

Market Chain Improvement: Linking Farmers to Markets in Nanggung, West Java, Indonesia

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Abstract

Farmers in Nanggung subdistrict live on or below the poverty line with access to less than 1 hectare of land, consisting of irrigated rice fields (0.3 ha) and upland tree gardens (0.5 ha). Gardens are found on steep slopes and include a large number of horticultural fruit/vegetable species, as well as, timber and commodity species (coffee, rubber and cloves). Traditionally, production of tree gardens is intended primarily for household consumption with some sales in local markets. Management is not intensive, the use agricultural inputs (fertilizers, pesticides, quality germplasm) is infrequent, and labor is mainly focused on harvesting products. Smallholders and agricultural/forestry professionals agree that tree gardens in Nanggung hold great market potential that is not currently utilized. Proximity to Jakarta and its infrastructure offer Nanggung farmers opportunity to target production to meet rising demand for fruit and vegetable products in lucrative urban and international markets. Fruit and vegetable products with a high demand include: banana, durian, mangosteen, rambutan, petai, jackfruit, chili peppers, tomatoes, sweet corn, peanuts, green beans and chickpeas. Banana holds particularly high potential, being the most common and profitable tree garden crop in Nanggung. Market demand far exceeds supply. No significant banana diseases are present in Nanggung and production has not yet been intensified. Under Nanggung conditions bananas will produce fruit 12 months after establishment and then every 4-6 months thereafter. Farmers are interested in intensifying their tree farming activities, but hesitate because they are not sure where to focus their efforts. We report here ongoing work to assist Nanggung farmers improve their tree garden management to enhance both the quantity and quality of the products and strengthen their ability to respond to market opportunities. Banana is used as an example of how to achieve success.

Key words: agroforestry, tree gardens, deliberate management, market channel, banana, farmer income, poverty reduction

INTRODUCTION

Nanggung subdistrict, West Java covers 110 km² and is characterized by gently to steep slopes ranging from 400 and 1800 m above sea level, with annual precipitation of 4500 mm (BPS 2000). Soils are primarily andosols and latosols (Djuwansah 1997). The subdistrict has a human population of 74,000 and 7,002 ha of arable land, of which 47.7% are managed by government agencies, state companies and private corporations (BPS 2003). The remainder of the land is owned by farmers. Farmers in Nanggung are primarily smallholders on or below the poverty line with access to less than 1 hectares of land. Many of these land holdings are found on steep slopes. Tree gardens (kebuns) are the most common smallholder farming system. These vary from complex multi-species systems integrated with perennial/annual crops, to monoculture timber plantations and fallow lands with low tree stocking. The tree component includes a large number of horticultural fruit/vegetable species, timber species and commodity species (coffee, rubber and cloves). Traditionally, these systems are intended to produce products for household consumption. Extractive in nature, tree garden systems are not deliberately managed and receive few inputs. Farmers have limited access to professional technical assistance that would enable them to enhance their tree garden management capacity. Because their land resources are limited and under-productive, many local communities are forced to openly or surreptitiously use neighboring lands to help meet their livelihoods needs. This is a cause for concern as Nanggung is part of one of the major watersheds for greater Jakarta and borders Mount Halimun National Park an important nature and biodiversity reserve (Roshetko et al. 2003).

In 2001, Indonesia imported 241 million and 324 million kgs of fruit and vegetables, respectively, while exporting only 21 million kgs and 113 million kgs respectively (Ditjen BP2HP, 2004). This data indicates the huge market demand of fruits and vegetables in Indonesia. Only 1-3 hours from Bogor and Jakarta, Nanggung has an advantageous location to serve these lucrative markets. Agricultural and forestry professionals, traders and farmers agree that tree gardens in Nanggung hold great market potential. Although this situation is promising, Nanggung farmers are poorly linked to commercial markets. In January 2003, the World Agroforestry Centre (ICRAF), Winrock International and the Indonesia Institute for Forest and Environment (RMI), through the support of the United States Agency for International Development (USAID) Jakarta Mission, initiated a program in Nanggung to develop an extension approach to improve the agroforestry production systems and strengthen farmers' ability to respond to market opportunities. This program addresses the dual goals of livelihood enhancement (poverty reduction) and conservation by empowering farmer to improve the farm productivity and market linkages while preserving their traditional sustainable natural resource management approach. Program results will be applicable to a wide range sites where poverty reduction and conservation are priorities. This paper summarizes program efforts to date that seek to enhance smallholders' market linkages as a means to address livelihood enhancement.

