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Land distribution and income inequality in rice-growing villages in the Philippines, 1993, 1997

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Abstract

This paper examines the relationship between land distribution and income inequality in three rice-growing villages in the Philippines. One of our findings is that access to land has ceased to be the most important determinant of household income position, as farming and landless households have increasingly derived their incomes from non-farm economic activities. The association between land distribution and income distribution has weakened. Non-farm income has become an equalizing factor, which means that the development of the non-farm sector and the improved access of households to such markets have played a more decisive influence on decreasing income inequality.

JEL classification: O10, O12, O15, O33
Keywords: Land distribution, income distribution, modern rice technology

1. Introduction

Land access is an important determinant of household income position and poverty situation (IFAD [2001]; Hossain, Gascon, and Marciano [2000]). This is because, as pointed out by Estudillo, Quisumbing, and Otsuka ([2001a], [2001b]) land is an important source of income and a depository of wealth in the rural communities. In more recent years, however, the rural household income structure has shifted away from farm to non-farm sources (Estudillo and Otsuka [1999]; Estudillo, Quisumbing, and Otsuka [2001a]). In rice-growing villages in Central Luzon, the proportion of farming household income derived from land decreased from 39 percent in 1966 to 19 percent in 1998 (Estudillo and Otsuka [1999]; Estudillo and Hossain [2003]). As earlier observed by Schultz [1998], this suggests the decline in economic importance of land and the increase in economic importance of human capital.

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The decline in the contribution of land income to total household income may indicate a decline in the association between land distribution and household income distribution in rural communities. According to Kuan and Quo [1985], land distribution is strongly associated with household income distribution in agrarian communities where households derive a large proportion of their total income from land. Hayami and Kikuchi [2000] argue that the development of the non-farm sector and the improved access of households to such markets are fundamental forces that can lessen the strong association between land distribution and income distribution. The availability of non-farm employment opportunities allows households to explore alternative sources of income so that the size of landholding becomes a less important factor affecting household income (Estudillo, Quisumbing, and Otsuka [2001a]). More importantly, Hayami and Kikuchi [2000] find that the availability of non-farm employment leads to a more equitable distribution of household income in rural communities because it allows landless households to improve their income position *vis à vis* the farming households.

The major objective of this paper is to examine the relationship between land distribution and household income inequality in three villages located in major rice-growing regions in the Philippines. We look more closely at land access and tenurial status, adoption of modern rice technology, demographic characteristics, and various sources of household income of farming and landless households. We differentiate between farming and landless households partly because the latter households are the poorest in the village community and partly because land distribution is believed to be strongly associated with income distribution.

This paper has six remaining sections. Section 2 describes the demographic characteristics, farm characteristics, and access to credit of sample households. Section 3 examines the distribution of landholdings. Section 4 describes the sources of household income while Section 5 identifies the determinants of farm and non-farm income sources. Section 6 describes the technique in estimating household income inequality and identifies the sources of inequality. Section 7 contains the concluding remarks.

2. Characteristics of sample households

In this study we use data sets drawn from household surveys conducted by the Social Sciences Division of the International Rice Research Institute (IRRI) in the crop years 1993 and 1997 in three rice-growing villages representing irrigated, rainfed, and upland ecosystems in the Philippines.[1] The irrigated and upland villages are located in Panay Island in Western Visayas and the rainfed village is located in Central Luzon (Figure 1). Central Luzon, which is the largest rice-producing region, contributed, on the average, 17 percent of the total rice production from 1970 to 1997 while Western Visayas, which is the second largest producer, contributed, on the average, 13 percent (Estudillo and Otsuka [2002]).

[1] Spearheaded by the IRRI project on "Technology, Income Distribution and Poverty", the surveys were conducted in the wet season of 1992 the and dry season of 1993 as well as the wet season of 1996 and the dry season of 1997.

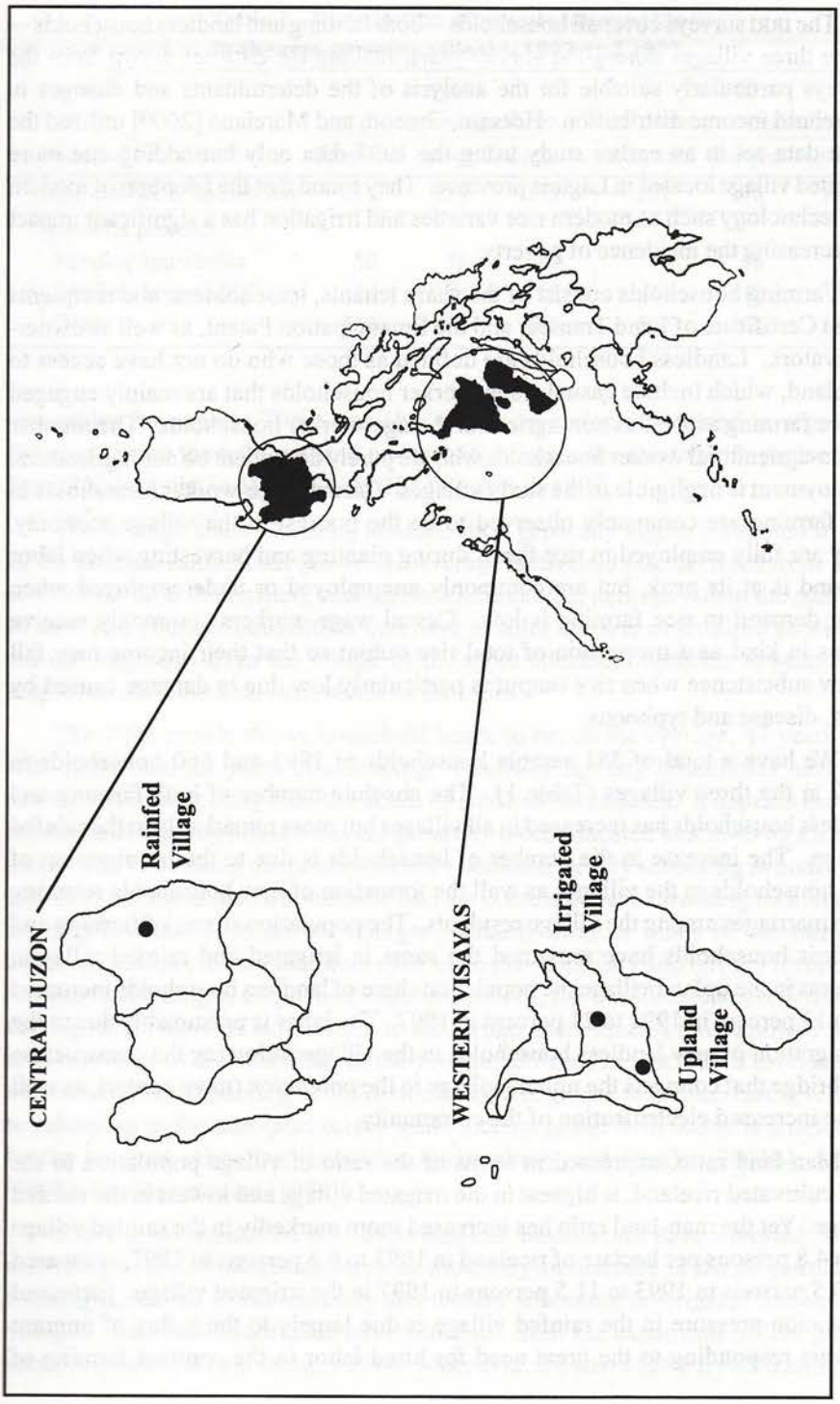


Figure 1. Map of the study villages

The IRRI surveys cover all households—both farming and landless households—in the three villages during the survey years, making the data set drawn from the surveys particularly suitable for the analysis of the determinants and changes in household income distribution. Hossain, Gascon, and Marciano [2000] utilized the same data set in an earlier study using the 1997 data only but adding one more irrigated village located in Laguna province. They found that the adoption of modern rice technology such as modern rice varieties and irrigation has a significant impact in decreasing the incidence of poverty.

