60 within the year due to theft by members of his family.

Expenditures

The distribution of household expenditures remained roughly the same as that of the previous year. As Table 16 shows, household expenses, agricultural expenses, and contributions to church and family were the principal categories of expenditures for all households.

Table 17 shows per capita expenditures in 1984-5 and 1985-6 for each household. It also lists by household the rupiah amount of the change between total expenditures for each of those years. Changes in expenditures from 1984-5 to 1986-6 ranged between a net decrease of Rp. 1,046,000 to a net increase of

Rp.222,000. The mean change was an increase in expenditures of about Rp.46,000 between the first and second years. The most significant change - the decrease of Rp. 1,046,000 in the case of demplot owner #16 - was due to an extraordinary expense in 1984-5 (the purchase of a house in Kupang for his daughter). Other, more routine changes in expenditures are discussed below.

Household: Although 16 (70%) households registered net changes of 20% or more in the percentage of expenditures represented by household expenses, these were not based on significant alterations in consumption patterns. There were two principal reasons for the changes. 1) In the case of increases in 1985-6, these occurred primarily because households were compelled to purchase large quantities of rice due to the shortage of production the previous year. 2) With respect to decreases in expenditures in 1985-6, the cause was an increase in the amount of goods the households exchanged or bartered rather than purchased outright in the local market.

Agricultural expenditures: As has been discussed above, the only new category of agricultural expenditure resulting from demplot participation was the P3A post-harvest subscription fee. This, however, represented a small percentage of overall agricultural expenditures. There were no significant increases in agricultural expenditures, although there were 5 cases (22%) in which expenditures rose between 20 and 45%. In each case this was due to tractor rental which had not occurred the previous year.

Contributions to church and family: Contributions to the church are relatively stable from year to year. Differences in the nature of contributions (cash, rice or livestock) may occur; however the value of these donations remains more or less constant.

Contributions to family members vary considerably depending upon the number of major rituals (weddings and funerals) that occur each year. In 1985-6 74% of the demplot households pro-

vided money to family members, as compared to 91% the previous year. On the other hand, during both years 100% of the demplot households provided ten or more kilograms of rice and/or one or more head of cattle to relatives.

A new category of contribution was added this year in the form of a village donation. Each household was assessed an extraordinary obligatory contribution of Rp.5000 to help defray the cost of constructing a village meeting hall. This project was undertaken during the month of August, 1985 as part of the "AKABRI Masuk Desa" program whereby young graduates of the national military academy in Jakarta came to NTT to assist in short-term village development projects.

Livestock: In 1984-5 only one household purchased livestock. During the past year, however, 7 (30%) of the households purchased horses and/or small animals - goats, pigs, and chickens. In general these purchases were intended to restore stock that had been depleted over the course of the year due to their use as contributions or to mortality. One farmer (#9) purchased 120 chicks for Rp.60,000 to restore a flock that had been decimated due to Newcastle disease the previous year. Three months after the purchase all the new chickens had succumbed to the same disease.