MATERIALS AND METHODS

Target Audience and Program Partnership

The project is premised on providing initial training to farmer leaders and more intensive follow-up assistance to farmer groups organized by those farmer leaders. Farmer leaders were identified with community participation and program partners

though introductory visits to each of the subdistricts'10 villages and a formal inception workshop. ICRAF and Winrock personnel lead the program with assistance from RMI staff, district agriculture and forestry extension staff, national park field staff, university researchers, commercial nursery operators and traders. As a group this partnership is referred to as *Team Kebun*.

Technical Assistance

Farmer leaders participated in a *series of workshops* held over an 18-month period to enhance their technical capacity and market knowledge. Workshops were generally 3-5 days in length and include the development of follow-up work plans. Workshop topics were: i) species, problems and market prioritization; ii) tree propagation and nursery management; iii) tree garden management; iv) farmer-market linkages; v) cross-visit to farmer-operated commercial enterprises; and vi) participatory evaluation. Workshop results and related information were shared with the wider community by farmer leaders and Team Kebun through various *follow-up assistance activities* including farmer meetings, mini-trainings, field days, cross-visits, demonstration trials and consultation with technical specialists. These activities were intend to confirm and implement follow-up work plans, as well as, develop farmer innovations and opportunities to achieve the program objective.

Surveys

Program implementation included a number of surveys and inventories. Those relevant to this discussion are a baseline data survey, market surveys and tree garden inventory.

1. The *baseline survey* was conducted with 105 farm families in three representative villages (Parakan Muncang, Curug Bitung and Cisarua) to identify the: i) socioeconomic characteristics of smallholder farmers; ii) annual and tree cropping systems cultivated by those farmers; and iii) marketing practices they follow. Representative village selection was based on informal field surveys of all 10 Nanggung villages and a review of government data (BPS, 2001 and 2003).
2. *Market surveys* were conducted using a rapid survey format modified from ILO (2000) and Betser (2001) to identify and understand: i) the agroforestry species and products that hold potential for Nanggung farmers; ii) the market channels that are used and hold commercial potential for smallholder products; iii) the marketing problems faced by farmers and market agents; iv) the opportunities to improve the quality and quality of farmers' agroforestry products; and v) market integration (through vertical price correlation and price transmission elasticity) and efficiency. A total of 45 market agents and 75 farmers were interviewed as part of the market surveys.
3. The *tree garden inventory* used the *dynamic plot inventory method* developed by Sheil et al (2002) to: i) verify the tree garden types previously noted through discussions with farmers and observation; ii) document species composition by garden type; and iii) analyze the relationship between garden size, remoteness from the home, landscape location and tree diversity variables. A total of 36 tree gardens were inventoried in the three representative villages indicated above (Manurung, 2004).

RESULTS

Farmer Profile

Results of the baseline survey indicate the average Nanggung smallholder cultivates 0.3 ha of irrigated rice and 0.5 ha of upland tree garden to support a family of 5. Average annual income is Rp 9.2 million, ranging from Rp 325,000 to Rp 37.7 million; 37.4% of the respondent households live below the poverty line. While 73.3% of the respondents (household heads) consider themselves farmers, agriculture accounts for only 31.2% of household incomes, only 20% of households have agriculture income that account for 60% or more of their total income, and only 3.8% of households rely on agriculture as their sole source of income. Trade (operating small shops), service sector and industry are the most common sources of off-farm income. Industrial employment includes mining (gold and bentonite) and plantation work. Farmers engage in gold and sand mining as a means of self-employment.

Priority Species

Priority species were identified by triangulating data from the first workshop, market studies and tree garden inventories. Comparison indicates that those species (or products) that hold the greatest potential to smallholder incomes in Nanggung are: banana (*Musa paradisiaca* L.), durian (*Durio zibethinus* Murr.), mangosteen (*Garcinia mangostana* L.), rambutan (*Nephelium lappaceum* L.), petai (*Parkia speciosa* Hassk.), jackfruit (*Artocarpus heterophyllus* Lam.), sengon (*Paraserianthes falcata* L.), African wood (*Maesopsis eminii* L.), chili peppers (*Capsicum annuum* L.), tomatoes (*Lycopersicon esculentum* Mill.), sweet corn (*Zea mays* L.), peanuts (*Arachis hipogaea* L.), green beans (*Vigna radiata* (L.) Wilczek) and chickpeas (*Cicer arietinum* L.). See Table 1.