Farming households consist of the share tenants, leaseholders, and recipients of the Certificate of Land Transfer and the Emancipation Patent, as well as owner-cultivators. Landless households are defined as those who do not have access to farmland, which include casual wage-worker households that are mainly engaged in rice farming as well as non-agricultural wage-worker households. The number of non-agricultural worker households who are purely dependent on non-agricultural employment is negligible in the study villages. Casual wage-worker households in rice farming are commonly observed to be the poorest in the village economy. They are fully employed in rice farms during planting and harvesting when labor demand is at its peak, but are commonly unemployed or underemployed when labor demand in rice farming is low. Casual wage-workers commonly receive wages in kind as a proportion of total rice output so that their income may fall below subsistence when rice output is particularly low due to damage caused by pests, disease and typhoons.

We have a total of 581 sample households in 1993 and 660 households in 1997 in the three villages (Table 1). The absolute number of both farming and landless households has increased in all villages but more remarkably in the rainfed village. The increase in the number of households is due to the in-migration of new households in the villages as well the formation of new households resulting from marriages among the village residents. The population shares of farming and landless households have remained the same in irrigated and rainfed villages, whereas in the upland village the population share of landless households increased from 13 percent in 1993 to 21 percent in 1997. The latter is presumably due to the in-migration of new landless households in the village following the construction of a bridge that connects the upland village to the *poblacion* (town center), as well as the increased electrification of the community.

Man-land ratio, expressed in terms of the ratio of village population to the total cultivated riceland, is highest in the irrigated village and lowest in the rainfed village. Yet the man-land ratio has increased more markedly in the rainfed village from 4.8 persons per hectare of riceland in 1993 to 6.3 persons in 1997, compared to 10.5 persons in 1993 to 11.5 persons in 1997 in the irrigated village. Increased population pressure in the rainfed village is due largely to the influx of migrant workers responding to the great need for hired labor in the contract farming of

Table 1. Distribution of sample households in the rice-growing villages, 1993 and 1997

	1993 *Rice-growing village*			1997 *Rice-growing village*		
Household distribution	*Irrigated*	*Rainfed*	*Upland*	*Irrigated*	*Rainfed*	*Upland*
Total number of households	217	229	135	221	278	161
Shares (in percent):						
Farming households	50	58	87	50	58	79
Landless households	50	42	13	50	42	21
Total	100	100	100	100	100	100

vegetables for export. There was also some conversion of riceland to vegetable farming so that the total riceland under cultivation in the rainfed village declined from 230 hectares in 1993 to only 202 hectares in 1997.

The average size of farming households is generally higher compared to that of the landless households (Table 2). Average household size declined from 1993 to 1997 for both the farming and landless households, perhaps due to the addition of new and younger households that have smaller number of children as well as the out-migration from the village of the more educated members to search for employment in the non-farm sector in the cities.

The 1993 profile shows household heads to be, on the average, 47 years old, with more than six years of schooling. Heads of farming households have 0.5 more years of schooling than the heads of landless households. It appears that the members of farming households are generally more educated as shown by a higher proportion of working members who have obtained tertiary schooling in both 1993 and 1997. There is also a noticeable decline in the number of working members of farming households in all the villages primarily because many of the farmers' children continue to stay in school even up to the secondary and tertiary levels. As reported in Deninger, Olinto and Maertens [2000], the wealth effects conferred by the implementation of land reform to the former share tenants have allowed them to invest more in the schooling of the younger generation. Increased investments of parents in the schooling of children may be a response to the increasing returns to schooling in the non-farm sector while income in the farm sector is unaffected by the level of schooling (Estudillo, Quisumbing, and Otsuka [2001b]; Joliffe [1998]; Psacharopoulos [1994]).

There is an indication that even landless households have invested in the schooling of their younger children as shown by an increase in the proportion of working members with secondary and tertiary schooling in irrigated and upland villages. Landless households have benefited from the expansion of free public secondary schools beginning in 1986. Moreover, the cost of tertiary education has

Table 2. Socioeconomic characteristics of households in the rice-growing villages, 1993 and 1997

	1993 *Rice-growing village*			1997 *Rice-growing village*		
Household characteristic	*Irrigated*	*Rainfed*	*Upland*	*Irrigated*	*Rainfed*	*Upland*
Farming households:						
Household size	5.2	4.7	5.7	5.0	4.7	5.2
Age of head	50.0	44.0	49.0	53.0	44.0	50.0
Schooling of head	7.3	6.7	5.9	8.1	7.7	6.2
Number of working household members[1]	2.7	2.8	2.9	2.6	2.5	2.5
Schooling[2] (composition of working members in percent):						
Primary	37	46	52	46	43	52
Secondary	33	39	34	23	42	34
Tertiary	30	15	14	31	15	14
Total	100	100	100	100	100	100
Landless households:						
Household size	5.1	4.5	4.2	5.0	4.5	4.2
Age of head	47.0	45.0	47.0	48.0	43.0	46.0
Schooling of head	6.7	5.7	6.4	7.1	6.5	6.8
Number of working household members[1]	2.3	2.5	1.8	2.3	2.2	2.3
Schooling[2] (composition of working members in percent):						
Primary	39	64	67	46	68	47
Secondary	35	32	28	23	32	35
Tertiary	26	4	5	31	0	18
Total	100	100	100	100	100	100

[1] Members who are 15 to 60 years old who are not in school.

[2] Primary means 1 to 6 years in school; secondary means 7 to 10 years in school; and tertiary means more than 10 years in school.

become affordable to the landless households. Transportation cost has declined due to the improvements in public infrastructure, and the decreased demand for child labor has reduced the foregone cost of tertiary schooling.

Increased investments in the schooling of children of the landless households may have a positive impact on the distribution of income in the villages. Landless households, who do not have land income, may be able to improve their income position *vis à vis* the farming households by taking advantage of higher returns to schooling in the non-farm sector. And since parental schooling affects investments

in schooling of children (Estudillo, Otsuka, and Sawada [2002]; Estudillo, Quisumbing, and Otsuka [2001c]), higher schooling investments in the current generation will induce greater investment in the next generation.

Table 3 shows the occupational distribution of the economically active population (15 to 60 years old) in the sample villages. Farming is by far the most dominant form of employment of farming households, and agricultural wage work for landless households. The most common non-farm work is in petty trade and informal personal services. There has been an increased dependency on non-agricultural work as shown by the increase in the proportion of economically active population who engaged in trade, construction, and personal services. Also, the number of professionals and overseas workers has increased from 153 to 198 persons. Younger children seem to stay longer in school to attend secondary and tertiary schools as shown by an increase in the proportion of students, while many female spouses have increasingly participated in the labor market as a response to increased wage rates.