Table 15
HOUSEHOLD EXPENDITURES 1985-86*

Category of Expenditure	Household Number										
	1	2	3	4	5	6	7	8	9	10	11
AGRICULTURE											
Genplot Fee	.022	.011	.011	.003	.005	.005	.009	.028	.006	.005	.00
Labor	.097		.089			.005					.00
Inputs	.015	.206	.033		.042	.018	.063	.053	.049	.005	.00
Tractor	1.364	.587		.076	.127		.070	.300	.120		.10
IPEDA Tax	.067	.026	.003	.025	.009	.000	.012	.033	.029	.008	.00
Land Purchase	2.250										
(SUBTOTAL)	(3.815)	(.830)	(.136)	(.104)	(.183)	(.036)	(.154)	(.414)	(.204)	(.018)	(.10)
LIVESTOCK PURCHASE											
Cattle											
Chickens					.002				.060		
Goats		.162					.012				
Horses	.150	.150									
Pigs											
(SUBTOTAL)	(.150)	(.312)			(.002)		(.012)		(.060)		
HOUSEHOLD											
Food/Supplies	.750	.500	.720	.156	.320	.280	.560	.550	.230	.104	.20
Clothing	.150	.080	.110	.050	.040	.100	.300	.080	.080		.00
Electricity		.030	.024				.018	.024	.021		.00
(SUBTOTAL)	(.900)	(.610)	(.854)	(.206)	(.360)	(.380)	(.878)	(.574)	(.331)	(.104)	(.20)
EDUCATION	(.070)	(.050)	(.050)	(.350)			(.138)	(.100)	(.030)		
CONTRIBUTIONS											
Church	.050	.050		.035	.006	.012	.023		.010	.018	.10
Family	.900	.200		.355	.195	.675	.040	.025	.115	.100	.00
Village	.010	.005	.005	.005	.005	.005	.005	.010	.005	.005	.00
(SUBTOTAL)	(.960)	(.255)	(.005)	(.395)	(.206)	(.692)	(.068)	(.035)	(.130)	(.123)	(.10)
MEDICAL		(.010)				(.015)		(.011)			
RECREATION											
Stimulants		.050	.100			.025		.040	.030	.020	.00
Transport		.030		.010		.015	.060	.020	.015		.00
(SUBTOTAL)		(.080)	(.180)	(.010)		(.040)	(.060)	(.060)	(.065)	(.020)	(.00)
OTHER											
Gold Purchase	.200	.100	.100								
Rice Mill Repair											
Radio, Television					.125						
Repay Loans											
(SUBTOTAL)	(.200)	(.100)	(.100)		(.125)						
TOTAL EXPENDITURES	6.095	2.247	1.325	1.065	.876	1.163	1.310	1.194	.820	.265	.60

* All amounts in Rpl.000.00

	12	13	14	15	16	17	18	19	20	21	22	23
7	.004	.001	.002	.003	.005	.005	.008		.005	.006	.006	
7	.045	.030	.005		.048	.017		.012		.045	.021	.063
0	.250				.117			.100		.022		
9	.018	.008		.010	.021	.000	.015	.020	.040	.207	.006	.007
3)	(.317)	(.039)	(.007)	(.013)	(.191)	(.030)	(.023)	(.132)	(.045)	(.280)	(.033)	(.070)
		.010					.005					
		(.010)					(.005)					
0	.380	.120	.066	.180	.400	.120	.110	.075	.250	.280	.260	.210
5	.020	.050		.050	.060	.075	.150	.035	.030	.075	.050	
9	.015		.012	.018	.030		.012		.035	.036	.020	
3)	(.415)	(.170)	(.078)	(.248)	(.490)	(.195)	(.672)	(.110)	(.315)	(.381)	(.330)	(.210)
		(.030)		(.060)		(.080)	(.085)	(.025)	(.100)	(.065)	(.070)	
0	.050	.075		.020	.015	.015	.100				.025	
5	.040	.020		.100	.150		.050	.010	.075	.300	.025	.215
9	.005	.005	.005	.005	.005	.005	.005	.005			.005	.015
0)	(.095)	(.100)	(.005)	(.125)	(.173)	(.020)	(.155)	(.015)	(.075)	(.300)	(.055)	(.230)
						(.200)				(.050)		
5	.015	.025		.025				.010			.020	
0	.010	.015		.010	.020		.030		.008		(.020)	
5)	(.025)	(.040)		(.035)	(.020)		(.030)	(.010)	(.008)			
										.050		
	.125			.180								
	(.125)			(.100)						(.050)		.100
3	.977	.389	.090	.581	.874	.525	.970	.292	.543	1.126	.508	.610

Table 16'

