Working Pape

Farm and Household Economic Study of Kecamatan Nanggung, Kabupaten Bogor, Indonesia
A Socio-economic base line study of Agroforestry Innovations and Livelihood Enhancement

Suseno Budidarsono, Kusuma Wijaya and James Roshetko

Southeast Asia

World Agroforestry Centre
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Introduction

This report is a farm/household level assessment focusing on farm and household budget analyses, part of the USAID funded 'Agroforestry Innovation and Livelihood Enhancement Program' implemented by World Agroforestry Centre – ICRAF Southeast Asia and Winrock International, with assistance from RMI (the Indonesian Institute for Forest and Environment) It is a socio-economic study to generate base line data for determining social and economic impacts of adopting trees, managing agroforestry systems and the improvement of its marketing system. The basic socio-economic data collected comprised of demographic data, agricultural undertakings and productions, households' income and expenditure, and marketing practices. The data generated by this study will be used for farm-level economic analysis: (a) analysis of the progress of agroforestry system in social and economic term, (b) analysis of the financial return to the farm under different scenario, and (c) orientation to farm budget and financial analysis by a selected group of interested farmers for examining their management options including market linkages.

The program is carried out in Kecamatan Nanggung, a sub-district administration unit situated in the western part of West Java Province, about 100 km away from Jakarta to the South. Farmers in this sub district are primarily smallholders on or below the poverty line with access to less than one hectare of land. Many of these land holding are found on steep slope. They have limited access to professional technical assistance and poor market linkage, particularly to more lucrative urban and regional market nearby Bogor and Jakarta. Because their lands are under productive, many local communities are forced to openly or surreptitiously encroach on neighboring protected areas – Gunung Halimun National Park – to meet their livelihoods needs. This is a cause for concern as Gunung Halimun is the major watershed for Jakarta and vicinity and an important reservoir for biodiversity.

Method

Working hypothesis of the study is that the socio-economic characteristics of farmers' household influence the type of their tree garden system and its economic productivity. The data collected by this survey, therefore, comprise of three interrelated aspects: (1) socio-economic aspect of households farmers, such as demographic, education, employments, landholdings, incomes and consumptions; (2) farming and agricultural activities and system of production (crops farming and tree farming); and (3) market aspects that will be focusing on marketing practices of agricultural and farm production.

A sample household survey technique was selected to accomplish the study and was carried out in August - September 2003. The survey was conducted in three sample villages (out of ten) that were purposively selected according to their location (up stream - down stream), their physical characteristics and demography Table 1 presents the three sample villages and their key characteristics.

Thirty five households were selected in every sample village to be interviewed. Within each household sample, enumerators interviewed either male or female head of household, defined as adult with significant decision-making authority in the households' financial matters. Purposive sampling technique was applied in this survey; hence the target population is farmers who have kebuns (tree gardens). It needs to note that prior to the survey, a village level study was carried out applying Rapid Rural Appraisal (RRA)[1] technique to gather data and information about Kecamatan Nanggung as basis for village selection.

[1] RRA consist of short, intensive and informal field surveys that focuses on people own views of their problem (Khon Kaen University 1987; Chambers *et al*, 1989). Generally, the method involves open-ended exploration of important issues and more focused understanding on important themes from key informants' perspectives. Two data collection techniques were applied i.e., field observation and in-depth interview with key informants using semi structured interview guide.

Table 1. Characteristics of three sample villages

Attributes	Parakan Muncang	Curug Bitung	Cisarua	Kecamatan Nanggung
Physical characteristics				
1. Altitude *(m above sea level)*	300 – 400	500 - 600	700	200 – 1800
2. Area *(ha)*				
~ Total Area	605.2	1,397.0	1,411	10,999.1
~ Agricultural Land *(Excluded national park)*	516.8	1,268.1	635.0	7,022.6
~ Paddy fields	268.8	150.5	275.0	1,740.7
~ *Ladang/Kebun*	248.0	767.6	325.0	1,836.5
Demography				
~ Population *(person)*	10,722	8,454	8,202	74,211
~ Number of households *(hh)*	1,536	2,121	1,877	17,187
~ Population Density *(ps km^{-1})*	1,772	605	581	675
~ Agriculture Density *(ps ha^{-1})*	21	9	13	15
Accessibility *(km)*				
~ Distance to Nanggung Market	2	7	7.5	
~ Distance to Leuwiliang Market	10	19	19.5	
~ Distance to national park	18 – 19	9 - 10	8 – 9	
~ Distance to State Forest Company (SFC) Land	8 – 9	1 - 2	2 – 3	
~ Distance to Gold Mining	11 – 12	9 - 11	8 – 10	

Source: Survey data

Results and Discussions

1. The study site

1.1. Physical characteristics

Kecamatan Nanggung situated in the western part of West Java Province, about 100 km away from Jakarta and about 45 km away from Bogor to the South. It covers a total area of 109.99 km^2, spans from Bogor – Rangkasbitung intercity road in the North to the mountain ranges of Gunung Halimun National Park in the South (See Figure 1). Topographically the area constitutes of uplands, characterized with gently undulating to steep landscape with the altitude is ranging between 400 and 1800 m above sea level. Annual rainfall is varies between 3,000 mm to 4,000 mm and the average annual temperature ranging between 22^o C and 34^o C.

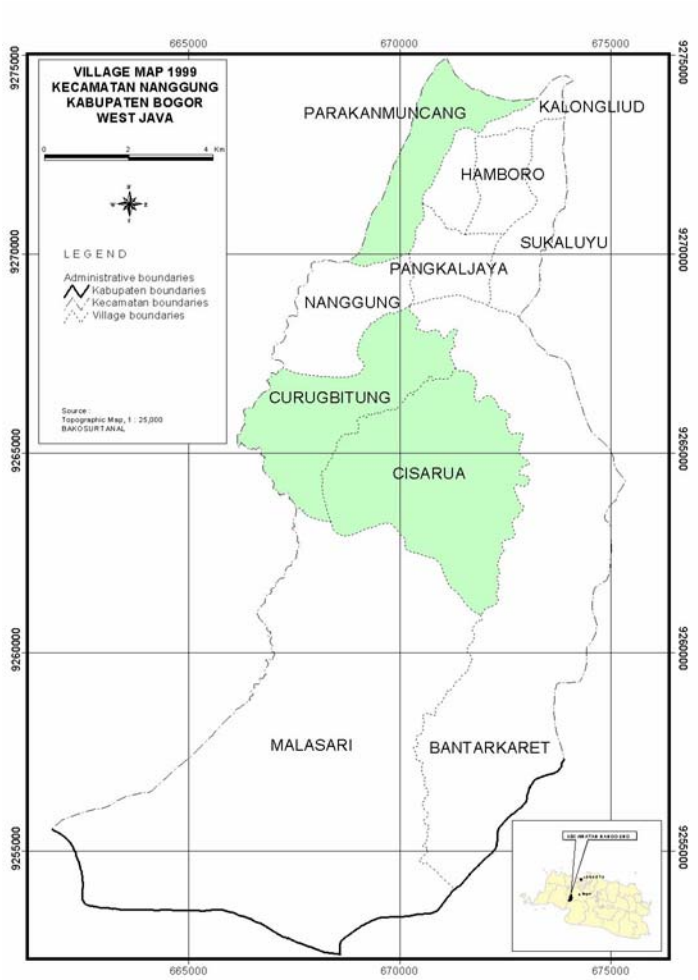


Figure 1. The Study Site

Statistics of Kecamatan Nanggung[2] records that 16.7% (1,837.5 ha) of the area is classified as protected forest, part of Halimun-Salak National Park (TNGH). An estimate of 7,022.3 (63.8%) hectare constitute of arable land[3] comprise of paddy field (1,740.7 ha.), ladang/*kebun* (1,836.5 ha.), community forest (144 ha.) and Perhutani/State Forest Corporation (SFC) land (2,050 ha.). The rest are housing and infrastructures (869 ha) and other uses (1,245.9 ha.). Table A2 in the annex presents details of the land uses figures. A closer look at Table A2, combined with information provided by kecamatan officers, enables us to assume that all paddy fields, *ladang/kebun* lands and community forests are privately owned. In total these privately held (farmer owned) lands compose 3,721.3 ha (52.3%). The rest (47.7%) are officially under the management of SFC and other large scale plantations. However, observation in the field found that there are patches of these areas are being cultivated by farmers.

There is also a state owned gold mining operation (PT. Aneka Tambang) in this area. Part of its concession area is within three villages (Bantar Karet, Cisarua and Malasari) in Kecamatan Nanggung. The company provides financial and technical assistances, as part of social relationship activities, to the neighboring communities for any kind of income generating activities.

1.2. Infrastructure and public utilities

This section describes infrastructure and public utilities available in the study site. It is commonly agreed that transportation infrastructure, domestic water and electricity supply, marketing facility and telephone line are essential for economic development as well as upliftment of the population. Table A2 of the Annex provides an overview of physical infrastructure available in the study area.

(a) Transportation

Except few *dusun* in Malasari – the most remote village of Kecamatan Nanggung – all villages in this study area are well linked to the market centres in Nanggung and Curug Bitung and kecamatan administrative centre in Parakan Muncang. There are 60.5 km paved/asphalted road (road density 550m/km^2) that is categorized as all weather road that passable for four wheel vehicle, connecting most villages of Kecamatan Nanggung to the provincial road network (Bogor – Rangkas Bitung). There are also graveled and dirt roads connecting all settlements in this study area to the main asphalted road network. Road density of those two type of roads are 1,004m/km^2 and 1,058m/km^2; a reasonable amount of road for a kecamatan like Nanggung. Although, not all this unpaved roads are passable for four-wheel vehicle, there are by *ojeg*[4] services available almost in all villages to transport people and things from every settlement to the nearest kecamatan market centers where people will have better access to four wheel public transport. Four wheel public transports are available daily, transporting people and things from kecamatan's market canters in Curug Bitung and Nanggung to the nearest bigger market centre in Leuwiliang and *vice versa*.

[2] Kecamatan Nanggung Dalam Angka, (1998, 1999, 2000, 2001 and 2003)
[3] Land that suitable for cultivation
[4] a transportation mode using motorbike; cost per trip (service) depend on the distance and road condition.

(b) Public utilities : Electricity, telephone line and domestic water

It is interesting to note that **e**lectricity supply (served by State Electricity Company/PLN) and telephone line (served by PT Telkom) are available almost in all villages in Kecamatan Nanggung. However not all households have access to these public services, due to the accessibility of the settlements that is too expensive to establish the line and the affordability of the services for some people. Statistics of kecamatan Nanggung records that there are 6,915 (40.2%) out of 17,187 households has electricity for their houses. The rest use privately owned power generator or just kerosene lamp. Regarding telephone line, PT. Telkom serves seven out of ten villages of Kecamatan Nanggung. There are 1,015 households (5.9%) has telephone line and four public telephone services (wartel).

Clean water services provided by the local government (PDAM) also available in Kecamatan Nanggung. But it only serves few households in two villages of Kecamatan Nanggung, that are Nanggung and Parakan Muncang. Most people in Kecamatan Nanggung get clean water for domestic use from springs and other sources available like shallow well.

(c) Market

There are four markets where Nanggung people normally go. Tree markets are within the kecamatan boundary (Nanggung weekly market, Curug Bitung market that operate twice a week and Cibeber daily market) and a bigger daily market in the neighboring kecamatan, namely Leuwiliang.

(d) Education

Based on Kecamatan Nanggung Statistics (2000), there were 44 primary schools in ten villages, with 157 teachers and 8,780 pupils, and a junior secondary school (SLTP) located in kecamatan centre with 15 teachers and 439 pupils. All primary and juniors secondary school are public school. Meanwhile in the senior secondary school, there was only one private school available with 14 teachers and 78 pupils. These figures reflect education situation of Kecamatan Nanggung that will be elaborated in further detail using demographic data of the surveyed household.

1.3. Economic activities

Agriculture is an economic mainstay of Nanggung population. Statistics of Kecamatan Nanggung shows, 63.4% of working population (economically active population) engages in agriculture. Food production is main focus of agriculture activity in this study site and paddy cultivation constitutes an important farming activity in 'wetland', while maize, cassava, sweet potatoes and vegetables or even dry-land paddy is most common planted in *tegalan*.

Where ever possible farmers cultivate paddy continuously for their own consumption. Paddy cultivation is done either in flood plain and river levees or even in a steep land that close to the source of water (creek or spring) by turning a hillside into a series of ascending terraces. Food security is they main concern,

although some rice is also sold by farmers. Paddy field in Kecamatan Nanggung covers an area of 1,741 hectare (15.83%) plus some area within Perhutani land which is suitable for paddy cultivation. *Tegalan* or dry land is generally used for maize, cassava, or sweet potatoes and vegetables or if possible they grow dry land paddy in the rainy season.

Kebun lands (tree gardens), on which this study is focused, receive little management attention from farmers. Major commodities harvested from *kebun* are banana and bamboo. Banana and bamboo are very easy to cultivate and not labor intensive; both provide regular income for farmers. Tree farming is practiced by farmers in their *kebuns*, but these systems are not intensively manages. Kebuns consist of both *pekarangan* – homegardens located near the home, and *dudukuhan* – tree gardens located at a distance from the home. Labor inputs for *kebun* farming is relatively low compare to paddy and '*tegalan'* cultivation. It relates to how farmers prioritize the use of their resources (capital and labor) and relates this to the returns in term of time. Technical knowledge in optimizing *kebun* productivity is limited among farmers.