Table 3. Occupational distribution (in percent) of the economically active population* of the rice-growing villages, 1993 and 1997

	1993 *Rice-growing village*			1997 *Rice-growing village*		
Occupation	*Irrigated*	*Rainfed*	*Upland*	*Irrigated*	*Rainfed*	*Upland*
Farm work:						
Farming	11	24	32	15	19	36
Wage work	13	16	2	11	22	6
Livestock raising	1	1	2	2	1	2
Others	0	0	1	1	1	0
Nonfarm work:						
Processing	1	0	1	1	0	1
Transportation	1	1	1	3	1	1
Trade	5	3	4	5	6	2
Construction	3	1	1	1	5	1
Professional	5	1	2	3	2	3
Personal services	13	8	9	15	7	4
Overseas work	1	2	2	2	1	1
Other work:						
Student	18	8	14	17	9	16
Housekeeping	28	35	29	24	26	27
Total	100	100	100	100	100	100
Number of individuals	602	628	417	620	710	446

*The economically active pupulation is composed of those between 15-60 years of age.

In summary, we have seen that the number of households in the study villages has increased due to the in-migration and formation of new households. As a result, the man-land ratio in terms of village population to total cultivated riceland has increased. Due to the decreased availability of lands, the occupational distribution of the economically active population has shifted away from farm to non-farm activities. There also seems to be an increase in investments in schooling of children induced by increasing returns to schooling, improved roads, and the expansion of free public school systems. Given these developments, it seems most likely for the non-farm sector to emerge as a major source of employment and income of the village population.

Table 4 shows farm characteristics such as the average size of cultivated riceland, tenure, and the adoption of modern rice technology such as irrigation and modern varieties of rice (MVs). The average size of cultivated rice farms has declined in all the study villages but most markedly in the rainfed village. The decline in farm size is brought about by the practice of dividing inherited land equally among children regardless of gender so that the average size of inheritable landholdings becomes smaller through time.[2]

A larger proportion of landholdings are cultivated by owner-cultivators and leasehold tenants, particularly in irrigated and rainfed villages, while share tenants remain the predominant tillers in the upland village. The land reform program converts share tenancy to leasehold tenancy and issues a Certificate of Land Transfer (CLT) if the landlord owns more than 7 hectares of land. CLT holders receive the Emancipation Patent (EP) upon completion of the amortization payments paid to the Land Bank of the Philippines. According to Otsuka [1991], the land reform program has been implemented successfully in favorable-environment rice-growing areas in the Philippines including Panay Island and Central Luzon. It is noticeable that the proportion of land under owner-cultivation has increased in the irrigated village, following the completion of amortization payments by the CLT holders who have since become full-fledged owner-cultivators.

The irrigated village is fully serviced by the national irrigation system, which was built as early as the Hispanic colonial period and was modernized in the 1950s. The ratio of area with irrigation has increased from 51 to 75 percent in the rainfed village due to the increased adoption of portable water pumps. The upland village, however, has experienced a decline in irrigation ratio due to the drying up of a stream that used to irrigate some farms in the upper portion of the village.

The availability of irrigation is the most important technical factor affecting the adoption of MVs (Hossain [1988]; David and Otsuka [1994]). Not surprisingly, the adoption ratio of MV reached 100 percent in both irrigated and favorable rainfed villages as early as 1993 while MV adoption ratio in the upland village increased

[2] This practice is largely observed in Panay Island. In Central Luzon, on the other hand, sons commonly receive the land while daughters of land-abundant households may inherit the land if their husbands did not receive land from their parents (Quisumbing [1994]; Estudillo, Quisumbing and Otsuka [2001c]).

Table 4. Farm characteristics of households in the rice-growing villages, 1993 and 1997

Farm Characteristic	1993 Rice-growing Village			1997 Rice-growing Village		
	Irrigated	*Rainfed*	*Upland*	*Irrigated*	*Rainfed*	*Upland*
Farm size[1]	1.00	1.76	0.98	0.91	1.39	0.79
Tenure (% area):						
Ownership[2]	39	47	33	44	49	37
Leasehold tenancy[3]	46	53	13	46	51	11
Share tenancy	15	0	54	10	0	51
Total	100	100	100	100	100	100
Irrigation (% area)	100	51	12	100	75	4
Adoption of MVs (% area)	100	100	90	100	100	95
Cropping intensity	2.40	1.50	1.20	2.50	1.40	1.20
Fertilizer use (NPK/ha)[4]	113	149	128	108	153	128
Rice yield (tons per ha per season)[4]	4.70	3.90	2.40	3.80	3.60	1.80

[1] Refers to the wet season cultivation area of farmer-respondents.

[2] Includes holders of Emancipation Patent.

[3] Includes holders of Certificate of Land Transfer.

[4] Refers to the wet season.

from 90 to 95 percent.[3] Cropping intensity remains fairly the same in all the villages. Note, however, that cropping intensity in the upland village is 1.2, which means that some farms particularly those in the upper portion maintain more than one cropping season of rice in one year.

Fertilizer application has remained fairly the same in all villages. Surprisingly, the application of elemental NPK has been lowest in the irrigated village where rice yield has been highest. Rice yield has also declined in all the villages, which might have been caused by the El Niño phenomenon. Rice yield is generally higher during the dry season due to fairly favorable weather conditions and greater absorption of solar energy.

Table 5 shows the sources of credit. As expected, a large number of landless households have no access to credit due to their lack of loan collateral. This is particularly true in the upland village where 73 percent of the landless households in 1993 and 61 percent in 1997 failed to avail of a loan. The two major sources of credit of landless households are the informal moneylenders and the employers of casual wage-workers, who are mainly farmers. In contrast, farming households have various sources of credit such as banks and credit cooperatives, moneylenders, landlords, traders, and relatives and friends. It is also important to point out that informal moneylenders appear to be much less active in the upland village than in irrigated and rainfed villages as shown by a lower proportion of both farming and landless households who avail of credit from moneylenders.

The major uses of loans are expenditures on production, consumption, schooling of children, medical care, asset purchase, non-agricultural business, burial, and marriage of a child. Among farming households, the largest proportion of borrowers use loans to finance the cost of current inputs in rice production such as fertilizer, pesticides and herbicides as well as to pay for labor cost. The largest proportion of borrowers among landless households, on the other hand, use loans for consumption purposes.[4]

3. Landholding distribution

Increased population pressure on limited land can lead to a high level of income inequality as a result of the increase in the number of poor landless households. Table 6 shows the pattern of distribution of landholdings, which include tracts of land under owner cultivation and those under leasehold and share tenancy. Pieces of land located in the village but owned by non-village residents are excluded because our sample respondents cover only village residents, with the exclusion of landowners living outside the village. We also exclude lands under the

[3] It is important to mention that MVs planted in 1993 are different from MVs planted in 1997 as newer MVs became available during the four-year interval.

[4] It is interesting to report that land pawning, which is deemed illegal by the land reform laws, is rather common so that we were able to document 118 incidents of pawning of land from 1980 to 2002. Land pawning is commonly transacted between relatives and acquaintances who are less likely to report such matter to the local land reform office.

Table 5. Sources of credit in the rice-growing villages, 1993 and 1997

	Share of households borrowing from the source (%)			
	1993		1997	
Source of loans	*Farming*	*Landless*	*Farming*	*Landless*
Irrigated villages				
No loan	38	61	54	62
Banks	15	4	2	5
NGOs[1]	0	1	0	0
Moneylenders	18	21	15	16
Relatives and friends	4	2	1	0
Landowners	8	2	11	5
Traders	7	0	5	3
Credit cooperatives and labor employer	10	9	12	9
Total	100	100	100	100
Rainfed villages				
No loan	21	52	30	52
Banks	3	2	0	2
NGOs	1	2	4	0
Moneylenders	20	10	35	10
Relatives and friends	2	6	2	3
Landowners	2	2	0	0
Traders	29	2	25	18
Credit cooperatives and labor employer	22	24	4	15
Total	100	100	100	100
Upland villages				
No loan	43	73	57	61
Banks	3	0	0	3
NGOs	0	0	0	0
Moneylenders	3	6	6	3
Relatives and friends	2	0	1	0
Landowners	8	0	2	3
Traders	3	0	0	0
Credit cooperatives and labor employer	38	21	34	30
Total	100	100	100	100

[1] NGO means non-governmental organization.