CATEGORY OF EXPENDITURE AS PERCENTAGE OF TOTAL 1985-1986 EXPENDITURES

HH#	HH Size	% Agriculture	% Livestock	% Household	% Education	% Contributions	% Medical	% Recreation	% Other
1	7	62.5	2.6	14.8	1.1	15.7			3.3
2	9	36.9	13.9	27.1	2.2	11.5	0.5	3.6	4.5
3	7	10.3		64.5	3.8	0.4		13.5	7.5
4	5	9.9		19.3	32.8	37.1		0.9	
5	3	20.9	0.3	41.2		23.5			14.3
6	3	3.1		32.7		59.5	1.3	3.4	
7	9	11.8	0.9	67.0	10.5	5.2		4.6	
8	10	34.7		48.0	8.4	2.9	1.0	5.0	
9	4	24.9	7.3	40.3	3.7	15.9		7.9	
10	4	7.8		38.8		45.9		7.5	
11	5	20.0		47.5		27.2		5.3	
12	5	32.4		42.5		9.7		2.6	12.8
13	4	10.0	2.6	43.7	7.7	25.7		10.3	
14	2	7.8		86.7		5.5			
15	10	1.7		42.9	10.4	21.6		6.1	17.3
16	5	21.4		56.4		19.9		2.3	
17	8	5.7		37.2	15.2	3.8	38.1		
18	6	2.4	0.5	69.3	8.8	15.9		3.1	
19	9	45.2		37.7	8.6	5.1		3.4	
20	5	8.3		58.0	18.4	13.8		1.5	
21	6	24.9		33.9	5.8	26.6	4.4		4.4
22	8	6.5		65.0	13.8	10.8		3.9	
23	5	11.5		34.4		37.7			16.4

Table 17

Household and Per Capita Expenditures 1984-5 & 1985-6 (in million rupiah)

HH##	HH Size	Total Expend. 1984-5	Total Expend. 1985-6	Per Cap. Expend. 1984-5	Per Cap. Expend. 1985-6	Change in Per Cap. Expend. 1984-5 to 1985-
1	7	4.952	6.095	.707	.871	+ .164
2	9	1.605	2.247	.178	.250	+ .072
3	7	.882	1.325	.126	.189	+ .063
4	5	.573	1.065	.115	.213	+ .098
5	3	.612	.876	.204	.292	+ .088
6	3	.499	1.163	.166	.388	+ .222
7	9	1.296	1.310	.144	.146	+ .002
8	10	2.164	1.194	.216	.119	- .097
9	4	.625	.820	.156	.205	+ .049
10	4	.473	.265	.118	.066	- .052
11	5	.464	.663	.092	.133	+ .041
12	5	.350	.977	.070	.195	+ .125
13	4	.553	.389	.138	.097	- .041
14	2	.043	.090	.022	.045	+ .023
15	10	.488	.581	.049	.058	+ .009
16	5	6.095	.864	1.219	.173	- 1.046
17	8	.193	.525	.024	.066	+ .042
18	6	.469	.970	.078	.162	+ .084
19	9	.215	.292	.024	.032	+ .008
20	5	.315	.543	.063	.109	+ .046
21	6	.720	1.126	.120	.188	+ .068
22	8	.666	.508	.083	.064	- .019
23	5	.285	.610	.057	.122	+ .065

Income

As has been discussed in previous reports, household income and expenditures are conditions of one another. The amount of agricultural produce sold each week depends upon current household needs, just as the amount of routine and extraordinary purchases depends, in part, on the extent of agricultural production and/or the availability of livestock to sell. In addition, households often exchange produce for household goods and foodstuffs; and they are not fully aware of the market value of these transactions. Thus, the values of income and expenditures do not reflect clearly households' productive capacity or consumption patterns.

Table 18 provides a list of sources of income for each household. Table 19 shows the percentile distribution of the contributions to household income made by aggregate sales of agricultural produce, livestock sales, tractor rental, family assistance, and other sources. As in 1984-5, the principal sources for the majority of households were agriculture, livestock, and family assistance. The most significant change in income distribution relating to demplot participation was in the increase of 9% (from 91% to 100%) of the households reporting that they derived some portion of their income from agriculture. In each case (HH# 7 and 14), the sole source of agricultural income in 1985-6 came from demplot corn.