Two plantations run by private company in the study site are (1) tea plantation (971 ha) in Malasari; since 2002 the ownership has changed to PT. Sari Wangi from the previous owner PT Nirmala Agung, and (2) rubber plantation run by PT Hevea Indonesia (94 ha). The rubber plantation that was established in 1994 since 2000 has stopped their operation; some of the land has been occupied by farmers for cultivation.

There are eight private sawmills operate in Kecamatan Nanggung; they operate below its installed capacity. Installed capacity varies from 6-15 m^3day^{-1} (six sawmills with 6-8 m^3day^{-1} installed capacity and the other two 10-15 m^3day^{-1}. In average they operate 3-6 m^3day^{-1} to 5-12 m^3day^{-1}. Most of timber production in Kecamatan Nanggung went to those sawmills.

Mineral extraction also exists in the study area, such as sand mining, bentonite mining and gold mining. Sand mining are found in Sukaluyu and Kelong Liud, while bentonite mining mostly done in Curug Bitung and Cisarua. There is a bentonite collector based in Curug Bitung. With regard to gold mining, although gold mining is exclusively under PT Aneka Tambang operation, there are traditional gold extraction units run by households in the neighboring village of PT. Aneka Tambang. Locally they are called as *gurandil*[5] or illegal miner. No official statistics record the number of *gurandil*. They (*gurandil*) always state that they scavenge for gold from the wastes of PT Aneka Tambang. This waste, primarily in the form of mud, is sold by the company for Rp 90,000/50kg-sack. However the company claims that till, which has not yet been processed for gold extraction, is often stolen from the concession area and sold for up to Rp 200,000/50 kg-sack, price depending on the till quality.

[5] *Gurandil* is a sundanese word. This term is used to mention the people who work as illegal gold mining.

2. Socio Economic Aspects

2.1. Demography

Population statistics of Kecamatan Nanggung shows that total population at present (2003) was 74,211 inhabitants, 106.1 sex ratio (meaning that male population is higher than female) within 17, 187 households. Population growth during the last five years (since 1998) was 3.23% per year; it is higher than West Java Province (2.17%) and even higher than national growth (1.35%). The study speculates that this relates to the 'gold fever' that occurred during 1999 to 2000 when a lot of in-migrant occurred in the kecamatan. Population density of the area is 675 persons per square kilometers (ps.km^{-2}) which is lower than for West Java in year 2000 (1,033 ps.km^{-2}) . At village level, population density varies from 155 ps.km^{-2} in Malasari (the upper most village) to 2,347 ps.km^{-2} in Kalong Liud. Looking at agricultural density (ratio between number of people to arable land), the figures indicate that agriculture intensification is necessary in many villages of Kecamatan Nanggung. Agricultural density of Kecamatan Nanggung is 15 ps/ha, while at village level the ratio varies from 6 ps ha^{-1} (Malasari) to 33 ps ha^{-1} in Sukaluyu. Seven out of 10 villages are above the kecamatan average.

Regarding demographic characteristics of the household samples, the study considered three aspects to describe: household size, age structure and labor force. These are summarized in Table 2. Total population of households surveyed was 530 persons. There is no significant different in average household size among the three sample villages; hence five people per household, ranging between two and 12 persons per households. In further detail, however, Parakan Muncang is the highest in number of households with household size is four person or less (54.3% of the sample households), while in Cisarua, 60% of sample households surveyed have larger family size, ranging between five and eight people per household.

There are extended families among the household surveyed. About one-fourth of household sample in Parakan Muncang and Curug Bitung are extended family, while in Cisarua 11.42% of the household sample are extended family.

Looking at the age structure, 61.3% of family member of the household samples are of working age or part of the economically active population (age group of 15 years old and above). Comparing the three villages, Parakan Muncang has the highest proportion of the working age population (69.1%). Deeper observation reveals that dependency ratio[6] of the households sample in Parakan Muncang is the lowest. This indicates that labor force[7] of Parakan Muncang is higher than the two other villages.

[6] Ratio indicating the number of dependants family members (aged 0-14 and over the age of 65) to the total working age population (aged 15-64)
[7] The term 'labor force' in this study is identified as working age/economically active population, hence age group of 15-65 years old

Table 2. Family Size, age structure and labor force by Village

	Parakan Muncang n = 35		Curug Bitung n = 35		Cisarua n = 35		Sample Villages N = 105	
Family member								
1. Total household members *(persons)*	181		169		180		530	
2. Range *(persons/household)*	2 – 11		2 - 12		2 – 8		2 – 12	
3. Average household size *(persons/households- rounded)*	5		5		5		5	
4. Household Size								
1 - 4	19	(54.3%)	17	(48.6%)	14	(40.0%)	50	(47.6%)
5 - 8	10	(28.6%)	17	(48.6%)	21	(60.0%)	48	(45.7%)
9 <	6	(17.1%)	1	(2.9%)	0	(0.0%)	7	(6.7%)
5. Nuclear family	27	(77.1%)	26	(74.3%)	31	(88.6%)	84	(80%)
Number of family member	160	(88.4%)	148	(87.6%)	174	(96.7%)	482	(90.9%)
6. Extended family	8	(22.9%)	9	(25.7%)	4	(11.4%)	21	(20%)
Number of family member	21	(11.6%)	21	(12.4%)	6	(3.3%)	48	(9.1%)
Age Structure								
< 15	46	(25.4%)	62	(36.7%)	82	(45.6%)	190	(35.8%)
15 - 64	125	(69.1%)	103	(60.9%)	97	(53.9%)	325	(61.3%)
64 <	10	(5.5%)	4	(2.4%)	1	(0.6%)	15	(2.8%)
Labor Force								
~ Proportion of labor Force	135	74.6%	107	63.3%	98	54.4%	340	64.2%
~ Average labor force per household (rounded)	4		3		3		3	
Dependency ratio	34.1%		57.9%		83.7%		55.9%	

Source: Household survey data

In relation to respondents' occupation, as presented in Table 3, most of the respondents are self employee (working for themselves) as farmers, carpenters and traders/merchants or in home industries; very few of the respondents work as employees such as civil servants or for private companies. In general, most of respondents (73.3%) consider themselves as farmers; engage in agriculture as their main occupation. It is interesting to note that the closer the village to market centre, the more variation of occupation of the respondents engages in, and number of respondent engage in agriculture is also lesser. This relationship also holds for family members' of the respondents.

Concerning side occupation, defined as income generating activities beside the main occupation, about one-fifth of the respondents engage in other activities out side their farm for additional income. This reflects that agricultural activities alone are not sufficient to support most farmers in the study area. The case of Cisarua, a village sample representing up stream and less accessible village, more than two-third of the respondents also engages in side occupations. As we can see in the Table 3, two dominance activities

are work as farm laborer (21.4%) and gold extraction activity (38.1%). It shows that Cisarua benefits from being in the vicinity of gold mining area of PT Aneka Tambang.

In further detail, to relate those occupation data to the labor force of the household members, it is found that there are 18.5% of the family member belong to working age population who have no occupation. There are no significant different among the three sample villages in the proportion of the jobless family member, ranging between 16.8% and 17.8%.

Educational attainment is another parameter considered. Statistics of Kecamatan Nanggung indicate that education level is very low; only 2.19% of the population in this area attained senior secondary school (SLTA/SMU/MA). The household survey found that 5.7 % of the respondents were illiterate, and most of the respondents (81.9%) never went through beyond elementary level. As summarized in Table 4, among the family members, only 17% attained higher level of education beyond elementary school, and primary school enrollment rate[8] is also low.

[8] **Primary school enrolment rate** is primary school enrolment ratio. Data refer to gross enrolment ratio, which is the total enrolment of all ages divided by the population of the specific age groups, corresponding to the primary school age group. The ratio may exceed 100 if the actual age distribution of pupils extends beyond the official school ages. (UNESCAP)

Table 3. Percentage distribution of respondent and family member by occupation

Working age population	Parakan Muncang		Curug Bitung		Cisarua		Sample Villages	
	% of n= 35	% of n= 100	% of n= 35	% of n= 72	% of n= 35	% of n= 63	% of n= 105	% of n= 235
Main Occupation								
1. Farmer	51.4	6.0	88.6	11.1	80.0	11.1	73.3	8.9
2. Farm laborer								
3. Trader/merchant	17.1	13.0	5.7	4.2	11.4	7.9	11.4	8.9
4. Home industry	2.9	1.0			2.9		1.9	0.4
5. Gold extraction				2.8	2.9	3.2	1.0	1.7
6. Carpenter	2.9				2.9		1.9	
7. Services								
~ Transport	2.9	2.0	2.9	2.8		3.2	1.9	2.6
~ Other services	8.6	4.0		1.4			2.9	2.1
8. Civil servant	8.6	2.0					2.9	0.9
9. Private company employee	2.9	6.0	2.9				1.9	2.6
10. Off farm laborer	2.9	7.0		1.4		1.6	1.0	3.8
Total (%)	100	41.0	100	23.6	100	27.0	100	31.9
Side occupation								
1. Farmer								
2. Farm laborer	2.8		5.6	1.4	21.4	6.3	10.5	2.1
3. Trader/merchant	11.1	3.0	16.7		4.8	1.6	10.5	1.7
4. Home industry	8.3						2.6	
5. Gold extraction			2.8		38.1		14.9	
6. Carpenter								
7. Services								
~ Transport			2.8				0.9	
~ Other services	2.8		8.3		4.8		5.3	
8. Civil servant		2.0						0.9
9. Private company employee				1.4				0.4
10. Off farm laborer	11.1	7.0	16.7	2.8	7.1	1.6	11.4	4.3
Total (%)	36.1	12.0	52.8	5.6	76.2	9.5	56.1	9.4

Source: Hhousehold survey data

Note r: respondents
fm: family members

Table 4. Percentage distribution of Respondents and Family members by educational attainment and elementary school enrolment rate

	Parakan Muncang	Curug Bitung	Cisarua	Sample Villages
Respondents (number)	**(35)**	**(35)**	**(35)**	**(105)**
Never goes to school	8.6%	2.9%	5.7%	5.7%
Not passed elementary school	34.3%	57.1%	48.6%	46.7%
Passed Elementary school	48.6%	22.9%	34.3%	35.2%
Junior secondary school	2.9%	14.3%	11.4%	9.5%
Senior secondary school	2.9%	2.9%		1.9%
Academy/University	2.9%			1.0%
	100.0%	100.0%	100.0%	100.0%
Family members (number)	**(146)**	**(134)**	**(145)**	**(425)**
Schooling age but not yet enrolled	6.2%	20.1%	20.0%	15.3%
Never goes to school	4.8%	5.2%	2.1%	4.0%
Kindergarten	2.7%			0.9%
Elementary school	53.4%	65.7%	66.2%	61.6%
Pesantren	1.4%	2.2%	1.4%	1.6%
Junior secondary school	20.5%	3.7%	8.3%	11.1%
Senior secondary school	8.9%	2.2%	2.1%	4.5%
Academy/University	2.1%	0.7%	-	0.9%
	100%	100%	100%	100%
Primary school enrolment rate	**84.6%**	**75.0%**	**74.5%**	**77.1**

Source: Household survey data

2.2. Assets

(a) Housing

As seen in Table 5 most of the sample households (99%) live in their own house. Respondents identified three ways in which their houses were obtained: bought from others, inherited from their parents or constructed by them self. It is interesting to note that the more accessible the village, in this case Parakan Muncang, the more houses that were bought from others, and the more remote the village, hence Cisarua, the proportion of houses that were constructed by the owner is higher. Village population density and the availability of unoccupied housing sites are are likely related to the way people obtain their houses also (See Table 1).

Table 5. Percentage distribution of respondents' houses by ownership status and ways of obtaining the house

	Parakan Muncang (of n = 35)	Curug Bitung (of n = 35)	Cisarua (of n = 35)	Sample Villages (of n = 105)
Ownership				
~ Own property	97.1%	100%	100%	99.0%
~ Renting in	2.9%	--	--	1.0%
Ways Obtaining				
~ Bought	31.4%	5.7%	11.4%	16.2%
~ Inherited	34.3%	48.6%	34.3%	39.0%
~ Own construction	31.4%	45.7%	54.3%	43.8%
~ Not relevant	2.9%	--	--	1.0%

Source: Household survey data

A closer look at the physical attributes of the houses where the surveyed household settle, such as building materials, type of floor, type of roof, floor space and water closet availability in each house, larger part of the household samples settle in reasonably appropriate houses for rural environment. As seen in Table 6, most of the houses were made of full concrete building material with appropriate floor; even some of houses furnished with ceramic tile. Besides, all the houses were roof-tiled. Average floor space of the houses were 88.3 m^2, varies between 28 m^2 and 400 m^2; average floor space per person were 20.42 m^2 ranging from 4 to 100 m^2 $person^{-1}$. With regard to toilet availability, as house size increases the existence of water closets increase. But, the number of houses without toilet is still high.

With regard to electricity, almost all houses of the surveyed household are supplied by electricity power from State Owned Electricity Power (PLN). While for telephone line very few houses in Parakan Muncang (3.15% of the houses) get connection this public services. No telephone lines exist in the surveyed houses of the other two villages.