"porcientuhan" contract, which is considered a labor contract and not a land contract. The porcientuhan arrangement employs a landless worker to work on the farm for a payment of 10 percent of the gross value of output.

There seems to be a trend towards pauperization rather than differentiation in land access in the upland village. The proportion of "functionally" landless households—defined as those who have access to no more than 0.20 hectares of land—has increased remarkably from 16 to 23 percent. Larger landholdings appear to have been cut down into smaller parcels. The share of middle-sized farms (with a size of 0.20 to 0.50 hectares and 0.51 to 1.00 ha) has increased and there has been a decline in the share of households who have access to land with a size of 2.01 hectares and above.

Land is heavily concentrated in the hands of a few households. For example, seven percent of the households in the irrigated village in 1993 have access to 40 percent of the total rice area while the functionally landless households, which comprise 52 percent of the total households, have no access to land (Table 6). It is thus not surprising that the Gini coefficient of land concentration is relatively high—0.74 in irrigated village; 0.68 in rainfed village; and 0.45 in upland village in 1993—and that the Gini coefficient has increased in all villages due to the increase in the proportion of functionally landless households without an equi-proportional increase in their share of total rice area.

Overall, the uneven distribution of landholdings in the sample villages points to the concentration of wealth in the hands of a few wealthy farmers. This pattern is more pronounced in irrigated and rainfed villages where the proportion of landless households is higher. If the landless and small farmers do not have access to employment opportunities other than labor earnings from rice farming, it is highly probable that land distribution exerts a strong influence on household income distribution.

4. Sources of household income

Before we discuss the sources of household income, we first look at factor shares, which shows the proportion of output accruing to each input in rice production (Table 7). In general, there has been an increase in the factor share of current inputs and labor in all the villages while the factor share of capital has remained fairly the same. The increase in factor share of current inputs is due to the increased application of herbicide while the increase in the factor share of labor is mainly due to the increased wages. It is noticeable that the factor share of labor is much higher in the upland than in irrigated and rainfed villages, which means that labor from rice farming is an important source of household income in the upland village, while in irrigated and rainfed villages, family labor has been replaced by hired labor. The factor share of land is highest in the irrigated village and lowest in the upland village. This attests to the higher land productivity brought

Table 6. Distribution of landholdings in the rice-growing villages, 1993 and 1997

	Share of households			
	1993		1997	
Landholding size	*Farming*	*Landless*	*Farming*	*Landless*
Irrigated villages				
Less than 0.20 ha	52	0	52	0
0.20 to 0.50 ha	18	11	21	14
0.51 to 1.00 ha	14	21	14	23
1.01 to 2.00 ha	9	28	9	28
2.01 ha and above	7	40	4	35
Total	100	100	100	100
Gini coefficient of land concentration		0.74		0.75
Rainfed villages				
Less than 0.20 ha	42	0	43	0
0.20 to 0.50 ha	14	6	21	11
0.51 to 1.00 ha	14	13	18	21
1.01 to 2.00 ha	14	22	10	22
2.01 ha and above	16	59	8	46
Total	100	100	100	100
Gini coefficient of land concentration		0.68		0.70
Upland villages				
Less than 0.20 ha	16	0	23	0
0.20 to 0.50 ha	24	9	23	9
0.51 to 1.00 ha	27	25	25	26
1.01 to 2.00 ha	25	42	22	41
2.01 ha and above	8	44	7	24
Total	100	100	100	100
Gini coefficient of land concentration		0.45		0.51

about by the presence of irrigation, thereby contributing an important component of total household income in the irrigated village.

The sources of annual income of farming and landless households are shown in Table 8. Since incomes are expressed in nominal terms we look more closely at the relative importance of each of the various income components. It is evident in Table 8 that both farming and landless households derive a higher proportion of their incomes from non-farm sources such as non-farm wage earnings and remittances.

The proportion of income of farming households derived from agriculture in 1993 was 37 percent in the irrigated village, 56 percent in the rainfed village, and 43 percent in the upland village. Rice income is by far the most important

Table 7. Factor shares per hectare per season[1] in rice production in Central Luzon and Panay, 1993 and 1997

	Factor shares (in percent)	
	1993	1997
Irrigated villages		
Gross output	100	100
Current inputs	19	21
Capital:	8	9
Owned	1	1
Hired	7	8
Labor:	31	26
Family	7	7
Hired	24	19
Land	42	44
Rainfed villages		
Gross output	100	100
Current inputs	26	30
Capital:	12	11
Owned	6	5
Hired	6	6
Labor:	30	38
Family	16	16
Hired	14	22
Land	32	21
Upland villages		
Gross output	100	100
Current inputs	29	40
Capital:	11	18
Owned	6	9
Hired	5	9
Labor:	46	56
Family	30	34
Hired	16	22
Land	14	(-14)

[1] Refers to the wet season.

Table 8. Sources of household income in the rice-growing villages, 1993 and 1997

	Percent of Income					
	1993 *Rice-growing village*			1997 *Rice-growing village*		
Source of income	*Irrigated*	*Rainfed*	*Upland*	*Irrigated*	*Rainfed*	*Upland*
Farming households						
Farm income:	37	56	43	43	60	45
Rice	31	38	14	29	36	14
Nonrice	1	6	10	1	9	9
Livestock	3	6	15	4	3	16
Off-farm	2	6	4	9	12	6
Non-farm income:	63	44	57	57	40	55
Wages	42	35	33	27	31	29
Remittances	21	9	24	30	9	26
Total	100	100	100	100	100	100
Total income ('000 Pesos/year)	64,383	38,916	23,083	94,107	61,577	36,729
Landless households						
Farm income:	8	42	22	15	29	17
Rice	0	0	0	0	0	0
Nonrice	1	4	2	3	3	3
Livestock	2	4	12	2	2	6
Off-farm	5	34	8	10	24	8
Non-farm income:	92	58	78	85	71	83
Wages	51	33	75	51	63	73
Remittances	41	25	3	34	8	10
Total	100	100	100	100	100	100
Total income ('000 Pesos/year)	50,846	21,201	24,735	56,960	35,267	38,577
Income ratio (F/L)						
Agricultural	5.8	2.4	1.8	4.7	3.6	2.5
Non-agriculture	0.9	1.4	0.7	1.1	1.0	0.6
Total income	1.3	1.8	0.9	1.7	1.7	1.0

US$1=PhP38.04 in 1993; US$1=PhP53.93 in 1997

agricultural income source while the other agricultural incomes consist of non-rice crops such as fruits and vegetables, livestock and poultry production, as well as off-farm labor activities in rice farming during planting and harvesting. The share of agriculture in the total household income of farming households increased slightly in all villages and this can be largely due to increased wages in farm work.

The income share of non-rice crops of farming households has remained fairly the same in irrigated and upland villages but has increased in the rainfed village due to the increased demand for ladyfinger (okra) as an export crop. The share of non-farm income declined slightly in all villages and this can be traced to the decreased income share of wages from formal and informal employment in retail, rural transport, and domestic services. Note however the increased income share of remittances particularly in the irrigated village whose residents have a long history of international labor migration. Remittances of farming households particularly in the irrigated village have been coming mainly from overseas workers as the Philippine labor market becomes more integrated with the international labor market. As a matter of fact, the number of deployed Filipino overseas workers increased from 686,461 workers in 1993 to 747,696 workers in 1997 (*Philippine Statistical Yearbook* [2002]).