In 8 households (35%) there were notable changes in the percentile distributions. In general, these were the result of shifts in the balance from contributions of sales of livestock to agriculture or vice-versa. In three cases (#8, 11, and 17) the demplot corn replaced livestock sales as the primary source of household income.

Table 10

HOUSEHOLD INCOME 1985-1986*

Income Source	Household Number								
	1	2	3	4	5	6	7	8	
AGRICULTURE									
Deeplot Corn	.890	.252	.950	.275	.260	.050	.275	.400	.1
Rice		.260	.070			.022		.375	.3
Bananas	.100	.300		.180	.050	.036			.0
Banana Stalks		.300	.020						
Betel		.045				.030			
Coconut	.600	.160		.032	.060				
Vegetables			.300			.025			
(SUBTOTAL)	(1.590)	(1.317)	(1.340)	(.487)	(.370)	(.163)	(.275)	(.775)	(.5
LIVESTOCK									
Cattle	5.450	.700			.500	1.300	.295	.620	.5
Chickens/Eggs									.0
Goats		.100							
Pigs									
Horses									
(SUBTOTAL)	(5.450)	(.800)			(.500)	(1.300)	(.295)	(.620)	(.5
TRACTOR RENTAL	(.500)								
FAMILY ASSISTANCE				(.076)		(.039)			
OTHER									
Wage Labor									
Honoraria (gov't)			.084						
Pension									
Salary (teacher)							1.680		
Jewelry Sales			.025						
Cake Sales				.270					
Crochet									
Woven Mats									
House Kiosk									
(SUBTOTAL)			(.109)	(.270)			(1.680)		
GROSS INCOME	7.540	2.117	1.449	.833	.870	1.502	2.250	1.395	1.0
- TOTAL EXPENDITURES	6.905	2.247	1.325	1.065	.876	1.163	1.310	1.194	.8
NET INCOME	.635	-.130	.124	-.232	-.006	.339	.940	.201	.2

* All amounts in Rp1,000,000

	10	11	12	13	14	15	16	17	18	19	20	21	22	23
		.275	.390	.002	.033	.060	.100	.160	.225	.050	.050	.275	.050	.200
	.040	.050	.040	.050		.050	.020	.040	.040		.075	.040	.050	
		.010	.030	.010				.005			.350	.350	.015	
)	(.040)	(.600)	(.520)	(.082)	(.033)	.165 (.275)	(.120)	(.205)	.065 (.330)	(.050)	(.475)	(.650)	(.155)	.420 (.620)
	.020	.040	.060	.030	.050	.300	3.500	.030	.270	.050				.015
	.010	.010				.020			.026	.060				
)	(.040)	(.070)	(.060)	(.030)	(.050)	(.320)	(3.500)	(.030)	.033	.010				(.015)
									.100	(.220)				
	(.300)		(.350)	(.300)	(.025)	(.100)		(.300)				(.350)	(.300)	
									.264				.090	
								.012				.156		
								.030	.170					
								(.042)	.052			(.156)	(.090)	
	.380	.670	.930	.412	.108	.695	3.620	.577	1.145	.270	.475	1.196	.545	.635
	.265	.663	.977	.389	.090	.581	.874	.525	.970	.292	.538	1.126	.508	.610
	.115	.007	-.047	.023	.018	.114	2.746	.052	.175	-.022	-.063	.070	-.037	.025

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Table 19
 CATEGORY OF INCOME AS PERCENTAGE OF TOTAL 1985-1986 INCOME