Table 5. Percentage distribution of respondents' houses by physical attributes.

	Parakan Muncang (% of n = 35)	Curug Bitung (% of n = 35)	Cisarua (% of n = 35)	Sample Villages (% of n = 105)
Building Material				
~ Bamboo / wood	28.6%	5.7%	14.3%	16.19%
~ Half concrete	8.6%	5.7%	2.9%	5.71%
~ Full concrete	62.9%	88.6%	82.9%	78.10%
Type of Floor				
~ Dirt	8.6%	--	5.7%	4.8%
~ Simple concrete cement	60.0%	45.7%	42.9%	49.5%
~ Simple tile	14.3%	25.7%	14.3%	18.1%
~ Ceramic tile	14.3%	28.6%	37.1%	26.7%
~ Wooden floor	2.9%	--	--	1.0%
Type of Roof				
~ *Roof-tile*	100%	100%	100%	100%
Floor space (m^2)				
< 30	--	--	2.9%	1.0%
30 - 49	28.6%	25.7%	14.3%	22.9%
50 - 99	34.3%	48.6%	62.9%	48.6%
100 - 149	25.7%	17.1%	8.6%	17.1%
150 ≤	11.4%	8.6%	11.4%	10.5%
Water closet				
~ Available	77.1%	74.3%	57.1%	69.5%
~ Not available	22.9%	25.7%	42.9%	30.5%
Electricity				
~ PLN	88.6%	97.1%	85.7%	90.5%
~ *Numpang*	8.6%	2.9%	14.3%	8.6%
~ No electricity	2.9%			1.0%
House with telephone line	3.15%	-	-	1.05%

Source: Household survey data

(b) Landholdings

The land that is controlled by farmers in Nanggung comprise of wet land rice field, *kebun* and *tegal* (dry land for food crop cultivation) and *pekarangan (*home yard). All surveyed household own at least one parcel of land for cultivation. *Pekarangan*, a parcel of land surrounding the house, is also considered as an agricultural land, especially those which reasonably large area (more than 1000 m^2). Some farmers cultivate their *pekarangan* with tree crops and/or food (annual/seasonal) crops. Table 6 presents land ownership of the surveyed household by land use type.

Comparing the three sample villages, Table 6 shows that average landholding size per household in Parakan Muncang is the lowest among the three sample villages, even for each land use type. As a dense populated village (with 1,772 inhabitants-km^{-2} population density and 21 person ha^{-1} agricultural density), the larger portion of the surveyed household belong to the lowest strata of land holding classes; hence 57.1%of the surveyed household controlling less than 0.25 ha of land. The other two village relatively better off in this regards

Looking at land tenure issue, not all agricultural land that is controlled by the surveyed household are owned land. The study revealed that 21.3% of the total agricultural land controlled by the surveyed household belongs to others and is cultivated by means of renting in, sharecropping, or just *numpang*[9]. Of the surveyed households, 52.4% cultivate land belonging to other individuals (see Table 6). It needs to note that sharecropping systems mainly applies to wetland rice field, while almost all respondents who utilizing others' kebuns mentioned that they only *numpang*. Rented in is applied when a house is included in the kebun (pekarangan) area.

There is unequal distribution of land holdings in the study area. As shown in Figure 2, the bottom 60% of the surveyed household controlled only 19% of total landholding size, while the top 21% controlling about 55% of the total land. Apart from that, regardless the land use type, average landholding size per household is 0.75 ha, with an average of 0.15 ha per family member. It is not too surprising that off farm activities become an important elements their livelihood.

[9] *Numpang* is a colloquial Bahasa Indonesia that is normally used for or means ride-in. It this context, the word of *numpang* means cultivating others land without any financial consequences, or right to use the land. It happens if the land is not used by the owner.

Table 6. Profile of surveyed households according to landholdings by village and land use type

	Parakan Muncang			Curug Bitung			Cisarua			Sample Villages		
	N	(%)	Total area	n	(%)	Total area	N	(%)	Total area	n	(%)	Total area
Number of surveyed households owning the land												
- Home yard	34	(97.1)	0.83 ha	35	(100)	0.48 ha	35	(100.0)	14,25 ha	104	(99.1)	2.74 ha
- Ricefiled	14	(40.0)	2.36 ha	23	(65.7)	7.18 ha	28	(80.0)	9.18 ha	65	(61.9)	18.72 ha
- Kebun and/or Tegal	32	(91.4)	12.04 ha	35	(100)	17.74 ha	29	(82.9)	13.75 ha	96	(91.4)	43.53 ha
Number of surveyed household controlling others' land												
- Homeyard	1	(2.9)	0.005 ha							1	(0.95)	0.005 ha
- Ricefiled	5	(14.3)	0.76 ha	9	(25.7)	1.26 ha	7	(20.0)	2.15 ha	21	(20.0)	4.17 ha
- Kebun and/or Tegal	3	(8.6)	0.28 ha	10	(28.6)	1.77 ha	20	(57.1)	7.60 ha	33	(31.4)	9.65 ha

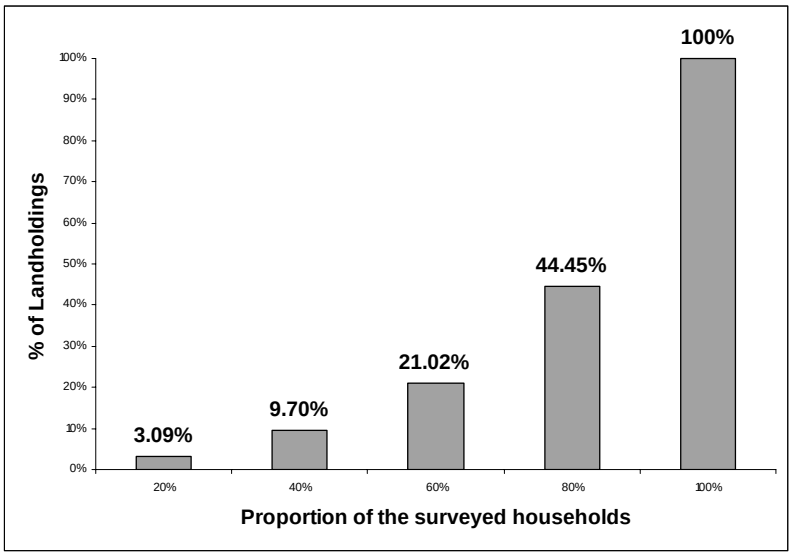
Percentage Distribution of surveyed households by landholding size

	of n= 35	*of n= 35*	*of n= 35*	*of n=105*
< 0.25 Ha	57.1%	14.3%	20.0%	30.5%
0.26 - 0.75 Ha	28.6%	45.7%	31.4%	35.2%
0.76 - 1.25 Ha	5.7%	20.0%	25.7%	17.1%
1.26 - 1.75 Ha		14.3%	11.4%	8.6%
1.75 Ha <	8.6%	5.7%	11.4%	8.6%

Descriptive statistics of landholding size

Mean	0.465 ha	0.814 ha	0.980 ha	0.753 ha
Median	0.225 ha	0.544 ha	0.660 ha	0.405 ha
Std. Deviation	0.665 ha	0.758 ha	1.053 ha	0.862 ha
Range	0.02 – 2.73 ha	0.112 – 3.85 ha	0.055 – 4.52 ha	0.02 – 4.52 ha

Source: Household survey data



Source: Household survey data

Figure 2. Cumulative distribution of the surveyed household by landholding size

(c) Animal husbandry and Poultry

Table 7 summarizes livestock and other small animal raised by the surveyed household. Very few respondents raise large animals like cows; in total only 2.9% of the surveyed household have cows , averaging 3 cows per household. Goat and sheep are more common in the three village samples with 46.7 % of sample households raise goats or sheep. Average number of goats or sheep is three to five per family. With regards to poultry, about two-third of the household sample raising chicken/duck. It should be noted that poultry production is by traditional means targeting home consumption; no modern market-oriented small scale poultry production exists in Nanggung.

Table 7. Animal husbandry and poultry

	Parakan Muncang	Curug Bitung	Cisarua	Sample Villages
Cattle				
Number of HH	0	1 (2.9%)	2 (5.7%)	3 (2.9%)
Number of Cattle	0	6	3	9
Goat/sheeps				
Number of HH	7 (20.0%)	20 (57.1)	22 (62.9)	49 (46.7%)
Number of goat/sheep	27	109	124	260
Poultry				
Number of HH	23 (65.7%)	27 (77.1%)	23 (65.7%)	73 (69.5%)
Number of chicken/duck	278	325	232	835

Source: Household survey data

(d) Other assets

Information concerning other assets such as farm implements, savings, motor bikes and electronic equipment (TV and Radio) were also collected in this survey as a means of identifying the socio economic conditions of the target population. The data are summarized as follows.

Televisions are more common as compared to Radios/Tape Cassette Players, as seen in Table 8. Curug Bitung seems to be better in this regard than the other two villages. With regards to motor bikes, very few of the surveyed households own a kind of vehicle. It is interesting that the proportion of the surveyed households with motor bike is the biggest in Cisarua and none of respondents in Parakan Muncang own motor bikes. The study speculates that motor-bike ownership inversely correlates to the location or accessibility of a village; Cisarua is less accessible compared to Parakan Muncang and Curug Bitung.

Ploughs and spraying equipment are two farm implements considered as important assets. The study found interesting results. Firstly, none of the surveyed household own ploughs. It is understandable, because the area of cultivation is mostly undulating or situated in relatively steep terrain. Secondly is spraying equipment ownership, i.e., about a quarter of the surveyed household own such equipment. Among the sampled villages, Parakan Muncang own the least spraying equipment. This can be understood by referring to the rice field ownership (See Table 6); as the area of rice field ownership increases the more likely the household owns spraying equipment.

Table 8. Surveyed household and other assets

	Parakan Muncang (% of n=35)	Curug Bitung (% of n=35)	Cisarua (% of n=35)	Sample Villages (% of n=105)
Communication				
~ Households own TV set	45.7	80.0	42.9	56.2
~ Household own Radio/Tape	37.1	45.7	34.3	39.0
~ Households own motor bike		5.7	11.4	5.7
Household own sprayer	5.7	34.3	37.1	25.7
Household own gold extraction unit	2.9	2.9	42.9	16.2
Household with cash saving	11.4	20.0	5.7	12.4

Source: Household survey data

To explore the extent to which people in Nanggung rely on gold mining the study also identified the ownership of simple machine for gold extraction. The evidence found that the largest proportion of the surveyed household operating gold extraction units (15 out of 17 household sampled) live in Cisarua; the closest village to the gold mining area. It is interesting to note that 60% among the surveyed households owning gold extraction unit in Cisarua are households with less than 0.75 ha of agricultural land. It

indicate that gold extraction is an alternative source of income for farmers with less land resources in the villages near the gold mining area.

Saving as other household assets was also collected in the study. Although the intention was to collect any kind of saving that the farmers have (not merely cash deposit) as additional for animal husbandry, during interview process, this aspect was always understood as cash deposit by respondent. Therefore, what it means by saving here is cash deposit. Very few respondents acknowledged having cash deposits or family cash saving; in total only 12.4%. Comparing the three sample villages, Cisarua has the least households with cash savings and Curug Bitung the largest number of households with cash saving. The amount of cash saving per households ranging between Rp. 120,000 to Rp. 10,000,000.

2.3. Income and Expenditure

This section discusses the living standards of the Nanggung population using two socio-economic indicators, i.e. income and expenditure. It simply describes the family income (and also per capita income), source of income, family expenditure (and also per capita expenditure) and expenditure allocation. It also assesses the level of family income and expenditure of the surveyed household compared to national and provincial poverty line to find out the status of their living standard; hence surveyed households are defined as poor if their income or expenditure is below poverty line.

(a) Income

Although most of people in Nanggung engage in agriculture (work as farmer), it is unlikely that agricultural income contribute the most to family income. Income data derived from this survey shows that agriculture is not the main contributor to family income. As seen in Table 9, agricultural activities alone contribute 31.2% to the total households' income. By referring these income figures to average landholding size (Table 6), it seems that the share of agricultural income to total family income correlates to average landholding size. In Parakan Muncang for example, where the average of landholding size is the lowest among the three sample villages, the share of agricultural income to total family income is also the least (17.6% of total household income). Whilst for Curug Bitung and Cisarua, where average land holding size are larger than in Parakan Muncang, total agricultural income are also higher. However, comparing these two villages, it is interesting to note that the share of agricultural income of the surveyed household in Curug Bitung to the total family income is higher than in Cisarua, although the average of landholding size in Curug Bitung s slightly less than in Cisarua. More detail observation reveal that in Cisarua, the most remote village among the three sample villages but very close to the gold mining area, there are 42.9% of surveyed household engage in gold extraction activities. This activity contributes about 48 % of the total off-farm income in Cisarua (see Annex).

The fact that off-farm incomes contribute the most to the total family income, it explains that most of the surveyed household can't rely mainly on agricultural activities with relatively narrow landholding size for

their livelihood. It also indicates that large portion of people, especially landless farmers in the study site, must engage in other income generating activities to meet their family livelihood needs.