Table 1. Species with high potential to enhance smallholders' incomes in Naggung.

Species – fruits	Farmer Preference	Market Study (Unmet Demand)	% of Trees in Inventoried Gardens
Banana (<i>Musa paradisiaca</i> L)	1	High	45.3%
Durian (<i>Durio zibethinus</i> Murr)	1	High	1.3%
Petai (<i>Parkia speciosa</i> Hassk)	1	High	1.8%
Jackfruit (<i>Artocarpus heterophyllus</i> Lam)	1	High	2.8%
Mangosteen (<i>Garcinia mangostana</i> L)	2	High	0.6%
Rambutan (<i>Nephelium lappaceum</i> L)	3	High	2.6%
Jengkol (<i>Archidendron pauciflorum</i> Benth)	1	Local market	2.6%
Mango (<i>Mangifera indica</i> L)	3	Local market	3.4%
Species – timber			
Sengon (<i>Paraserianthes falcata</i> L)	1	High	8.7%
African wood (<i>Maesopsis eminii</i> L)	1	High	16.7%
Puspa (<i>Schima wallichii</i> (DC) Korth)	2	Local market	3.2%
Kisampang (<i>Euodia latifolia</i> DC)	3	Local market	2.4%
Bamboo (<i>Bambusoidea</i> spp)	1	High	24.1%*
Species – seasonal crops			
Chili peppers (<i>Capsicum annuum</i> L)	1	High	Not present
Tomatoes (<i>Lycopersicon esculentum</i> Mill)	1	High	Not present
Sweet corn (<i>Zea mays</i> L)	3	High	Not present
Peanuts (<i>Arachis hipogaea</i> L)	3	High	Present

Green beans (<i>Vigna radiata</i> L)	1	High	Present
Chickpeas (<i>Cicer arietinum</i> L)	1	High	Present
Scallions (<i>Allium cepa</i> L)	1	High	Present

*bamboo is present in 24.1% of tree gardens (Budidarsono et al. 2004).

Tree Garden Types, Species Component, Management and Productivity

Four types of tree gardens exist in Nanggung: monoculture timber plantations (type I), mixed fruit-timber-seasonal crop gardens (type II), mixed fruit-timber gardens (type III), and fallow gardens (type IV). Banana is a prominent component of types II, III and IV. Landscape location influences gardens' tree component. Fruit species are more common in communities in the lower watershed and timber species more common in the upper watershed (Manurung 2004). Only 12.5% of gardens receive any type of management. The most common management conducted in gardens is product harvesting followed by crop weeding and maintenance (primarily targeting annual crops) and tree planting. Labor input to gardens that are managed averages 29 days/year/ha; compared to 175 to 236 days/year/ha for irrigated rice land. Although gardens receive very little agricultural inputs or labor, these systems provide 48.4% of the agricultural income and 15.1% of total household income.

Market Channels and Agents

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.

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.

Table 2 provides a comparison of prices, costs and margins between the four channels. Buying price is the price an agent or customer pays for bananas. Selling price is the price a farmer or agent receives for the bananas. Marketing margin is the difference between buying and selling price. Marketing costs are the expenses incurred

by an agent to prepare and sell the bananas. These costs include time, labor, transportation, processing and government fees. Marketing costs vary greatly by channel and agent. Farmers do not incur marketing costs because collectors purchase bananas directly from the farm. Profit margin is marketing margin minus marketing costs. The profit margin is different for each channel and agent. The highest profit margin is received by regional retailers (Rp 21,800/bunch) in channel 3; followed by local traders (Rp. 14,335) and local collectors (Rp 12,850) in channel 4; and then local collectors (Rp 12,050) in channel 3 and regional retailers (Rp 11,960) in channel 4. These profit margins do not consider fixed costs (vehicles, rents, maintenance of facilities, miscellaneous equipment and supplies) agents incur to operate their businesses.

Table 2. Comparison of prices, costs and margins associates with different banana marketing channels.