Landless households are, to a large extent, more dependent on non-farm income sources compared to the farming households. The non-farm income of landless households comprised 92 percent in the irrigated village, 58 percent in the rainfed village, and 78 percent in the upland village in 1993 while the corresponding ratios are 63 percent, 44 percent and 57 percent respectively for the farming households. The non-agricultural income shares of landless households increased further in all the villages in 1997 due to increased non-farm wage incomes. There has been a marked decline in the share of remittance income of landless households in irrigated and rainfed villages due to the decreased domestic remittance income. The remittances to landless households mainly come from children who have migrated to Manila or nearby towns and cities, as distinguished from the international remittances received by farming households.

Noticeable is the sharp increase (30 percentage points) in the income share of non-farm wages and the simultaneous decline in the share of off-farm labor income of landless households in the rainfed village, which indicates that rural landless labor has been shifted away from farm to non-farm activities. This is perhaps due to increased wages in the non-farm sector as the aggregate economy experienced an annual GNP growth rate of 5.8 percent from 1996 to 1997 (*World Development Report* [1998/1999]). The rainfed village has benefited to a greater extent from the aggregate economic growth because of its proximity to Metropolitan Manila which has been the center of economic growth in the mid-1990s. Non-farm labor activities of the landless households are predominantly construction work for men, and domestic services such as paid housekeeping and laundry jobs for women. It is common for male landless workers to migrate to Manila or nearby cities and towns

to work in the construction projects during the slack season in rice farming while female laborers oftentimes commute daily from the village to the town center to work as domestic help, usually on a daily basis.

Average household income is highest in the irrigated village. Having three cropping seasons in a year is common among rice farms in the irrigated village. Non-farm wage income is about 3.0 times higher in 1993 and 2.2 times higher in 1997 in the irrigated village than in the rainfed and upland villages. Remittance income, on the other hand, is about 3.7 times higher in the irrigated village for both 1993 and 1997.

The income gap between farming and landless households in terms of the ratio of their total income is shown in the last line of Table 8. It is remarkable that in 1993, landless households in the upland village generated an average income that is higher than that of the farming households, largely due to higher non-farm wage income. In addition, the non-farm income of landless households can even be higher than that of farming households as in the case of irrigated and upland villages in 1993 and in rainfed and upland villages in 1997. Thus, it seems clear that landless households can improve their income position *vis à vis* the farming households through increased participation in non-farm wage employment.

The ratio of total the income of farming households to that of landless households in the irrigated village increased from 1.3 to 1.7 due to a substantial rise in the remittance income of farming households. In 1993, the remittance income of farming households was only 69 percent of that of the landless households but it rose to 145 percent in 1997. The income gap between farming and landless households remained fairly the same in rainfed and upland villages.

Overall, we have seen that both farming and landless households obtain a higher proportion of their income from non-farm sources which seems to indicate that rice has become more of a "sideline" or a secondary source of income in the rural households. Landless households in particular derive a substantial portion of their total incomes from non-farm activities because labor employment opportunities in rice farming are seasonal and have become more limited in recent years due to the progress in the adoption of labor-saving technologies such as tractors, threshers, herbicides, and direct seeding. Thus, the development of the non-farm sector may well be a solution to the high level of income inequality and the high incidence of poverty in the rural Philippines.

5. The determinants of household income

Household income is affected by access to land and tenure status, adoption of new technology such as modern varieties of rice and irrigation, number and composition of working members, and proximity to markets (Estudillo and Otsuka [1999]; Estudillo, Quisumbing, and Otsuka [2001a]). We represent access to land

in terms of the ratio of area under different tenure categories such as owned, leasehold, and share-tenancy while the interaction term between MV and irrigation represents the adoption of modern rice technology. The composition of working members is represented by the ratio of female working members and ratio of members with secondary and college schooling. Dummy variables for villages may represent access to markets. The income functions are estimated separately for farm and non-farm incomes because the explanatory variables may have different impacts on different components of income. We use double logarithmic specification and ordinary least squares estimation procedure.[5]

Table 9 shows the determinants of farm and non-farm incomes in 1993 and 1997. Farm size significantly affects farm income but not non-farm income, which means that access to land is not associated with higher non-farm income. Farm incomes of farmers such as owner-cultivators, leasehold tenants, and share tenants are significantly higher than that of the landless households (the control). Owner-cultivators have the highest farm income, which is 2.9 times higher in 1993 and 4.1 times higher in 1997 than the farm income of landless households. In the case of non-farm income however, farming households, except for share tenants, do not appear to have a significant non-farm income advantage over the landless households.

The coefficients of the ratio of area under leasehold tenancy, owner-cultivation, and share-tenancy in the farm income function have increased from 1993 to 1997 due to higher rice income, non-rice crop income, and labor income from rice farming activities outside own farm. It is important to mention that the increase in the coefficients is more remarkable in the case of share tenants. The coefficient of the variable MV cum irrigation in the farm income function increased from 0.16 in 1993 to 0.36 in 1997 due to the increased usage of portable water pumps, which enables farmers to plant a second crop of rice in the dry season.

The coefficients of the number of working members in both farm and non-farm income functions are positive but the values decline from 1993 to 1997 indicating that the characteristics have become more important than the mere number of working members. Gender and schooling composition of working members, in general, do not significantly affect farm income although it seems that female working members and those with secondary schooling are less involved in rice farming. According to Estudillo, Quisumbing, and Otsuka [2001b], female working members and the more educated ones have a higher probability to engage in non-farm employment, perhaps due to higher returns to female schooling in the non-farm sector.

The coefficients of college schooling and secondary schooling in the non-farm income functions are positive and the values have increased absolutely, indicating the increased importance of college and secondary schooling in the non-

[5] The double logarithmic specification eliminates households with zero or negative income as well as households with no working members in the age bracket 15 to 60.

Table 9. Determinants of household income in sample villages in Central Luzon and Panay, 1993 and 1997

	1993		1997	
Variable	*Farm income*	*Non-farm income*	*Farm income*	*Non-farm income*
FHD*log farm size	0.50**	0.07	0.35**	0.07
	(7.61)	(0.74)	(6.94)	(1.11)
Ratio of planted area under:				
Owner cultivation	1.08**	-0.19	1.41**	0.15
	(6.68)	(-0.75)	(8.33)	(0.76)
Leasehold tenancy	0.77**	-0.17	1.55**	-0.35
	(4.89)	(-0.69)	(8.32)	(-1.54)
Share-tenancy	0.60**	-0.71**	1.57**	-0.59**
	(3.06)	(-2.23)	(7.33)	(-2.23)
MV*Irrigation[2]	0.16	-0.03	0.36*	-0.05
	(1.17)	(-0.17)	(2.17)	(-0.26)
Number of working members	0.33**	0.84**	0.13	0.34**
	(3.32)	(5.29)	(1.12)	(2.34)
Ratio of female working members	-0.51**	0.32	-0.36	-0.03
	(-2.50)	(1.01)	(-1.57)	(-0.14)
Ratio of working members with:				
Secondary schooling	-0.34**	0.30	-0.42**	0.42**
	(-2.51)	(1.39)	(-2.95)	(2.40)
College schooling	-0.27*	1.65**	-0.32	1.77**
	(-1.65)	(6.90)	(-1.99)	(9.11)
Village dummies:				
Rainfed village	0.43**	-0.06	0.52**	0.06
	(3.00)	(-0.27)	(3.24)	(0.35)
Irrigated village	0.16*	0.80**	0.21	0.47**
	(1.09)	(3.27)	(1.18)	(2.17)
Constant	8.14**	7.84**	8.24**	8.87**
	(40.12)	(23.91)	(37.88)	(32.19)
R-squared	0.35	0.27	0.35	0.22
No. Observations	523	425	610	540

[1] FHD means farm household dummy.