HH#	# in HH	Total Income in Million Rupiah	Agriculture	Livestock Sale	Tractor Rental	Family Assistance	Other
1	7	7.540	21.1	72.3	6.6		
2	9	2.117	62.2	37.8			
3	7	1.449	92.5				7.5
4	5	.833	58.5			9.1	32.4
5	3	.870	42.5	57.5			
6	3	1.502	10.9	86.5		2.6	
7	9	2.250	12.2	13.1			74.7
8	10	1.395	55.6	44.4			
9	4	1.055	49.8	50.2			
10	4	.380	10.5	10.5		79.0	
11	5	.670	89.6	10.4			
12	5	.930	55.9	6.5		37.6	
13	4	.412	19.9	7.3		72.8	
14	2	.108	30.6	46.3		23.1	
15	10	.695	39.6	46.0		14.4	
16	5	3.620	3.3	96.7			
17	8	.577	35.5	5.2		52.0	7.3
18	6	1.145	28.8	28.7			42.5
19	9	.270	18.5	81.5			
20	5	.475	100.0				
21	6	1.146	57.7			30.3	13.5
22	8	.545	28.4			55.0	16.6
23	5	.635	97.6	2.4			

Table 20 shows the change in per capita income from 1984-5 to 1985-6. 83% of the households showed net increases ranging from under Rp.5000 to over Rp.300,000. The most significant decrease occurred in the case of household #16. In this instance, in 1984-5 the head of household had sold Rp.5,000,000 worth of cattle in order to purchase a house in Kupang for his daughter; and this purchase distorted the per capita income figure for his household that year.

Other increases in per capita income reflect only indirectly the contribution by demplot corn sales. At this point it is premature to determine the extent to which production of secondary crops during the dry months of the year will affect per capita income. As has been emphasized throughout this and previous reports, income and expenditures are somewhat artificial and may not be the most accurate measures of changes in the standard of living in most households. Rather, it is important to determine how money from secondary crop production is utilized and to determine the extent to which it enables households to expand and protect their productive resources.

Table 20

Household and Per Capita Income 1984-5 & 1985-6 (in million rupiah)

HH#	HH Size	Total Income 1984-85	Total Income 1985-86	Per capita Income 1984-85	Per capita Income 1985-86	Change in Per Cap. Income 1984-5 to 1985-6
1	7	4.960	7.540	.708	1.077	+ .369
2	9	2.550	2.117	.283	.235	- .048
3	7	.915	1.449	.130	.207	+ .077
4	5	.590	.833	.118	.166	+ .048
5	3	.612	.870	.204	.290	+ .086
6	3	.507	1.502	.169	.501	+ .332
7	9	1.640	2.250	.182	.250	+ .068
8	10	2.200	1.395	.220	.139	- .081
9	4	.655	1.055	.164	.264	+ .100
10	4	.372	.380	.093	.095	+ .002
11	5	.470	.670	.094	.167	+ .073
12	5	.335	.930	.067	.186	+ .119
13	4	.568	.412	.142	.103	- .039
14	2	.091	.108	.046	.054	+ .008
15	10	.461	.695	.046	.070	+ .024
16	5	6.500	3.620	1.300	.724	- .576
17	8	.197	.577	.025	.072	+ .047
18	6	.580	1.145	.097	.191	+ .094
19	9	.210	.270	.023	.030	+ .007
20	5	.340	.475	.068	.095	+ .027
21	6	.785	1.146	.131	.191	+ .060
22	8	.511	.545	.064	.068	+ .004
23	5	.325	.635	.065	.127	+ .062

IV. Conclusion

At the end of the re-survey interview at each demplot household, the consultant asked the respondents to discuss the experience of participating in the new groundwater irrigation project over the course of its first year. This provided an opportunity for them to offer suggestions that might be useful in improving operations of the existing demplot and in establishing new sites elsewhere. It also provided the farmers with a chance to express any concerns or complaints that they might not articulate in P3A meetings or in casual encounters with the consultant or P2AT staff members.