For those households that have other sources of income (remittance, donation and dowry), although these sources are irregular and relatively small as a portion of total family income, this additional income is meaningful for their livelihood. In this regards, Parakan Muncang is also the 'best', meaning number of households receiving this kind of income is highest , as well as the amount of income from these irregular sources is also highest.

Table 9. Households' Income by source of income and by village sample

	Parakan Muncang			Curug Bitung			Cisarua			Sample Villages		
	N	Rp 000	%	n	Rp 000	%	n	Rp 000	%	n	Rp 000	%
Agricultural income												
~ Rice Fields	19	26,935	7.4	29	54,055	18.6	28	39,721	11.1	76	120,711	10.4
~ Kebun and Tegal	33	34,645	9.5	35	71,583	24.6	35	39,878	13.0	103	146,105	15.5
~ Livestock	10	2,630	0.7	13	8,185	2.8	15	24,048	7.9	38	34,863	3.7
	34	**64,210**	**17.6**	**35**	**133,823**	**46.0**	**35**	**103,646**	**33.2**	**104**	**301,678**	**31.2**
Off farm income												
~ Main occupation	28	227,349	62.4	13	42,260	14.6	14	89,120	28.6	55	358,729	37.1
~ Occasional occupation	16	33,600	9.2	25	84,660	29.1	25	117,611	37.6	24	58,011	6.1
	31	**260,949**	**71.6**	**25**	**126,920**	**43.7**	**32**	**206,731**	**66.2**	**88**	**594,600**	**61.5**
Other Income												
~ Remittance and donation	21	38,722	10.6	14	22,540	7.7	10	8,396	2.7	45	69,658	7.2
~ Dowry etc.	1	500	0.1	1	200	0.1	1	500	0.2	3	1,200	0.1
	21	**39,222**	**10.7**	**14**	**22,740**	**7.8**	**11**	**8,896**	**2.9**	**46**	**70,858**	**7.3**
Total households' income												
	35	**364,381**	**100**	**35**	**290,683**	**100**	**35**	**312,073**	**100**	**105**	**967,136**	**100**

Source: Household survey data
Note : n denotes number of surveyed households involved.

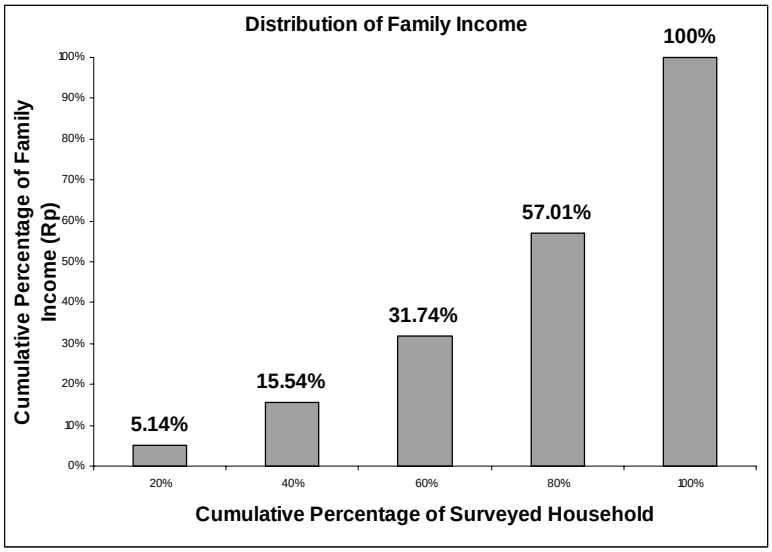
From living standard point of view, it is necessary to question whether the surveyed households can fulfill their needs. To answer such questions, the study applies the poverty line of BPS – Statistics of Indonesia that refers to the daily minimum requirement of 2,100 kilo-calories per capita plus the non-food minimum requirement, such as for living, clothing, schooling, transportation, household necessities and other individual needs. The value of expenditure (in rupiahs) needed for fulfilling the basic minimum requirement including food and nonfood (that is called as poverty line) for rural area of Indonesia and West Java Province in 2002 were Rp. 96,512 and Rp 96,455 capita^{-1} month^{-1} respectively or in annual basis were Rp 1,158,144. and Rp 1,157,460 capita^{-1} year^{-1} (BPS, 2002). Using average per capita income of the surveyed household in three sample villages, the study reveals the average person/family in Nanggung is still above the poverty line. As seen in Table 10, average per capita incomes of the three sample villages are still much higher than the poverty line of Indonesia and West Java Province. But, because of skewed distribution of income (see Figure 3), it needs to be treated with cautions, especially if

number of people below poverty line is counted. The study found that there were about 33 % of the persons in the surveyed household are below poverty line, mean that those people cannot afford the basic needs requirement, and thus are categorized as poor. Comparing the sample villages, Cisarua is the worst among the three sample villages; hence, about 37% of the people below poverty line.

Table 10. Descriptive statistics of family income of the surveyed households and people under poverty line

	Parakan Muncang	Curug Bitung	Cisarua	Sample Villages
Number of surveyed household	35	35	35	105
Number of family member	181	169	180	530
Total family income (Rp 000/year)	364,381	290,683	312,073	967,136
Range (Rp 000/year)				
Minimum	325	577	620	325
Maximum	37,667	24,399	24,547	37,667
Average family income per household (Rp 000/year)	10,410	8,305	8,916	9,211
Income per capita (Rp 000/year)	2,013	1,720	1,733	1,824
Proportion of people below poverty line				
~ of Indonesia (Rp 1,158,144 capita^{-1} year $^{-1}$)	30.4	31.4	36.7	32.8
~ of West Java (Rp 1,157,460 capita^{-1} year $^{-1}$)	30.4	31.4	36.7	32.8

Source: Household survey data



Source: Household survey data

Figure 3. Cumulative distribution of the surveyed household by Income

(b) Expenditure

The following Table 11 describes expenditures of the surveyed households in the three sample villages. The data are annual expenditure derive from the surveyed household.

Table 11. Households' expenditure by items

	Parakan Muncang (n = 35)		Curug Bitung (n = 35)		Cisarua (n = 35)		Sample Villages (n = 105)	
	Rp 000	(%)	Rp 000	(%)	Rp 000	(%)	Rp 000	(%)
1. Meal or Food	**158,741**	**(44.8)**	**112,521**	**(41.5)**	**114,345**	**(43.6)**	**385,607**	**(43.4)**
2. Housing	**26,810**	**(7.6)**	**12,600**	**(4.6)**	**9,564**	**(3.6)**	**48,974**	**(5.5)**
~ Electricity	16,286	(4.6)	12,120	(4.5)	9,384	(3.6)	37,790	(4.3)
~ Telephone	10,188	(2.9)					10,188	(1.1)
~ Water	336	(0.1)	480	(0.2)	180	(0.1)	996	(0.1)
3. Clothing	**22,575**	**(6.4)**	**16,960**	**(6.3)**	**19,105**	**(7.3)**	**58,640**	**(6.6)**
4. Schooling	**27,134**	**(7.7)**	**28,807**	**(10.6)**	**25,317**	**(9.7)**	**81,257**	**(9.2)**
~ Elementary school	9,980	(2.8)	6,973	(2.6)	14,504	(5.5)	31,456	(3.5)
~ junior secondary school	10,758	(3.0)	3,382	(1.2)	7,043	(2.7)	21,183	(2.4)
~ senior secondary school	4,117	(1.2)	9,602	(3.5)	3,770	(1.4)	17,489	(2.0)
~ tertiary education	2,280	(0.6)	8,850	(3.3)			11,130	(1.3)
5. Household necessities	**38,155**	**(10.8)**	**23,905**	**(8.8)**	**21,360**	**(8.1)**	**83,420**	**(9.4)**
~ Soap etc.	23,415	(6.6)	21,231	(7.8)	18,515	(7.1)	63,161	(7.1)
~ Furniture	2,580	(0.7)	1,874	(0.7)	845	(0.3)	5,299	(0.6)
~ Maintenance	12,160	(3.4)	800	(0.3)	2,000	(0.8)	14,960	(1.7)
6. Health	**6,249**	**(1.8)**	**5,323**	**(2.0)**	**3,623**	**(1.4)**	**15,195**	**(1.7)**
7. Transportation	**13,440**	**(3.8)**	**12,720**	**(4.7)**	**12,918**	**(4.9)**	**39,078**	**(4.4)**
8. Individual needs	**42,296**	**(11.9)**	**39,090**	**(14.4)**	**40,249**	**(15.3)**	**121,635**	**(13.7)**
~ Cigarette	39,240	(11.1)	36,186	(13.4)	38,190	(14.6)	113,616	1(2.8)
~ Cosmetics	3,056	(0.9)	2,904	(1.1)	2,059	(0.8)	8,019	(0.9)
9. Tax	**834**	**(0.2)**	**2,252**	**(0.8)**	**496**	**(0.2)**	**3,582**	**(0.4)**
10. Social obligation	**18,455**	**(5.2)**	**16,842**	**(6.2)**	**15,320**	**(5.8)**	**50,617**	**(5.7)**
Total expenditure	**354,690**	**(100)**	**271,018**	**(100)**	**262,297**	**(100)**	**888,005**	**(100)**
Family expenditure per household per year (Rp. 000)		**10,134**		**7,743**		**7,494**		**8,457**

Source: Household survey data

Survey data on household expenditures shows that all expenditures (excluding saving which is very little) are slightly lower than family income, and average expenditure per households is also slightly lower than average family income (see also Table 9 and Table 10). This demostrates that almost all income is spent on consumption. Having a close look at the expenditure items, the largest proportion is spent on food (43.4%) and other non-food consumption that is categorized as basic needs for the family livelihood, such housing, cloth, schooling, transportation, and household necessities. Very little expenditure is found for non basic-need spending like furniture and house maintenance.

3. Farming and System of Production

This section presents the profile of farming practices of the surveyed household based on the information gathered by interviewing the respondents. It describes how farmers manage their agricultural land and the productions with special emphasis on *kebun* management. As mention earlier, agricultural land controlled by the surveyed household is comprise of dry land in the form of *kebun* and *tegal*, covering a total area 53.2 ha and wet land for paddy cultivation, covering area of 22.9 ha (See Table 12 below).

Household landholdings are scattered in small plots. This indicates that the physical characteristics of the agricultural land in most part of Nanggung are situated in undulating area, from gently to steep slope. As seen in Table 12, there are 112 plots within 22.88 ha of rice field, and 212 plot of *kebun* and *tegal* within 53.18 ha of land controlled by the surveyed households. In addition, topographically, most of the land is sloping land; hence, more than 80% of the plots are considered by the respondents as gently to steep sloping land.

Table 12. Number of plot, slope and distance of the agricultural land Physical Char

	Parakan Muncang	Curug Bitung	Cisarua	Sample Villages
Rice field				
~ Total area (ha)	3.12	8.44	11.33	22.88
~ Plot	21	42	51	114
~ Percentage distribution of plots by slope				
flat to slightly slope	19.0%	12.5%	21.6%	17.9%
gently slope	33.3%	47.5%	37.3%	40.2%
steep slope	47.6%	40.0%	41.2%	42.1%
~ Percentage distribution of plots by distance				
≤ 500 m	37.5%	24.2%	45.2%	36.3%
500 - 1,000 m	50.0%	33.3%	35.7%	37.4%
1,000m <	12.5%	42.4%	19.0%	26.4%
Kebun and tegal				
~ Total area (ha)	12.32	19.51	21.35	53.18
~ Plot	44	88	80	212
~ Percentage distribution of plots by slope				
flat to slightly slope	27.2%	17.0%	13.6%	17.8%
gently slope	52.3%	40.9%	33.3%	40.4%
steep slope	20.5%	42.1%	53.1%	41.8%
~ Percentage distribution of plots by distance				
≤ 500 m	61.1%	60.8%	76.5%	65.8%
500 - 1,000 m	25.0%	31.1%	15.7%	24.8%
1,000m <	13.9%	8.1%	7.8%	9.3%

Source: Household survey data

3.1. Kebun (and Tegal)

(a) Profile of *kebun*

Kebun systems vary from mere bare land to very complex systems of perennial and annual crops. The more complex kebun systems produce a combination of timber crops (including bamboo), fruit crops, annual crops, and some medicinal crops all in a single plot. The yield from kebuns depends on the owner's or landholder's species selection, cultivation and management. Based on the data collected from the surveyed households on species cultivated in their respective kebun, the study group the plots into seven type of kebun according to three broad groups of species cultivated in every kebun: timber producing plant, fruit producing plant, and annual/seasonal crops (especially food crop). The seven types of kebuns are: Type 1 - kebuns of mainly fruits producing trees, Type 2 – kebuns of mainly timber producing trees, Type 3 – kebuns of mainly annual/seasonal crops, Type 4 - kebuns with a combination of fruit trees and annual/seasonal crops, Type 5 - kebuns with a combination of timber trees and annual/seasonal crops, Type 6 – kebuns with a combination of fruit and timber trees, and Type 7 - kebuns with a combination fruit trees, timber trees and annual/seasonal crops. Table 13 presents the type of kebuns plus fallow (bare) land and their respective distribution in the three sample villages.