[2] Interaction term between the percentage of area planted with modern varieties (MV) of rice and percentage of area with irrigation.

farm sector. More importantly, the coefficient of college schooling increased from 1.65 in 1993 to 1.77 in 1997 which indicates that households with college-educated working members earn non-farm income that is 5.2 times higher in 1993 and 5.9 times higher in 1997 than the non-farm income earned by households whose members have primary schooling or zero schooling (the control). It is important to point out that the values of the coefficients of college and secondary schooling in the non-farm income function in 1997 are higher than the values of the coefficient of farm size in the farm income function. This implies that human capital has become a more important determinant of household income than farm size.

Farm income in rainfed and irrigated villages is significantly higher than in the upland village (the control) in 1993. In 1997, however, farm income in the upland village does not differ significantly from that of the irrigated village. This is partly due to the opening of the bridge that connects the upland village to the town proper, thus widening the access to agricultural markets, and partly due to the increased production of higher valued crops such as fruits and vegetables in the upland village. The irrigated village had significantly higher non-farm income than the rainfed and upland villages in both 1993 and 1997.

To sum up, the results of our income determination function show that the importance of farm size has declined *vis à vis* the importance of secondary and college schooling as a determinant of household income. This may mean that the distribution of land has become a less important determinant of the distribution of household income. Indeed, according to Estudillo, Quisumbing, and Otsuka [2001a], the distribution of human capital has become the more important factor that is associated with the distribution of rural household income.

6. The distribution of household income

This section examines the relative contribution of each income source to total income inequality. We are particularly interested in the inequality contribution of farm income, which is affected by the distribution of land, and the inequality contribution of non-farm wage income, which is affected by the distribution of human capital. Since schooling does not affect labor income from rice farming (Estudillo and Otsuka [1999]; Estudillo, Quisumbing, and Otsuka [2001a]), inequality in off-farm income is not so much affected by the inequality in the distribution of human capital. We use conventional methods such as the Gini coefficient and Lorenz curve in order to assess the inequality in the distribution of land. Due to the lack of an appropriate method in assessing the distribution of human capital, we use the coefficient of variation in schooling attainment of all working members in the village.

Table 10 shows the income shares of households grouped by decile. In all villages, the poorest 10 percent of the household population has an average income share of only 1 percent whereas the richest 10 percent has an average income share

Table 10. Income shares of households by decile in the rice-growing villages, 1993 and 1997

	1993			1997		
	Rice-growing village			*Rice-growing village*		
Decile group	*Irrigated*	*Rainfed*	*Upland*	*Irrigated*	*Rainfed*	*Upland*
Bottom 10 percent	1	1	1	1	1	1
20 percent	1	2	2	2	3	3
30 percent	2	3	3	3	5	4
40 percent	4	5	4	4	5	5
50 percent	5	6	5	6	6	6
60 percent	6	8	6	7	7	7
70 percent	9	10	8	10	9	10
80 percent	11	13	11	13	12	12
90 percent	18	18	18	18	18	14
Top 10 percent	44	34	42	36	34	38
Top 5 percent	29	20	25	23	23	25
Gini coefficient	0.57	0.48	0.53	0.51	0.46	0.48

of 40 percent in 1993 and 36 percent in 1997. The distribution of household income is fairly unequal: The Gini coefficient in 1993 is 0.57 in irrigated village, 0.48 in rainfed village, and 0.53 in upland village. The higher value of the Gini coefficient in the irrigated village is due to the larger income share of the top 10 percent of the household population. Note, however, that the Gini coefficient in all the villages has declined which can be explained by the decrease in the income share of the top 10 percent as well as by an increase in the income share of the middle deciles, specifically those comprising the middle 30 to 80 percent of the population. Irrigated and upland villages have experienced a marked decline in the value of the Gini coefficient.

We use the Gini decomposition technique suggested by Fei et al. [1978] and Pyatt et al. [1980] in order to assess the percentage contribution to total income inequality of each of the income source. According to Shorrocks [1983], however, the percentage of inequality contribution of each source generated by this technique may be different from those generated by alternative measures of inequality. Nevertheless, we use the Gini decomposition rule because of the popularity of the use of the Gini coefficient in economic analysis.

The Gini decomposition formula is shown as follows:

$$G(Y) = \sum s_i R(Y, Y_i) G(Y_i)$$
$$= s_i P G(Y_i)$$

where $G(Y)$ is the Gini ratio of total household income (Y); Y_i is the ith income source; s_i is the share of ith source of income; $R(Y,Y_i)$ is the rank correlation ratio; $G(Y_i)$ is the Gini ratio of ith income; and $PG(Y_i)$ is the pseudo-Gini coefficient of income inequality. The pseudo-Gini coefficient can be regarded as the "within-group" inequality. If $PG(Y_i)$ is greater than $G(Y)$, the distribution of ith income source is less equal than the total income so that the ith income source can be considered as inequality—increasing whereas if $PG(Y_i)$is less than $G(Y)$, the ith income can be considered as inequality—decreasing.

The rank correlation ratio is defined as

$$R(Y,Y_i)=\frac{Cov\left[Y_i,r(Y)\right]}{Cov\left[Y_i,r(Y_i)\right]}$$

where $Cov\left[Y_i,r(Y)\right]$ is the covariance between the ith income source and total income rank, $r(Y)$; and $Cov\left[Y_i,r(Y_i)\right]$ is the covariance between the ith income source and the ith source income rank, $r(Y_i)$. If the ith income source comprises a larger proportion of total household income, there is a larger correlation between Y and Y_i, so that R is larger.

The Gini coefficient of the total income can be computed as

$$G(Y)=\frac{2}{nu}\left(Cov\left[Y,r(Y)\right]\right)$$

where n is the number of households, u is the mean of total income, and $Cov\left[Y,r(Y)\right]$ is the covariance between total income and total income rank. Similarly the Gini coefficient of the ith income source, $G(Y_i)$, can be computed as

$$G(Y_i)=\frac{2}{nu_i}\left(Cov\left[Y_i,r(Y_i)\right]\right)$$

where u_i is the mean of the ith income. Note that in the computation of $G(Y)$, households are ranked in accordance with the values of Y, but in the case of $G(Y_i)$ households are ranked in accordance with the values of Y_i.

Table 11 shows the decomposition of total income inequality by the contribution of each income component. Farm income has a lower contribution to total income inequality than non-farm income due to its lower share of income and lower value of the pseudo-Gini coefficient. Farm income can be considered a source of decreasing inequality in all villages as shown by the value of its pseudo-Gini coefficient, which is lower than the overall Gini. Note that the decreasing contribution of farm income to total income inequality comes in the presence of increased inequality in the distribution of land, which means that land distribution exerts a marginal influence on the distribution of farm income.

The share of rice income in total income inequality has remained fairly constant while a moderate increase in inequality contribution of non-rice income is noticeable

in the rainfed village due to the increased diversification of agricultural production in favor of high-valued vegetable crops. It is also important to mention the relatively lower values of the pseudo-Gini coefficients of off-farm income, which is negative in the irrigated village in 1993, thereby implying that off-farm income is a source of decreasing inequality.