In general, all participants in the project were pleased with the irrigation system. They all derived profits in cash and/or in kind from the corn they produced and felt that the demplot had provided them with the guarantee that future production of rice on their parcels there would be successful. Given the cultural importance of producing rice - even at financial risk - this latter benefit of the demplot is especially important to the farmers.

On the other hand, nearly 50% of the farmers commented during the final interview that they would consider abandoning the production of rice altogether on their demplot parcels if there were other more profitable crops (such as green corn) that could be grown there. From their perspective the principal problem with diversifying and expanding the crops produced is the lack of expert agricultural advice available to them. They were unanimously laudatory of Mr. Suwito, the P2AT staff member who oversaw all demplot operations; however they know that his agricultural experience and knowledge are limited. Their experience with the local agricultural extension service has been negative throughout the first year of the demplot's existence;

and the farmers are pessimistic about the chances of any improvement in the future. It was especially discouraging to them that the local extension headquarters (BPP) is only a kilometer away from the demplot but the PPLs and PPM have not made an effort to participate in demplot activities.

The other primary concern is related to the problem of equity. The Pukdale farmers have a strong sense of equal rights and access to public benefits. Thus, they believe that all members of the demplot group should pay in exact proportion to the amount of land they own in the irrigation command area. Knowing that pumped water takes varying amounts of time to reach each parcel, the farmers are particularly concerned that later-when P2AT is no longer directly involved - those whose land lies farthest from the pump will bear more of the financial burden of pump operations. None of the farmers have considered an alternative to the most apparent payment mechanism (paying for water use by the hour) and seem to be waiting for P2AT to help them devise a more equitable payment scheme.

When they were asked whether they would be willing (and able) to pay for their share of pumped water in the future, all of the farmers said they felt they had no choice. 19 (83%) of them added that no matter what sacrifices they would have to make (i.e., selling cattle or other livestock), they would find money to pay for irrigation. Most of them said that they "must" take advantage of the new water supply since it has been provided to them (and not to others) free of charge or obligation by P2AT. This indicated not they they feel forced to participate in the project but that they have a moral commitment to utilize a scarce resource to which they have access. It is important to note, however, that the P2AT staff have not discussed the cost of irrigation with the farmers, so the latter do not have a clear understanding of their future financial obligations.

Four of the farmers, all of whom rank in the lowest grouping of demplot participants in terms of ownership of productive

resources, said that they did not know how they would be able to afford the cost of irrigation in the future. All of them suggested that P2AT continue to fund demplot operations for as long as possible.

This contrasted with the comments of the majority of farmers who are more financially secure (in terms of their ownership of productive property) who asserted that sustaining demplot operations is their own responsibility. 48% of the respondents suggested that the P3A begin raising its post-harvest subscription fee as a way to accustom the farmers to payment for water in the future. As might be expected, none of those who suggested this raise were among the members of the lowest economic group of demplot participants.

The consultant's final report (No. 5) discusses these and other suggestions in more detail. It also describes lessons learned from the first year's experience of developing and operating the demplot from the perspective of both the farmers and the implementing agency, P2AT. It is clear from the response of all participants in the demplot that they are enthusiastic about continuing to utilize the new irrigation system, but that they are ill-prepared in terms of agricultural expertise, experience in water management, and in estimating the opportunity costs and benefits of demplot participation. As the household surveys have shown, all farmers in the sample are willing to pay high costs for the production of rice because of the importance of producing their own supply of the staple. Thus, the challenge of sustaining the participation this group of farmers is not that they cannot afford to pay for irrigation. Rather, they must develop an acceptable payment system which they believe is equitable and which they are committed to support.

Annex A

Household Re-Survey Instrument

Tanggal _____

Socio-economic Survey - Follow-up
Survei Sosio-ekonomi - Tindakan Lanjutan

1. Number of residents in the household:

Jumlah orang di rumah:

Number of residents currently in school:

Jumlah yang masih sekolah:

2. Has there been any change in the number of household residents since the last interview? Explain (births, deaths, marriage out, etc.) Have there been any visitors from (or visits by household members) outside the area?