Table 13. Kebun type in Nanggung and its distribution by village (in percentage of plots)

Type of kebun	Parakan Muncang	Curug Bitung	Cisarua	Total
	(% of n=44)	(% of n=88)	(% of n=81)	(% of n=213
Bare Land	2.3%	4.5%	3.8%	3.8%
Type 1 : Fruit plants only	**47.7%**	**35.2%**	**48.8%**	**42.9%**
Type 2 : Timber plants only	4.5%	6.8%	8.8%	7.1%
Type 3 : Annual crops Only	4.5%		2.5%	1.9%
Type 4 : Fruit plant and annual crop	**27.3%**	**14.8%**	7.5%	**14.6%**
Type 5 : Timber plants and annual crop		1.1%		0.5%
Type 6 : Fruit and timber plants	9.1%	**19.3%**	**21.3%**	**17.9%**
Type 7 : Fruit, timber and annual crop	4.5%	**18.2%**	7.5%	**11.3%**

Source: Household survey data

Table 13 shows that 42.9% out of 212 plots perform as kebun type 1; kebuns of mainly fruit trees. This type of kebun is prominence in all sample villages. The second most common type of kebun is combination of fruit and timber trees, common in both Curug Bitung and Cisarua, and representing 17.9% of the kebuns of respondents. The third most common kebun type is fruit trees combined with annual/seasonal crops, very common in Parakan Muncang and some what common in Curug Bitung, and representing 14.6% of all kebuns. The fourth most common kebun type is a combination of fruit trees, timber trees and annual/seasonal crops, which represents 11.3% of all kebuns. Timber only kebuns represent only 7.1% of kebuns. Fruit is the key kebun component present in of 86.7% of the kebuns.

Timber is a component of 36.8% of the kebuns; annual/seasonal crops a component of 28.3% of the kebuns. This demonstrates farmers preference for fruit tree cultivation. Further evidence is provided by the list of plants cultivated in the kebuns of sample households (see Table A3 in the Annex). Among the fruit species cultivated by farmers, banana is most popular one (cultivated in 75.9% of kebuns), followed by petai (47.2% of kebuns), and then mango (39.2% of kebuns). Village wise comparison, there are 27 fruits species cultivated by the surveyed household in Parakan Muncang, whereas in Curug Bitung and Cisarua there are 31 and 30 fruit species respectively cultivated by the surveyed households.

With regard to timber production, there are seven timber species and bamboo cultivated by the surveyed households. Table 14 presents the percentage distribution of plots by species found. Bamboo is the most dominant species cultivated in their kebun, followed by Sengon (*Paraserianthes falkataria*) and Afrika (*Maesopsis eminii*). Same as fruits, a greater number of species (6) are found in Curug Bitung and Cisarua than in Parakan Muncang (4).. It is illustrative to remember that Parakan Muncang is the most accessible (least remote) village and that Curug Bitung and Cisarua are remote and close to remnant natural forests. Timber kebuns are more common and important in Curug Bitung and Cisarua.

Table 14. Percentage distribution of plots by timber species (including bamboo) cultivated by the surveyed households

Plants cultivated in the kebun		Parakan Muncang	Curug Bitung	Cisarua	Total
Local name	**Scientific name**	(% of n=44)	(% of n=88)	(% of n=80)	(% of n=212)
Bambu	*Bambusoideae*	13.6%	29.5%	23.8%	24.1%
Sengon	*Paraserianthes falkataria*	2.3%	21.6%	13.8%	14.6%
Afrika	*Maesopsis eminii*	4.5%	15.9%	10.0%	11.3%
Puspa	*Schima wallichii*	6.8%	8.0%	1.3%	5.2%
Pinus	*Pinus* sp		2.3%		0.9%
Sungkai	*Pheronema canescens*			1.3%	0.5%
Tisuk	*Hibiscus cannabinus*		1.1%		0.5%
Sampang	*Eudia latifolia*			1.3%	0.5%
No Plot		100 %	100 %	100 %	100 %

Source: Household survey data

There are some plots were occasionally used for annual crops cultivation, mostly tubers such as cassava, *Talas (Taro)*, sweet potato and *lengkuas* (*Alpinia galangal*), for own consumption and also for sale. Vegetables such as long bean (*vigna sinensis*), string bean (*Phaseolus vulgaris*) and scallion (*Allium cepa*) are also planted by some households for income generation. Annual crop cultivation is dominated by cassava; 25.5% of plots are partly cultivated for cassava.

(b) Kebun Management: agricultural inputs and returns

The survey data indicates that very little management conducted in kebun systems. Harvesting is the dominant kebun management activity. Table 15 presents the level of inputs (external inputs application and labor inputs) allocated to kebun management by the surveyed household, as can be seen agricultural inputs used by the surveyed household in their kebuns is very low. The study found that chemical fertilizer was applied in only 7 kebuns (3.3% of the total plots) and organic fertilizer was applied in only 15 kebuns (7.1%). The rate of fertilizer application, for chemical fertilizer was also very little, ranging between 7.4 and 87.5 kg ha^{-1}, whereas for organic fertilizer, some plots applies reasonably high, up to 4.3 ton ha^{-1}.

With regard to labor inputs, based on activities implemented, the data shows that harvesting is the activity most commonly conducted in the kebun. During the previous year crops were harvested in nearly three-quarters (72.6%) of the kebun plots[10]. Weeding and maintenance of tree or seasonal crops is the next most common activity, conducted 30.7% of the kebun plots. The number of person-days involve in harvesting is less than the number of person-days involved in weeding and maintenance. As seen in the Table 15, number of person-days involved in harvesting activities during 2002/2003 planting session, less than the labor employed for tree and crops care activities during the same period.

Paying attention to the returns gain from kebuns, data derived from respondents shows that during planting session 2002/2003, among the three groups of commodities produced in the kebun, fruits components contribute the most (63.7 %) to the total returns gain from kebun, whereas annual crops contribute the least (7.4 %). Village wise comparison presented in Table 16 shows that Curug Bitung has the highest returns gain from kebun among the three sample villages; again, fruits component took the largest share. Comparing among the seven types of kebun (Table 17), the study found similar results; fruit components contribute the most and kebun with fruits components provide larger returns than kebun without fruit components.

The study also carried out a farm budget analysis for the period of the study for every plot of kebun controlled by the surveyed household. This analysis mainly focused on net returns calculation during 2002/2003 planting year. It should be clarified that net returns in this regards represents net cash inflow for a single year (2002/2003 cropping year), and does not represent land use profitability. Table 18 summarizes the net returns calculation by type of kebun. The results of the analysis shows that excepts the bare land kebun, all type of plots gain positive net returns, meaning that cash inflow was larger than cash outflow. In other words, all of the kebun provides income to the owners. In comparing the seven type of kebun, it is interesting to see that kebun with fruit and annual crops components provide better net return than the other type of kebun.

[10] It doesn't mean that the rest 27.4% of kebun plots were not harvested at all; hence harvesting activities were done by buyers directly in the kebun (not by the owners nor hired labors) or some farmers do picking up the yields of their kebun when they pass by their kebun (not intentionally to harvest the yields).

Table 15. Level of Input in Kebun management by type of kebun

	Bare Land	Fruit Trees Only (type 1)	Timber Trees Only (type 2)	Annual Crops Only (type 3)	Fruit Trees and Annual Crop (type 4)	Timber Trees and Annual Crop (type 5)	Fruit and Timber Trees (type 6)	Fruit, Timber and Annual crop (type 7)	All
No of Plot	8	91	15	4	31	1	38	24	212
Total Area (ha)	0.43	18.56	3.82	0.26	4.70	0.50	15.94	8.97	53.18
Average area per plot (ha)	0.054	0.204	0.254	0.065	0.152	0.500	0.419	0.374	0.251
Inputs									
1. External Inputs									
1.1. Chemical Fertilizer									
~ Plot applying chemical fertilizer (%)	-	0.5%	-	0.5%	1.4%	-	0.9%	0.0%	3.3%
~ Rate of fertilizer application (kg ha^{-1})	-	25	-	14	87.5	-	7.4	-	17.0
1.2. Organic Fertilizer									
~ Plot applying organic fertilizer (%)	-	1.4%	0.5%	0.9%	2.8%	-	0.5%	0.9%	7.1%
~ Rate of fertilizer application (kg ha^{-1})	-	2,273	1,429	4,333	1,018		4,000	3,000	1,948
1.3. Pesticide									
~ Plot applying pesticide (%)	-	0.0%	0.0%	0.0%	9.7%	-	2.6%	0.0%	1.9%
2. Labor inputs									
2.1. Planting									
~ Plot with planting activity (%)	-	3.3%	0.5%	0.0%	0.9%	-	0.9%	0.5%	6.1%
~ Total Labor (ps-day/ha)	-	5	8	-	15	-	13	2	7
2.2. Tree & crop care									
~ Plot with tree & crop care activity (%)	-	17.5%	1.4%	0.5%	3.8%	-	4.7%	2.8%	30.7%
~ Total Labor (ps-day/ha)	-	22	37	93	45	-	14	70	25
2.3. Harvesting									
~ Plot with harvesting activity (%)	-	30.7%	2.8%	0.9%	13.7%	-	15.1%	9.4%	72.6%
~ Total Labor (ps-day/ha)	-	17	7	58	20	-	7	7	11

Source: Household survey data

Table 16 . Return gain from kebun by village and groups of commodities

	Parakan Muncang	(%)	Curug Bitung	(%)	Cisarua	(%)	Total	(%)
Return gain from Fruits								
Number of plot involve	39	88.6%	77	87.5%	68	85.0%	184	86.8%
Sum (Rp. 000)	24,391.3	69.9%	42,781.9	59.1%	27,114.5	66.4%	94,287.7	63.7%
Average per plot (Rp. 000)	625.4		555.6		398.7		1,579.8	
Returns gain from Timber								
Number of plot involve	8	18.2%	40	45.5%	30	37.5%	78	36.8%
Sum (Rp. 000)	4,403.3	12.6%	26,273.3	36.3%	12,131.5	29.7%	42,808.1	28.9%
Average per plot (Rp. 000)	550.4		656.8		404.4		1,611.6	
Returns gain from Annual Crops								
Number of plot involve	16	36.4%	30	34.1%	14	17.5%	60	28.3%
Sum (Rp. 000)	6,102.7	17.5%	3,291.3	4.5%	1,592.5	3.9%	10,986.5	7.4%
Average per plot (Rp. 000)	381.4		109.7		113.7		604.9	
Total return gain from kebun								
Number of plot involve	44	100%	88	100%	80	100%	212	100%
Sum (Rp. 000)	34,897.3	100%	72,346.5	100%	40,838.5	100%	148,082.3	100%
Average per plot (Rp. 000)	793.1		822.1		510.5		2,125.7	
Std. Deviation (Rp. 000)	1,274.7		1,281.4		843.5		3,399.6	

Source: Household survey data

Table 18. Net return of kebun in 2003/2003, by type of kebun

	Bare Land	Fruit Trees Only (type 1)	Timber Trees Only (type 2)	Annual Crops Only (type 3)	Fruit Trees and Annual Crop (type 4)	Timber Trees and Annual Crop (type 5)	Fruit and Timber Trees (type 6)	Fruit, Timber and Annual crop (type 7)	Total All
Number of plot	8	91	15	4	31	1	38	24	212
Total area (ha)	0.43	18.56	3.82	0.26	4.70	0.50	15.94	8.97	53.18
Average area per plot (ha)	0.054	0.204	0.254	0.065	0.152	0.500	0.419	0.374	0.251
Inputs (Rp 000)									
~ External farm inputs	-	57	7	18	57	-	39	26	204
~ Labor Inputs	-	6,214	696	287	2,203	-	2,597	2,001	13,974
Sum	**-**	**6,271**	**704**	**304**	**2,260**	**-**	**2,636**	**2,027**	**14,177**
Returns (Rp 000)									
~ fruit components	-	41,625	-	-	15,016	-	15,536	22,111	94,288
~ timber components	-	-	5,604	-	-	818	22,042	14,345	42,808
~ annual crop components	-	-	-	1,175	7,563	763	-	1,485	10,986
Sum	**-**	**41,625**	**5,604**	**1,175**	**22,579**	**1,581**	**37,578**	**37,940**	**148,082**
Net returns (Rp 000)									
~ total	-	35,354	4,900	871	20,319	1,581	34,942	35,913	133,905
~ average per plot	-	389	327	218	655	1,581	920	1,496	632
~ average per hectare	-	1,905	1,284	3,350	4,319	3,162	2,192	4,002	2,518

Source: Household survey data

3.2. Rice fields

The study found 66 surveyed households controlling 22.8 hectare of wetland paddy fields that are scattered around in 107 small plots. Dependent on water availability, farmers cultivate paddy on their *sawah* two to three times a year. Data provided by the respondents on their agricultural undertakings during 2002/2003 planting year (first and second planting session), shows that level of inputs and average paddy yields per hectare, except for Parakan Muncang, were less than West Java average. Using the available statistics of cost structure of paddy cultivation in West Java (BPS, 1993), showing the rate of fertilizer application of Urea and TSP were 219.3 and 115.5 kg ha^{-1} respectively, and paddy production was 5.25 ton ha^{-1}, average urea application in Nanggung was about 25% lower and TSP application was about 66% lower than West Java average (See Table 19). Parakan Muncang, where most rice field are situated in relatively flat areas, both paddy production and the rate fertilizer application were higher than West Java average. This is not too surprising because Parakan Muncang constitutes paddy production centre for Kecamatan Nanggung (together with Kelong Liud). However, it needs to note that the higher application rate does not necessarily lead to more profit to farmers. Statistical test on 107 observed plots proved that the correlation between total inputs and total profit from rice field is weak (Pearson correlation r= 0.354 at 0.01 significance level).