The contribution of non-farm income to total income inequality declined in irrigated and rainfed villages. This is caused primarily by the marked decrease in the value of the pseudo-Gini coefficient of non-farm wages. In 1993, the pseudo-Gini coefficient of non-farm wages was higher than the overall Gini but in 1997 the value of pseudo-Gini coefficient became lower than the overall Gini. It means that non-farm wages, which were a source of increasing income inequality in 1993, have become a source of decreasing income inequality in 1997. We speculate that this is due to the decrease in inequality in human capital as measured by the coefficient of variation in schooling of all working household members. The coefficient of variation has declined from 0.43 to 0.63 in the irrigated village and from 0.36 to 0.54 in the upland village while it increased slightly from 0.37 to 0.43 in the rainfed village. The decreasing contribution of non-farm wages may also be due to the decline in wage rates variability in different sectors in manufacturing and services as the country experienced a shortage of labor due to its relatively high economic growth rate from 1996 to 1997. On the other hand, remittance income remains an increasing source of inequality as the value of its pseudo-Gini coefficient has remained higher than the overall Gini in both 1993 and 1997 even though the pseudo-Gini coefficient has declined.

Our results, which show the positive impact of non-farm income in the distribution of household income, are consistent with the findings of Hayami and Kikuchi [2000], Otsuka, Cordova, and David [1992], Hossain, Gascon, and Marciano [2000], and Estudillo, Quisumbing, and Otsuka [2001a]. Note, however, that non-farm income has a negative impact on the distribution of household income if international remittances are included as one of its components.

Overall, we have seen that farm income is an inequality-decreasing source of income, which seems to imply that land distribution is much less associated with income distribution in the study villages. As a matter of fact, land is so much more unequally distributed than income and, whereas land concentration has increased further, income distribution, on the other hand, has improved as shown by the Lorenz curve in Figure 2. The Gini coefficient of land concentration increased from 0.74 in 1993 to 0.75 in 1997 in the irrigated village; from 0.68 to 0.70 in the rainfed village; and from 0.45 to 0.51 in the upland village. In contrast, the Gini coefficient of income distribution declined from 0.57 in 1993 to 0.51 in 1997 in the irrigated village; from 0.48 to 0.46 in the rainfed village; and from 0.53 to 0.48 in the upland village.

Table 11. Contributions of income components to total household income inequality in the rice-growing villages, 1993 and 1997

	1993 *Rice-growing village*			1997 *Rice-growing village*		
Source of income	*Irrigated*	*Rainfed*	*Upland*	*Irrigated*	*Rainfed*	*Upland*
Farm income:	0.08(14)[1]	0.19 (40)	0.11(21)	0.13(25)	0.20(43)	0.10(21)
Income share	0.24	0.53	0.4	0.33	0.51	0.39
Pseudo-gini	0.34	0.37	0.28	0.38	0.4	0.26
Rice	0.08(14)	0.14 (28)	0.03(6)	0.08(16)	0.13(28)	0.03(7)
Income share	0.18	0.27	0.12	0.18	0.25	0.11
Pseudo-gini	0.46	0.51	0.28	0.41	0.53	0.3
Nonrice	0.001(0)[2]	0.03 (6)	0.04(7)	0.01(2)	0.04(9)	0.01(2)
Income share	0.01	0.06	0.09	0.02	0.07	0.08
Pseudo-gini	0.11	0.41	0.38	0.5	0.56	0.14
Livestock	0.003(0)	0.02 (4)	0.03(6)	0.01(2)	0.01(2)	0.04(8)
Income share	0.02	0.06	0.14	0.03	0.03	0.14
Pseudo-gini	0.2	0.35	0.23	0.29	0.27	0.28
Off-farm	-0.003(0)	0.01 (2)	0.01(2)	0.03(5)	0.02(4)	0.02(4)
Income share	0.03	0.14	0.05	0.09	0.16	0.06
Pseudo-gini	-0.12	0.03	0.21	0.32	0.16	0.29

Table 11. Contributions of income components to total household income inequality in the rice-growing villages, 1993 and 1997 (continued)

Source of income	1993 Rice-growing village			1997 Rice-growing village		
	Irrigated	*Rainfed*	*Upland*	*Irrigated*	*Rainfed*	*Upland*
Non-farm income:	0.49(86)	0.29 (60)	0.42(79)	0.38(74)	0.25(54)	0.38(79)
Income share	0.76	0.47	0.6	0.67	0.49	0.61
Pseudo-gini	0.64	0.62	0.69	0.57	0.5	0.62
Wages	0.27(47)	0.20 (42)	0.27(51)	0.17(33)	0.19(43)	0.22(46)
Income share	0.46	0.34	0.39	0.36	0.4	0.38
Pseudo-gini	0.58	0.59	0.7	0.46	0.48	0.56
Remittances	0.22(39)	0.09 (18)	0.15(28)	0.21(41)	0.05(11)	0.16(33)
Income share	0.3	0.14	0.21	0.31	0.09	0.23
Pseudo-gini	0.72	0.71	0.7	0.67	0.57	0.71
Total income	0.57(100)	0.48(100)	0.53(100)	0.51(100)	0.46(100)	0.48(100)
Income share	1	1	1	1	1	1
Pseudo-gini	0.57	0.48	0.53	0.51	0.46	0.48

[1] Numbers in parentheses are percentage shares.

[2] Less than one percent.

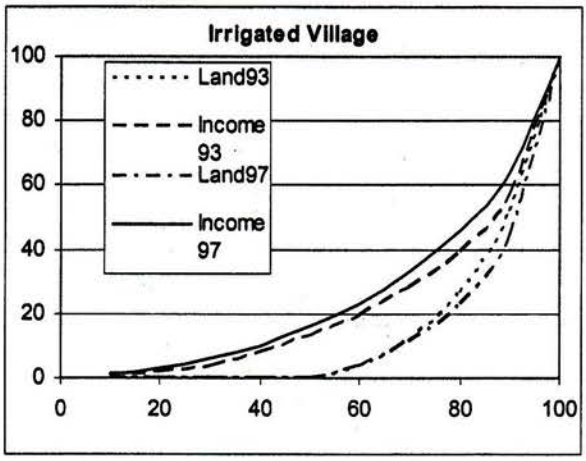
The Lorenz curves in Figure 2 also show that the association between the distribution of land and income is much less in irrigated and rainfed villages than in the upland village, i.e. the Lorenz curves of land concentration and income distribution are closer in the upland village. Households in irrigated and rainfed villages are more involved in non-farm wage employment activities whereas households in the upland village are more dependent on the production of rice, non-rice crops, and livestock. Thus, it seems clear that the higher the dependence of households on land-based agricultural income sources, the stronger the degree of association between land concentration and income distribution.

7. Concluding remarks

The objective of this paper was to trace the connection between land concentration and household income distribution in rural Filipino communities and identify the determinants of changes in household income inequality. We found, among other things, that the contribution of farm income to total household income inequality did not change substantially despite the increase in the concentration of lands. In fact, farm income has been a source of decreasing inequality. This implies that neither modern rice technology nor land access has much of a decisive influence on income distribution in the rural Philippines.

Both farming and landless households are more dependent on non-farm income sources as shown by a higher proportion of total household income derived from non-farm sources. Household income distribution has improved from 1993 to 1997 due to the decreased contribution of non-farm wages to total household income inequality. This indicates that non-farm income has become more evenly distributed among households. This can be attributed to an increase in schooling attainment of household members and the development of the non-farm sector—both of which allow the landless households to explore the non-farm labor market. Greater participation of the landless households in non-farm employment opportunities has resulted in a decline in income inequality.