Apakah ada perubahan dalam jumlah orang yang tinggal di rumah sejak wawancara pertama pada tahun lalu? (Menjelaskan - ada orang meninggal, lahir, kawin, pindah, dsb.) Apakah ada tamu dari luar (atau ada orang dari keluarga ini yang pergi jauh)?

3. Has this household held any ceremonies (i.e., marriage, funeral, baptism, etc.) in the past year? If so, state the cost, number of livestock slaughtered, etc. What did other households contribute?

Apakah ada upacara (perkawinan, penuburan, pembaptisan, dsb.) sejak wawancara pertama?
Bila ada, menjelaskan ongkosnya, jumlah ternak yang dipotong, dsb.
Apa (dan berapa) yang disumbangkan oleh orang lain?

4. List purchases (of household effects, clothing, tools, gifts, etc.) and their prices over the past year. What sources of money were used?

Mendaftarkan barang (perabot rumah tangga, pakaian, alat pertanian, hadiah, dll.) yang dibeli sejak tahun lalu dan mencatat harganya masing-masing. Sumber uang belanja darimana?

5. Amount and kind of taxes paid. Source of money used?

Kalau telah bayar pajak - berapa? macam pajak apa?
Sumber uang dari mana?

6. Agricultural production [for each crop state amount of land planted (or number of trees), type and source of seeds used, yields, amount of and reason for any losses].

Hasil dari usaha pertanian [untuk masing mencatat luasnya tanah yang ditanam (atau jumlah pohon); macam dan sumber bibit; jumlahnya hasil; kalau ada kerugian - berapa persentase dari tanaman yang hilang dan Kenapa].

corn	jagung
paddy rice	padi
vegetables (list types)	sayur2an (macam apa)
fruits " "	buah2an " "
other	lain2

7. Costs of agricultural production [list amounts of fertilizer, seed, insecticide, and so on purchased for each crop listed above; list labor costs (and explain labor arrangements)]

Pengeluaran untuk usaha pertanian [ongkosnya pupuk, bibit, obat, dll. untuk setiap macam tanaman; menjelaskan caranya memakai dan membiayai tenaga kerja].

8. Income from agricultural production (list for each crop)

Pendapatan dari usaha pertanian (untuk tanaman masing2)

9. Disposal of earnings (amount saved/by whom/for what purpose, amount spent/on what/by whom)

Gunanya pendapatan tersebut (jumlah disimpan/oleh siapa/ untuk apa, jumlah yang sudah di pakai/untuk apa/oleh siapa)

10. Livestock - expenditures (type, numbers, and cost of animals purchased/why/from whom; medical or other expenses)

Usaha peternakan - pengeluaran (macam, jumlah, dan harganya ternak yang di beli/untuk apa/dari mana; pengeluaran untuk pengobatan atau pengeluaran lain)

11. Income from livestock (for each type list number sold, price, profit after transport or other expenses; reason sold)

Pendapatan dari usaha peternakan (untuk masing2 mencatat jumlah yang dijual, harganya, untung setelah transport dan pengeluaran lain sudah di potong; kenapa ternak dijual)

12. Other work (list type of work, length of time, form and amount of payment - for each member of the household)

Pekerjaan lain (mencatat macam pekerjaan, jangka waktunya, macam dan jumlah pembayaran - untuk anggota rumah tangga masing2)

13. Other sources of income (amounts, earned by whom, how used)

Sumber uang lain (jumlah, siapa yang dapat, dipakai untuk apa)

14. Priorities for expenditure of money from earnings and/or savings

Prioritas untuk pengeluaran uang pendapatan dari usaha2 dan/atau simpanan

15. Comments on experience of demplot during its first year - suggestions for improvements at Pukdale/new sites

Pendapat mengenai pengalaman demplot setelah tahun pertama - usulan untuk Pukdale/demplot baru