Table 19. Average inputs and outputs per hectare wetland paddy cultivation in three sample villages of Kecamatan Nanggung, 1st and 2nd planting session of 2002/2003.

	Parakan Muncang		Curug Bitung		Cisarua		All	
	First planting session '02/'03	Second planting session '02/'03	First planting session '02/'03	Second planting session '02/'03	First planting session '02/'03	Second planting session '02/'03	First planting session '02/'03	Second planting session '02/'03
External Input								
~ Seeds (kg. ha^{-1})	111	116	75	76	68	60	76	73
~ Fertilizer (kg. ha^{-1})								
Urea	235	205	134	137	88	111	165	159
TSP	124	122	96	91	78	79	39	36
KCL	15	14	0	0	0	0	2	2
Manure	0	26	0	0	0	0	0	3
~ Pesticide (ltr. ha^{-1})	7	9	6	6	6	7	6	7
Labor input (ps-day ha^{-1}								
~ Land preparation								
Hoeing	58	61	60	60	76	90	65	71
Plowing	8	7	3	3	6	5	5	5
~ Sowing & Planting	40	38	35	34	39	40	38	38
~ Crop care								
Fertilizing	4	4	7	7	6	7	6	6
Weeding	53	53	32	33	45	47	42	43
~ Harvesting	38	38	37	36	46	47	42	40
Total Labor inputs	201	201	174	173	218	236	198	203
Out put (Paddy) kg	7,527	7,113	4,515	4,131	3,877	2,958	4,957	4,411

Source: Household survey data

Amount of seed used by farmers for paddy cultivation were reasonably high, as well as the rate of pesticide application. West Java statistics notes that average number of paddy seed in wetland paddy cultivation was 30.8 kg ha^{-1} and the rate of pesticide application was 5.8 liter ha^{-1}. A careful observation needs to be taken on the Nanggung figures. High rate of pesticide application conveys a message that farmers were not efficient in pesticide application due the physical characteristics of the rice fields i.e., scattered in small plots and situated in sloping land. The high amount of seed used for paddy cultivation, probably relates to farmers' behaviour regarding paddy seeds. The study found that 83% of those cultivating paddy used own production seeds. Without neglecting the possibility of recalling bias during interview, the study speculates that farmers already took into account the survival rate of the seeds, as it was derived from experience on their own farm.

4. Marketing

Marketing aspect of the study emphasize on the following two questions: (a) what commodities were sold during the period under study and the proportion of the marketed commodities compared to the total harvest? and (b) what market channels were normally chosen by farmers to sell the commodities harvested from their agricultural land? The first question is to understand the marketable agricultural commodities in the study site, which farmers prefer to produce and sell for their income, whereas the second question concerns about the position of Nanggung farmers in local market web for their agricultural commodities.

As an introductory note, since the data regarding the quality of the produce sold could not be collected in a consistent and reliable manner, the study was not been able to conduct a detailed analysis concerning product quality and varieties. This includes timber sold by the surveyed household, which was mentioned only in number of trees harvested (stump). Specifically for timber, this problem results because the respondents were not able to recall the diameters or volumes of the timber sold. In general, farmers have very poor access to market information, include product quality specifications, and thus are not able to give reliable responses.

4.1. *Kebun* Commodities

Data derived from respondents, revealed that there are 40 fruit plant species, eight timber species and nine annual crops cultivated in the kebun. Among the fruit plant species, 33 species have produced yields for farmers during the 2002/2003 planting year (See Annex, Table A6 and Table A7). However, only 19 types of fruits were sold during the period. Whilst for timber, as seen in Table 20, seven species were harvested and sold during the study period. All nine annual crops were harvested and sold during the study period.

Looking at the quantity or volume of commodities, it is not surprising to see that not all yields harvested from the kebun were sold. Table A7 in Annex, presents the percentage of yields sold for every fruit species harvested by the surveyed household. Proportionately, most of the yields of the key fruit species – banana (*Musa* sp), mangoes (*Mangifera* sp) and rambutan (*Nephelium lappaceum)*, the most dominant fruit

species in the kebuns) were not sold. Data recorded from the surveyed household shows that 58% of banana yields and respectively 33.4% and 10%.2% of mangoes and rambutan were sold by the surveyed households. The remainder of the fruit crops were consumed by the household or spoiled. The low percentage of fruit product sold provides some evidence that i) the quality of fruit produced is not very high (not marketable), ii) the fruit species produced do not match market demand, iii) post-harvest handling is poor, and/or iv) that farmers lack adequate market information and market access. This relates directly to species selection and kebun management.

Fruit and vegetable products from Nanggung are market through four channels:

Channel 1: Farmer → local household or local market
Channel 2: Farmer → local collector → local trader → local customer or local market
Channel 3: Farmer → local collector → regional trader or retailer → urban customer (Bogor or Jakarta)
Channel 4: Farmer → local collector → local trader → regional trader → regional retailer → urban customer (Bogor or Jakarta)

The main types of market agents are farmers, collectors, local and regional traders and regional retailers. The role of farmers is largely restricted to production. Collectors, traders and retailers, to different degrees, all are engage in sorting, grading, storage and transportation. They also contribute market intelligence and capital to the marketing process.

For instance, farmers sell 22% of their bananas through channel 2; 64% through channel 3; and 7% through channel 4. About 7% of the banana crop is consumed in homes. Although the price received by farmers is highest in channel 1, the volume of bananas sold through this channel is small because of limited local demand. On average, the price received by farmers does not vary between the other three channels. Farmers know little about how the different channels function. Channels 2, 3 and 4 are interlinked, but generally procure bananas of different quality - channel 2 (like channel 1) average quality bananas, channel 3 good quality bananas, and channel 4 the best quality bananas. The collectors in each channel are generally familiar with each other. Collectors in channel 2 sort bananas and sells high quality products in bulk to collectors in channels 3 or 4. Collectors and traders in channel 3 and 4 sort the bananas they procure for sale to down channel agents according to quality (Tukan et al. 2006).

With regards to timber (including bamboo) and annual crops, the data exhibit slightly better situation than the fruits. Although these kinds of plant were found in few plots and cultivated in few patches within plot, largest portions of the yields were sold. The study recorded that 1,385 stems of sengon tree (*Paraserianthes falkataria*), 1182 stems of puspa (*Schima wallichii*) and 785 trees of afrika (*Maesopsis eminii*) were harvested for timber during the period under study. The portion of these stems sold were 66%, 34% and 81%, respectively. Additionally, 12,033 stems of bamboo were harvested by respondents during the study period, with 74% of the yield sold. Table 20 presents the full details regarding annual and timber crop yields and marketing.

Table 20. Annual crops and Timber harvested in the Kebun and the percentage sold

	Unit	Parakan Muncang'		Curug Bitung		Cisarua		All	
		Yield	Sold (%)	Yield	Sold (%)	Yield	Sold (%)	Yield	Sold (%)
String bean (*Phaseolus vulgaris*)	Kg			180	100%			180	100%
Caesim /Mustard green	Kg			150	100%			150	100%
Pepper (*Piper nigrum*)	Kg			1	0%			1	0%
Cassava (*Manihot esculenta*)	Kg	1,360	11%	8,953	68%	5,200	69%	15,513	63%
Taro (*olocasia esculenta*)	kg			85	0%	30	0%	115	0%
Cowpea (*Vigna unguiculata*)	bunches			225	91%			225	91%
Tanaman hias	bunches	506	100%	0				506	100%
Scallion (*Allium cepa*)	bunches			80	38%			80	38%
Galangal (*Alpinia galangal*)	kg	10	100%	161	93%			171	94%
Sengon (*Paraserianthes falkataria*)	stems	42	29%	923	57%	420	91%	1,385	66%
Tisuk (*Hibiscus cannabinus*)	stems	12	0%	1	100%	0	0%	13	8%
Afrika (*Maesopsis eminii*)	stems	20	60%	579	78%	186	92%	785	81%
Puspa *Schima wallichii*	stems	640	49%	96	53%	446	7%	1,182	34%
Pinus (*Pinus Sp)*	stems			27	100%	27	0%	54	50%
Bambboo (*Bambusoideae)*	stems	669	71%	7,159	71%	4,205	78%	12,033	74%
Sungkai (*Pheronema canescens)*	stems			1	0%	2	50%	3	33%
Sampang (*Eudia latifolia*)	stems			2	0%	4	50%	6	33%

Source: Household survey data

Village wise comparison, the study notes that, from the number of kebun commodities harvested and the quantity (in percentage) of commodities sold in the market, Curug Bitung is the best among the three sample villages. It was found that in Curug Bitung there were 46 commodities harvested in the kebun, and 29 out of them were sold by the surveyed households. Most of the commodities (20 commodities) were sold in a reasonably large proportions – above 60% of the harvested yields. In Parakan Muncang, 36 commodities were harvested from kebuns and 18 of them were sold. Only eight of 18 commodities were sold at proportion of more than 60% of the yields harvested. In Cisarua, there were 32 commodities harvested from kebuns; 17 commodities were sold. However, most of the commodities (12 out of 17) were sold at proportions less than 50% of the total yields harvested. (See Table A7 Annex, and Table 20 above)

Regarding the second question, i.e., where does the produce go after it is harvested, the evidence of poor marketing ability of farmers in Nanggung is clearly found. None of the surveyed households process the commodities harvested. This is a huge missed opportunity to gain additional market margin through value added processing. Most of the commodities were sold to collectors, the most immediate marketing agent to the farmer producers in the marketing channel. See details in Table 21.

Not very much different was found in timber marketing. Farmers sold the timber to collectors or sawmill in the village or in the neighboring village. Very few respondents sold sawn timber or processed bamboo directly to consumer in the village or in other markets. Collectors and sawmill play an important role in timber and bamboo marketing.

4.2. Paddy

As mentioned earlier that paddy cultivation constitutes a subsistence-farming activity for most Naggung farmers. The study noted very little paddy production was sold. Altogether only 6% out of 91.3 ton paddy production during two planting session (in 2002/2003) were sold. The rest was for own consumption.

Table 21. Marketable commodities and the marketing chain used, in percentage by commodities)

	Commodities	Collectors	Wholesaler	Market	Consumers
Fruits etc.					
1	Banana (*Musa sp.*)	90.9%	1.8%	5.5%	1.8%
2	Coconut (*Cocos nucifera*)	79.2%	4.2%	4.2%	12.5%
3	Jackfruit (*Artocarpus heterophyllus*)	63.0%	18.5%	3.7%	14.8%
4	Mango (*Mangifera indica*)	60.0%		20.0%	20.0%
5	Durian (*Durio zibethinus*)	80.0%	20.0%		
6	Pete (*Parkia speciosa*)	80.0%	6.7%	13.3%	
7	Jengkol (*Pithecellobium jiringa*)	75.0%	12.5%	6.3%	6.3%
8	Rambutan (*Nephelium lappaceum*)	57.1%	14.3%	14.3%	14.3%
9	Melinjo (*Gnetum gnemon*)	50.0%			50.0%
10	Clove (*Eugenia aromatica*)	87.5%		12.5%	
11	Jambu air (*Syzigium aqueum*)			100.0%	
12	Kecapi (*Sandoricum koetjape*)	80.0%		20.0%	
13	Manggis (*Garcinia mangostana*)	50.0%			50.0%
14	Coffee (*Coffea* sp)	80.0%		20.0%	
15	Kemang (*Mangifera remanga*)	100.0%			
16	Duku (*Lansium domesticum)*	50.0%	50.0%		
17	Aren (*Arenga pinnata*)	50.0%	16.7%	33.3%	
18	Tea (*Camelia Sinensis*)				100.0%
19	Pineapple (*Ananas comosus*)	100%			
Annual crops					
1	String bean (*Phaseolus vulgaris*)	100%			
2	*Caesim* /Mustard green	100%			
3	Cassava (*Manihot esculenta*)	86.2%	13.8%	0.0%	0.0%
4	Taro (*olocasia esculenta*)				
5	Cowpea (*Vigna unguiculata*)	50.0%	0.0%	25.0%	25.0%
6	*Tanaman hias*				
7	Scallion (*Allium cepa*)	100%			
8	Galangal (*Alpinia galangal*)	66.7%	33.3%	0.0%	0.0%

Concluding remark

1. The project site, Kecamatan Nanggung, endow with relatively good accessibility to two lucrative urban centers of Bogor and Jakarta, rich natural resources of forest and mineral, and an ideal climate for agricultural development such as annual rainfall varies between 3,000 mm to 4,000 mm and the average annual temperature ranging between 22^{o} C and 34^{o} C. Those endowments hold advantages to support market based agricultural commodities development through agroforestry innovation. However there are bundles of problems that impede agroforestry innovations. Small landholding size and high population density are among the problems identified. Although 63.85% (7,022 ha) of the area is available for cultivation, only 3,721 ha are owned by or accessible to farmers for culitivation. This small land base must support the livelihood of 74,211 inhabitants (17,187 households). Population densities of the ten villages of Kecamatan Nanggung were between 155 ps.km^{-2} in Malasari (the upper most village) and 2,347 ps.km^{-2} in Kalong Liud. Whereas agricultural density of Kecamatan Nanggung was 15 ps/ha, and at village level the ratio varied from 6 ps ha^{-1} (Malasari) to 33 ps ha^{-1} in Sukaluyu. Seven out of 10 villages are above the average population density of the kecamatan. Topographically the area characterized with gently undulating to steep landscape with the altitude is ranging between 400 and 1800 m above sea level. The physical characteristics of the agricultural land in most part of Nanggung are situated in undulating area, from gently to steep slope.