Overall, the findings in this paper seem to point to four important strategies to reduce income inequality: (1) improving the levels of schooling of household members through the expansion of public school systems; (2) increasing access of households to the non-farm labor markets through improved public infrastructure; (3) effective implementation of land reform program to give the landless and tenant households access to land; and (4) improving irrigation infrastructure and new technology dissemination to increase farm productivity.



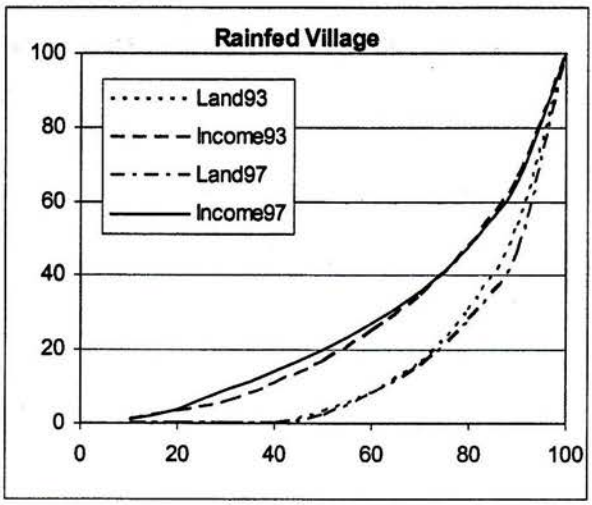


Figure 2. Lorenz curve of income distribution and land concentration

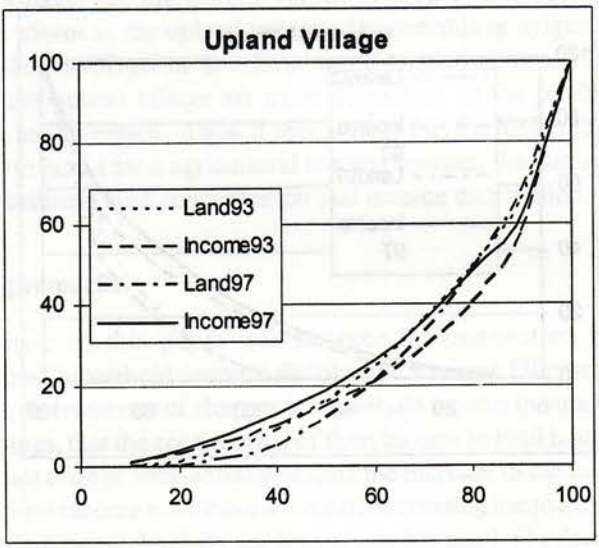


Figure 2. Lorenz curve of income distribution and land concentration (continued)

References

David, C. C. and K. Otsuka [1994] *Modern rice technology and income distribution in Asia.* Boulder, CO: Lynn Rienner.

Deninger, K., P. Olinto, and M. Maertens [2000] "Redistribution, investment, and human capital accumulation: the case of agrarian reform in the Philippines". The World Bank, Washington, DC. Mimeographed.

Estudillo, J.P. and M. Hossain [2003] "Green revolution in the Philippines: a perspective from long-term household surveys". International Rice Research Institute, Los Banos, Laguna, Philippines. Mimeographed.

Estudillo, J. P. and K. Otsuka [1999] "Green revolution, human capital and off-farm employment: changing sources of income among farm households in Central Luzon, 1966-94", *Economic Development and Cultural Change* **47**(3): 497-523.

Estudillo, J. P., and K. Otsuka [2001] "Has green revolution ended? a review of long-term trends in MV adoption, rice yields and rice income in Central Luzon, 1966-99", *Japanese Journal of Rural Economics* **3**: 51-64.

Estudillo, J.P. and K. Otsuka [2002] "Lessons from the green revolution in the Philippines". Paper presented at the Conference on: Green Revolution in Asia and its Transferability in Africa, held in Tokyo, Japan, December 8-11, 2002.

Estudillo, J.P., A. R. Quisumbing and K. Otsuka [2001a] "Income distribution in rice-growing villages during the post-green revolution periods: the Philippine case, 1985 and 1998", *Agricultural Economics* **25**(1): 71-84.

Estudillo, J. P., A.R. Quisumbing and K. Otsuka [2001b] "Gender differences in land inheritance, schooling and lifetime income: evidence from the rural Philippines", *Journal of Development Studies* **37**(4): 23-48.

Estudillo, J. P., A.R. Quisumbing, and K. Otsuka [2001c] "Gender differences in land inheritance and schooling investments in the rural Philippines", *Land Economics* **77**(1): 130-43.

Estudillo, J.P., Y. Sawada, and K. Otsuka [2002] "Gender, household income, and child schooling: a study of rural villages in the Philippines, 1985-2002". Foundation for Advanced Studies in International Development, Tokyo, Japan. Mimeographed.

Fei, J., G. Ranis, and S. Kuo [1978] "Growth and family distribution of income by factor components", *Quarterly Journal of Economics* **92**(1): 17-53.

Hayami, Y., and M. Kikuchi [2000] *A rice village saga: three decades of green revolution in the Philippines*. London: Macmillan Press.

Hossain, M. [1988] "Nature and impact of the green revolution in Bangladesh", Research Report No.67, International Food Policy Research Institute, Washington, DC.

Hossain, M., F. Gascon, and E. Marciano [2000] "Income distribution and poverty in rural Philippines: insights from repeat village study". Paper presented at the Third Conference of the Asian Society of Agricultural Economists, held in Jaipur, India, October 18-20, 2000.

International Fund for Agricultural Development (IFAD) [2001] *Rural poverty report 2001*. Oxford, UK: Oxford University Press.

Joliffe, D. [1998] "Skills, schooling and household income in Ghana", *World Bank Economic Review* **12:** 81-104.

National Statistical Coordination Board (NSCB) [2002] *Philippine Statistical Yearbook 2002*. Manila, Philippines: NSCB.

Otsuka, K. [1991] "Determinants and consequences of land reform implementation in the Philippines", *Journal of Development Economics* **35:** 339-55.

Otsuka, K., V.G. Cordova, C.C. David [1992] "Green revolution, land reform, and household income distribution in the Philippines", *Economic Development and Cultural Change* **40**(4)**:** 719-41.

Otsuka, K., F. Gascon and S. Asano [1994] "Second-generation MVs and the evolution of the green revolution: the case of Central Luzon, 1966-90", *Agricultural Economics* **10**: 283-95.

Psacharopoulous, G. [1994] "Returns to investment in education: a global update", *World Development* **22**: 1325-43.

Pyatt, G., C.Chen and J. Fei [1980] "The distribution of income by factor components", *Quarterly Journal of Economics* **95**: 451-73.

Quan, N. and A. Koo [1985] "Concentration of landholdings: an empirical exploration of Kuznets' conjecture", *Journal of Development Economics* **18**: 101-17.

Quisumbing, A. R. [1994] "Intergenerational transfers in Philippine rice villages: gender differences in traditional inheritance customs", *Journal of Development Economics* **43**: 167-95.

Schultz, T.W. [1998] "Investing in people" in: C.K.Eicher and J.M.Staatz, eds. *International agricultural development*, 3rd Edition. Baltimore: The Johns Hopkins University Press.

Shorrocks, A. [1983] "The impact of income components on the distribution of family income", *Quarterly Journal of Economics* **98**: 310-26.

World Bank (WB) [1999] *World Development Report 1998/1999*. Washington, DC.: WB.