2. Socio economics characteristics of the surveyed households clear demonstrate that problems stem not merely from the natural capital available for the people, but also inform limitations of human capital and financial capital that are not easy to resolve. The evidence of low level education attainment, such as 5.7 % of the respondents were illiterate, and most of the respondents (81.9%) never went through beyond elementary level and primary school enrollment rate is also low (77.1%), is an example. The assessment of income and expenditure of the surveyed households found that the largest proportion of family income were spent on food (43.4%) and other non-food consumption that is categorized as basic needs for the family livelihood. Very few (12.4%) of the surveyed household had cash deposits. This indicates that capital accumulation hardly to occur without any intervention from out side.

3. Although most of people in Nanggung engage in agriculture (work as farmer), agricultural does not contribute the most to family income. Annual average income per household sample was Rp. 9.22 million ranging between Rp 325,000 and Rp 37.67 million. Agricultural income contributed 31.2% to the total households' income. During the period under study, only 3.8% of the surveyed households rely fully on agricultural income, and 20% of the surveyed households have agricultural income more than 60% of their total household income. The share of agricultural income to total family income partly correlates to average landholding size (r=0.542 at 0.01 significance level). The evidence that off-farm incomes contribute the most to the total family income explains that most of the surveyed

household can't rely mainly on agricultural activities with relatively narrow landholding size for their livelihood.

4. From a living standard point of view, applying the poverty line of BPS (2002) for rural area of Indonesia and West Java Province in 2002 (Rp 1,158,144 and Rp 1,157,460 capita^{-1} year^{-1} respectively) the study found that 37.4% of the surveyed household are below poverty line, and thus are categorized as poor. Cisarua, a village representing remote village, was the worst among the three sample villages; hence, about 41% of the people were below poverty line.

5. There are 112 plots within 22.81 ha of rice field, and 213 plots of *kebun* and *tegal* within 53.18 ha of land controlled by the surveyed households. Topographically, more than 80% of the plots are considered by the respondents as gently to steep sloping land. Not all agricultural land that is controlled by the surveyed household are owned land. The study revealed that 21.3% of the total agricultural land controlled by the surveyed household belongs to others and is cultivated by means of renting in, sharecropping, or just *numpang*[11]; this involves 52.4% of the surveyed households. Unequal land distribution is a characteristic of the study site. The bottom 60% of the surveyed household controlled only 19% of total landholding size, while the top 20% controlling about 55% of the total landholding size.

6. Kebun systems vary from fallow land to very complex systems of perennial and annual crops. The more complex kebun systems produce a combination of timber crops (including bamboo), fruit crops, annual crops, and some medicinal crops all in a single plot. Fruit trees are the major kebun component, present in of 86.7% of the kebuns. Timber is a present in 36.8% of the kebuns; annual/seasonal present in 28.3% of the kebuns. Among the fruit species cultivated by farmers, banana is the most popular (cultivated in 75.9% of kebuns), followed by petai (47.2% of kebuns), and then mango (39.2% of kebuns). With regard to timber production, there are seven timber species and bamboo cultivated by the surveyed households. Bamboo is the most dominant species cultivated in their kebun, followed by Sengon (*Paraserianthes falkataria*) and Afrika (*Maesopsis eminii*). Some plots are occasionally used for annual crops cultivation, mostly tubers such as cassava, *Talas (Taro)*, sweet potato and *lengkuas* (*Alpinia galangal*), for own consumption and also for sale. Vegetables such as long bean (*vigna sinensis*), string bean (*Phaseolus vulgaris*) and scallion (*Allium cepa*) are also planted by some households for income generation. Annual crop cultivation is dominated by cassava; which is cultivated in 25.5% of plots.

7. With regard to kebun management, the study found that farmers' technical knowledge and inputs regarding kebun management is limited. Harvesting was the dominant kebun management activity and agricultural inputs used by the surveyed household in their kebuns are very low. Only 3.3% of the

[11] *Numpang* is a colloquial Bahasa Indonesia that is normally used for or means ride-in. It this context, the word of *numpang* means cultivating others land without any financial consequences, or right to use the land. Numpang occurs when owners are not using their land.

total plots applied chemical fertilizer and 7.1% applied organic fertilizer; the rate fertilizer application was also very little, ranging between 7.4 and 87.5 kg ha^{-1}. Data on labor inputs based on activities implemented during the period under study shows that harvesting is the activity most commonly conducted in the kebun, followed by weeding and maintenance of tree or seasonal crops. However, the number of person-days involve in harvesting (124 person-days) is less than the number of person-days involved in weeding and maintenance (306 person-days). In total labor input for kebun management is 483 person-days or about 10 person-days per ha. This was far below agricultural labor inputs for paddy cultivation that was ranging between 175 and 236 per ha^{-1} per cropping session.

8. Regarding returns from kebuns, the study found that (with exception of fallow land kebuns) all type of kebuns provide positive net returns. Kebun with fruit and annual crops components provide better net return than the other types of kebun.

9. The marketing aspect of the study found that a low percentage of fruits harvested are marketed. Most of the yields of the key fruit species planted in the kebuns – banana (*Musa* sp), mangoes (*Mangifera* sp) and rambutan (*Nephelium lappaceum)*, were not sold. Data recorded from the surveyed household shows that 58% of banana yields and respectively 33.4% and 10%.2% of mangoes and rambutan were sold by the surveyed households. The reasons for this are: a) the quality of fruit produced is not very high and thus not marketable, b) the fruit species produced do not match market demand, c) post-harvest handling is poor, and/or d) that farmers lack adequate market information and market access. Whilst for timber, the data exhibit slightly better situation than the fruits. There were seven species were harvested and sold during the study period. They are Sengon (*Paraserianthes falkataria*), Tisuk (*Hibiscus cannabinus*), Afrika (*Maesopsis eminii*), Puspa, *Schima wallichii*), Pinus (*Pinus Sp*), Bambboo (*Bambusoidea* sp), Sungkai (*Pheronema canescens*) and Sampang (*Eudia latifolia*). The three largest harvest of timber species during the period under study were: sengon tree (1,385 stems were cut), puspa (1182 stems) and afrika (785 stems). The portion of these stems sold were 66%, 34% and 81%, respectively. Additionally, 12,033 stems of bamboo were harvested by respondents during the study period, with 74% of the yield sold

10. Other evidence of poor marketing ability of farmers in Nanggung was also found. None of the surveyed households process the commodities harvested. This is a huge missed opportunity to gain additional market margin through value added processing. Similar conditions were found in timber marketing. Although all the common timber species cultivated can be marketed, the size and quality of the logs produce do not match market specifications well. Farmers have only a general understanding of market specifications and commonly sell standing logs. Collectors and sawmill assume the major and important roles in timber and bamboo marketing.

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ANNEX

Table A1. Land Uses of Kecamatam Nanggung (in ha)

Village	Paddy field	Housing	Farm/ garden	Fishpond	Infra structure	Forest	Fallow land	Other uses	Total
Malasari	240.00	43.00	971.00	-	-	3,377.00	-	125.40	4,756.40
Bantar Karet	117.18	62.50	162.18	5.00	323.21	155.32	15.00	0.65	841.04
Cisarua	**275.00**	**68.00**	**355.00**	**3.00**	**22.36**	**5.00**	**15.00**	**667.64**	**1,411.00**
Curug Bitung	**150.50**	**60.00**	**817.57**	**3.50**	**11.53**	**350.50**	**3.40**	**-**	**1,397.00**
Nanggung	100.44	35.00	214.00	3.00	9.90	60.00	-	275.06	697.40
Pangkal Jaya	227.00	32.00	56.30	3.64	13.83	36.00	30.00	0.15	398.92
Sukaluyu	7.75	60.00	87.00	0.75	3.35	48.00	-	0.45	207.30
Hambaro	225.00	45.05	45.00	1.05	8.28	-	-	31.40	355.78
Kalong Liud	129.10	24.27	131.45	-	6.77	-	-	37.41	329.00
Parakan Muncang	**268.76**	**25.50**	**248.03**	**4.50**	**14.43**	**-**	**8.00**	**35.99**	**605.20**
Total	1,740.73	455.32	3,087.53	24.44	413.66	4,031.82	71.40	1,174.15	10,999.05

Source: Kecamatan Nangung dalam Angka 2003, processed

Table A2. Physical Infrastructure and Public Utilities of Kecamatan Nanggung

Physical infrastructures and Public utilities	Unit	Ratio to the related significance unit.
Road network		
- Paved/asphalted	60.5 km	550 m km^{-2},
- Gravelled	110.5 km	1,004 m km^{-2}
- Dirt road	116.4 km	1,058 m km^{-2}
Irrigation facilities		
- Dam (public work)	3	
- Dam (self-reliance)		
Domestic water		
- Sallow well		
- Community domestic water network		
Electricity supply (PLN)	7,619 houses in nine villages	54.3 %
Telephone line	1.010 households	5.9 %
Education Facility		
- Kindergarten : 1	1	
- Elementary school (SD/MI)	44 / 16	
- Junior secondary school (SLTP/MT)	1 / 2	
- Senior secondary school (SMU)	1	
Health Facility		
- *Puskesmas* - Public health centre	1	
- *Puskesmas Pembantu*	4	
- *Posyandu* - Integrated health services for mother and kids (settlement based)	93	9 $village^{-1}$
- Family planning post	1	
Marketing facilities		
- Market	2	
- Kiosk /*warung*	586	
- *Toko*	39	
- others	295	

Source: Survey data

Table A3. Household Income (Rp)

	Parakan Muncang		Curug Bitung		Cisarua		Total	
	n	Sum	n	Sum	n	Sum	N	Sum
Agriculture								
RiceFields	19	26,934,814	29	54,055,207	28	39,720,512	76	120,710,533
Kebun and Tegal	33	34,644,745	35	71,583,004	35	39,877,506	103	146,105,255
Livestock	10	2,630,000	13	8,185,000	15	24,047,500	38	34,862,500
Total Agriculture Income	**34**	**64,209,559**	**35**	**133,823,211**	**35**	**103,645,518**	**104**	**301,678,288**
Off Farm								
Trade & Merchant	15	107,225,000	5	20,400,000	9	42,620,000	29	170,245,000
Home industry	2	6,050,000			1	1,800,000	3	7,850,000
Gold extraction			2	6,600,000	3	19,600,000	5	26,200,000
Carpenter	1	10,920,000			1	3,800,000	2	14,720,000
Services							-	-
- Transport	3	16,200,000	3	9,360,000	1	13,200,000	7	38,760,000
- Other services	5	21,880,000	1	1,800,000			6	23,680,000
Civil servant	4	22,824,000	1	500,000			5	23,324,000
Private company employee	5	34,200,000			1	7,200,000	6	41,400,000
Off farm laborer	5	8,050,000	1	3,600,000	1	900,000	7	12,550,000
Total Off Farm	**28**	**227,349,000**	**13**	**42,260,000**	**14**	**89,120,000**	**55**	**358,729,000**
Farm Laborer	1	140,000	2	7,500,000	9	11,531,000	12	19,171,000
Trade & Merchant	6	11,250,000	6	50,580,000	3	16,800,000	15	78,630,000
Home industry	3	12,720,000					3	12,720,000
Gold extraction			1	9,600,000	15	79,780,000	16	89,380,000
Carpenter							-	-
Services							-	-
- Transport			1	3,600,000			1	3,600,000
- Other services	1	720,000	3	4,600,000	2	4,800,000	6	10,120,000
Civil servant	2	-					2	-
Private company employee			1	-			1	-
Off farm laborer	8	8,770,000	9	8,780,000	3	4,700,000	20	22,250,000
Total Side Off Farm	**16**	**33,600,000**	**18**	**84,660,000**	**25**	**117,611,000**	**59**	**235,871,000**
Total Off Farm Income	**31**	**260,949,000**	**25**	**126,920,000**	**32**	**206,731,000**	**88**	**594,600,000**
Others								
Bantuan	21	38,722,000	14	22,540,000	10	8,396,000	45	69,658,000
Hajatan	1	500,000	1	200,000	1	500,000	3	1,200,000
Total Others	**21**	**39,222,000**	**14**	**22,740,000**	**11**	**8,896,000**	**46**	**70,858,000**
Total Household Income	**35**	**364,380,559**	**35**	**290,683,211**	**35**	**312,072,518**	**105**	**967,136,288**

Source: Household survey data

Tabel A4. Inputs Kebun and Tegal by Types

		Bare Land/Fallow Land	Fruit Trees Only	Timber Trees Only	Annual Crops Only	Fruit Trees and Annual Crop	Timber Trees and Annual Crop	Fruit and Timber Trees	Fruit and Timber Trees + Annual Crop	Total
No of Plot		8	91	15	4	31	1	38	24	212
Total Area (m2)		4,289	185,576	38,155	2,600	47,045	5,000	159,375	89,745	531,785
Total Area (Ha)		0.43	18.56	3.82	0.26	4.70	0.50	15.94	8.97	53.18
Average Plot (m2)		536.13	2,039.30	2,543.67	650.00	1,517.58	5,000.00	4,194.08	3,739.38	2,508.42
Inputs										
External Inputs										
Numbers of plot using Chemical Fertilizer	Plot	-	1	-	1	3	-	2	-	7
	Area (m2)	-	10,000	-	700	2,400	-	25,800	-	38,900
	Total Fertilizer (Kg)	-	25	-	0.98	21	-	19	-	65.98
Numbers of plot using Organic Fertilizer	Plot	-	3	1	2	6	-	1	2	15
	Area (m2)	-	3,300	2,115	1,500	10,000	-	1,000	3,500	21,415
	Total Fertilizer (Kg)	-	750	300	650	1018	-	400	1050	4,168
Numbers of plot using Pesticide	Plot	-	-	-	-	3	-	1	-	4
	Area (m2)	-	-	-	-	2,325	-	1,000	-	3,325
	Total Pesticide (Ltr)	-	-	-	-	5	-	1	-	6
Labor Inputs										
Planting	Plot	-	7	1	2	2	-	2	1	13
	Area (m2)	-	18,300	700	1,400	2,200	-	4,000	3,000	28,200
	Total Labor (ps-day)	-	8.86	0.57	1.68	3.29	-	5.14	0.57	18.43
Tree & Crop Care	Plot	-	37	3	1	8	-	10	6	65
	Area (m2)	-	101,320	7,500	1,000	12,000	-	42,800	11,100	175,720
	Total Labor (ps-day)	-	220.29	28.00	9.29	54.14	-	57.86	77.57	447.15
Harvesting	Plot	-	65	6	2	29	-	32	20	154
	Area (m2)	-	112,006	24,550	1,400	43,795	-	147,875	84,145	413,771
	Total Labor (ps-day)	-	185.14	17.86	8.14	89.43	-	110.14	55.29	466.00

Source: Household survey data

Tabel A5. Output Kebun and Tegal by Types

		Bare Land/Fallow Land	Fruit Trees Only	Timber Trees Only	Annual Crops Only	Fruit Trees and Annual Crop	Timber Trees and Annual Crop	Fruit and Timber Trees	Fruit and Timber Trees + Annual Crop	Total
No of Plot		8	91	15	4	31	1	38	24	212
Total Area (m2)		4,289	185,576	38,155	2,600	47,045	5,000	159,375	89,745	531,785
Total Area (Ha)		0.43	18.56	3.82	0.26	4.70	0.50	15.94	8.97	53.18
Average Plot (m2)		536.13	2,039.30	2,543.67	650.00	1,517.58	5,000.00	4,194.08	3,739.38	2,508.42
Output from Fruit	Plot	-	79	-	-	31	-	37	24	171
	Area (m2)	-	171,076	-	-	47,045	-	157,875	89,745	465,741
	Return (Rp)	-	41,625,298	-	-	15,016,070	-	15,535,712	22,110,599	94,287,679
Output from Timber	Plot	-	-	15	-	-	1	38	24	78
	Area (m2)	-	-	38,155	-	-	5,000	159,375	89,745	257,305
	Return (Rp)	-	-	5,603,611	-	-	817,600	22,042,230	14,344,655	42,808,096
Output from Annual Crop	Plot	-	-	-	4	31	1	-	24	60
	Area (m2)	-	-	-	2,600	47,045	5,000	-	89,745	144,390
	Return (Rp)	-	-	-	1,175,132	7,562,785	763,400	-	1,485,166	10,986,483
Total	Plot	-	79	15	4	31	1	38	24	192
	Area (m2)	-	171,076	38,155	2,600	47,045	5,000	159,375	89,745	478,026
	Return (Rp)	-	41,625,298	5,603,611	1,175,132	22,578,855	1,581,000	37,577,942	37,940,420	148,082,258

Source: Household survey data

Tabel A6. Species found in plots

No	Plants cultivated in the kebun		Parakan Muncang	Curug Bitung	Cisarua	Total
	Local name	Scientific name	% of n=44	% of n=88	% of n=81	% of n=213
1	Pisang	*Musa sp.*	88.6%	79.5%	65.0%	75.9%
2	Pete	*Parkia speciosa*	40.9%	42.0%	56.3%	47.2%
3	Mangga	*Mangifera indica*	36.4%	44.3%	35.0%	39.2%
4	Jengkol	*Pithecellobium jiringa*	45.5%	34.1%	33.8%	36.3%
5	Rambutan	*Nephelium lappaceum*	25.0%	35.2%	41.3%	35.4%
6	Durian	*Durio zibethinus*	31.8%	28.4%	25.0%	27.8%
7	Kelapa	*Cocos Nucifera*	34.1%	20.5%	21.3%	23.6%
8	Nangka	*Artocarpus heterophyllus*	52.3%	19.3%	11.3%	23.1%
9	Melinjo	*Gnetum gnemon*	15.9%	9.1%	15.0%	12.7%
10	Kemang	*Mangifera kemanga*	11.4%	13.6%	8.8%	11.3%
11	Manggis	*Garcinia mangostana*	9.1%	10.2%	10.0%	9.9%
12	Lengkeng	*Dimocarpus longan*	0.0%	22.7%	0.0%	9.4%
13	Jeruk buah	*Citrus sinensis*	0.0%	6.8%	13.8%	8.0%
14	Teh	*Camelia Sinensis*	4.5%	9.1%	5.0%	6.6%
15	Jambu air	*Syzigium aqueum*	0.0%	6.8%	10.0%	6.6%
16	Duku	*Lansium domesticum*	6.8%	5.7%	3.8%	5.2%
17	Sirsak	*Annona muricata*	2.3%	2.3%	10.0%	5.2%
18	Cengkeh	*Eugenia aromatica*	6.8%	3.4%	5.0%	4.7%
19	Jambu batu	*Psidium guajava*	9.1%	2.3%	5.0%	4.7%
20	Kupa		4.5%	2.3%	6.3%	4.2%
21	Pala	*Myristica fragrans*	4.5%	8.0%	2.5%	5.2%
22	Nanas	*Ananas comosus*	0.0%	5.7%	3.8%	3.8%
23	Kopi	*Coffea* sp	2.3%	3.4%	3.8%	3.3%
24	Pisitan		11.4%	1.1%	1.3%	3.3%
25	Kecapi	*Sandoricum koetjape*	2.3%	3.4%	0.0%	1.9%
26	Aren	*Arenga pinnata*	2.3%	2.3%	0.0%	1.4%
27	Pepaya	*Carica papaya*	2.3%	1.1%	1.3%	1.4%
28	Kluwih	*Artocarpus communis*	4.5%	0.0%	1.3%	1.4%
29	Kepundung		0.0%	2.3%	0.0%	0.9%
30	Sawo	*Manilkara kauki*	0.0%	2.3%	0.0%	0.9%
31	Alpukat	*Persea americana*	2.3%	0.0%	0.0%	0.5%
32	Randu	*Ceiba pentandra*	0.0%	1.1%	0.0%	0.5%
33	Picung		0.0%	1.1%	0.0%	0.5%
34	Jambu bol	*Syzygium malaccense*	0.0%	1.1%	0.0%	0.5%
35	Jambu monyet	*Anacardium occidentale*	0.0%	0.0%	1.3%	0.5%
36	Menteng	*Baccaurea* sp	0.0%	0.0%	1.3%	0.5%
37	Kemiri	*Aleurites moluccana*	2.3%	0.0%	0.0%	0.5%
38	Jeruk nipis	*Citrus aurantifolia*	2.3%	0.0%	0.0%	0.5%
39	Sukun	*Artocarpus altilis*	0.0%	0.0%	1.3%	0.5%
40	Jeruk Bali	*Citrus maxima*	0.0%	0.0%	1.3%	0.5%

Source: Household survey data

Table A7. Fruit yield harvested from kebun in the three sample villages of Kecamatan Nanggung and the proportion of produce sold

	Commodities		Unit of measurement	Parakan Muncang		Curug Bitung		Cisarua		All	
	name	scientific		Yield	Sold	Yield	Sold	Yield	Sold	Yield	Sold
1	*Aren*	*Arenga pinnata*	kg			244	89.8%	21	9.5%	265	83.4%
2	Coconut	*Cocos Nucifera*	Buah	2,198	84.0%	1,338	65.8%	377	49.1%	3,913	74.4%
3	Clove	*Eugenia aromatica*	kg	42	90.5%	14	78.6%	12	8.3%	68	73.5%
4	*Pala*	*Syzigium aqueum*	kg			35	65.7%			35	65.7%
5	Coffee	*Coffea* sp	kg			1,440	65.6%	50	4.0%	1,490	63.6%
6	melinjo	*Gnetum gnemon*	bunches	***48***	***0.0%***	433	69.3%	***2***	***0.0%***	483	62.1%
7	*Kecapi*	*Sandoricum koetjape*	kg	513	78.0%	675	66.7%	270	5.6%	1,458	59.3%
8	Banana	*Musa sp.*	Tandan	721	27.7%	2,784	78.2%	3,018	46.7%	6,523	58.0%
9	*Petai*	*Parkia speciosa*	Tangkai	2,058	96.5%	7,379	35.5%	791	89.1%	10,228	51.9%
10	Jack fruit	*Artocarpus heterophyllus*	Buah	298	36.2%	622	47.4%	741	38.5%	1,661	41.4%
11	*Kemang*	*Mangifera kemanga*	kg	810	49.4%	***50***	***0.0%***	***155***	***0.0%***	1,015	39.4%
12	*Jengkol*	*Pithecellobium jiringa*	kg	2,162	3.7%	1,560	83.5%	158	19.0%	3,880	36.4%
13	manggo	*Mangifera indica*	Buah	1,007	41.7%	322	46.6%	***379***	***0.0%***	1,708	33.4%
14	Manggis	*Garcinia mangostana*	kg	424	50.5%	***270***	***0.0%***	***6***	***0.0%***	700	30.6%
15	Durian	*Durio zibethinus*	Buah	***141***	***0.0%***	66	98.5%	74	8.1%	281	25.3%
16	Pineaple	*Ananas comosus*	Buah	***30***	***0.0%***	15	66.7%			45	22.2%
17	*Duku*	*Lansium domesticum*	kg	522	28.7%	***150***	***0.0%***	***192***	***0.0%***	864	17.4%
18	Tea	*Camelia Sinensis*	kg			37	51.4%	***115***	***0.0%***	152	12.5%
19	Rambutan	*Nephelium lappaceum*	kg	1,705	15.8%	***720***	***0.0%***	***212***	***0.0%***	2,637	10.2%
20	*Papaya*	*Carica papaya*	Buah	***8***	***0.0%***	***288***	***0.0%***	***15***	***0.0%***	***311***	***0.0%***
21	*Kluwih*	*Artocarpus communis*	Buah	***12***	***0.0%***	***120***	***0.0%***	***50***	***0.0%***	***182***	***0.0%***
22	Jambu monyet	*Anacardium occidentale*	kg			***150***	***0.0%***			***150***	***0.0%***
23	Jambu air	*Syzigium aqueum*	kg	***100***	***0.0%***	***20***	***0.0%***	***3***	***0.0%***	***123***	***0.0%***
24	Orange	*Citrus sinensis*	kg			***50***	***0.0%***	***25***	***0.0%***	***75***	***0.0%***
25	Sirsak	*Annona muricata*	Buah	***3***	***0.0%***	***55***	***0.0%***			***58***	***0.0%***
26	*Picung*		Buah	***50***	***0.0%***	***8***	***0.0%***			***58***	***0.0%***
27	Avocado	*Persea americana*	Buah			***10***	***0.0%***	***35***	***0.0%***	***45***	***0.0%***
28	*Sukun*	*Artocarpus altilis*	Buah	***30***	***0.0%***					***30***	***0.0%***
29	*Pisitan*		Buah	***2***	***0.0%***	***21***	***0.0%***	***7***	***0.0%***	***30***	***0.0%***
30	*Jambu bol*	*Syzygium malaccense*	kg	***5***	***0.0%***	***1***	***0.0%***			***6***	***0.0%***
31	*Jambu batu*	*Psidium guajava*	kg	***5***	***0.0%***					***5***	***0.0%***
32	*Kupa*		Buah			***2***	***0.0%***			***2***	***0.0%***
33	Kemiri	*Aleurites moluccana*	kg							***1***	***0.0%***

Source: Household survey data

Who we are

The World Agroforestry Centre is the international leader in the science and practice of integrating 'working trees' on small farms and in rural landscapes. We have invigorated the ancient practice of growing trees on farms, using innovative science for development to transform lives and landscapes.

Our vision

Our Vision is an 'Agroforestry Transformation' in the developing world resulting in a massive increase in the use of working trees on working landscapes by smallholder rural households that helps ensure security in food, nutrition, income, health, shelter and energy and a regenerated environment.

Our mission

Our mission is to advance the science and practice of agroforestry to help realize an 'Agroforestry Transformation' throughout the developing world.

FUTURE HARVEST CGIAR

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