No	Descriptions	Channel 1		Channel 2		Channel 3		Channel 4	
		Price/ bunch (Rp)	Perce tage (%)	Price/ Bunch (Rp)	Perce tage (%)	Price/ bunch (Rp)	Perce tage (%)	Price/ bunch (Rp)	Perce tage (%)
1	Farmers								
	Selling Price	10,000	100.00	6,500	23.21	6,500	14.77	6,500	10.83
2	Collectors								
	Buying Price			6,500	23.21	6,500	14.77	6,500	10.83
	Selling Price			15,000	53.57	20,000	45.45	20,000	33.33
	Marketing Margin			8,500	30.36	13,500	30.68	13,500	22.50
	Marketing Cost:			1,450	5.18	1,450	3.30	650	1.08
	Profit Margin			7,050	25.18	12,050	27.39	12,850	21.42
3	Local Traders								
	Buying Price			15,000	53.57			20,000	33.33
	Selling Price			28,000	100.00			40,000	66.67
	Marketing Margin			13,000	46.43			20,000	33.33
	Marketing Cost			1,465	5.23			5,665	9.44
	Profit Margin			11,535	41.20			14,335	23.89
4	Regional Traders								
	Buying Price							40,000	66.67
	Selling Price							48,000	80.00
	Marketing Margin							8,000	13.33
	Marketing Cost							40	0.07
	Profit Margin							7,960	13.27
5	Regional Retailers								
	Buying Price					20,000	45.45	48,000	80.00
	Selling Price					44,000	100.00	60,000	100.00
	Marketing Margin					24,000	54.55	12,000	20.00
	Marketing Cost:					2,200	5.00	40	0.07
	Profit Margin					21,800	49.55	11,960	19.93
6	Consumer								
	Buying Price	10,000	100.00	28,000	100.00	44,000	100.00	60,000	100.00

- i) Farmers sell bananas to collectors at a price of Rp 5,000-Rp 7,000/bunch. Prices indicates in the Table are averages. (Collectors assume one bunch can produce 8 hands of banana).
- ii) Percentage indicates percentage of consumer *buying prices*.

DISCUSSION

Farmers are interested in intensifying their farming system as a means of increase farm income by increasing production, both quality and quantity. However, farmers are not sure where to focus their efforts. Their landholdings are small. Farmers are busy. Most farmers must pursue both agricultural and off-farm income generating activities to meet their family livelihood needs. Farmers have the capacity to increase their family labor input, however interventions must be well targeted taking advantage of those opportunities that hold the greatest promise.

Banana (*Musa paradisiaca*) holds particularly high potential for Nanggung farmers. It accounts for 45.3% of the trees growing in tree gardens (Manurung 2004) and is cultivated in 75.9% of gardens (Budidarsono et al 2004). It grows well in the rainfall range, elevation range and soils found in Nanggung (DTB 2002 and Poerwanto 2003). Under these conditions bananas produce fruit 12 months after establishment and then every 4-6 months thereafter. No significant banana diseases, such as fusarium, blood disease bacterium (BDB) and banana bunchy top virus (BBTV), are current present in Nanggung, but do occur in other parts of West Java (Tabbada 2003 and CRC-TPP 2004). Current management is best described as no management. Lacking access to quality germplasm farmers plant whatever is available regardless of the variety, although they are aware that certain varieties maintain a high market demand and command a higher price. The use of other agricultural inputs (fertilizers and pesticides) is infrequent and when available used for annual crop production. Fundamental banana cultivation is not practiced. Little to no weed control is conducted under and near bananas. Systematic or uniform spacing is not followed. A minimal number of stems per plant are not maintained – it is common to see 6-7 stems per plant. The removal of senescent leaves and male flowers is not conducted. Harvesting is not based on fruit maturity but rather on the arrival or anticipated arrival of local collectors, which is often unannounced. Post-harvest, bunches are often stored on the floors of homes or farm sheds for 1-3 days before collectors' arrival. Bananas are sold in bulk by bunch regardless of quality. Collectors do not pay a price differential based on variety. Under current production system farmers estimate that only 58.0% of the banana crop is sold. The remainders are not merchantable because they are of poor quality or the wrong variety. For most other priority garden species the portion of the crop sold is even lower – durian 25.3%, mangosteen 30.6%, rambutan 10.2%, petai 51.9% and jackfruit 41.4% (Budidarsono et al. 2004).

Team Kebun implemented a series of activities to address farmers' banana production systems. Meetings and farm visits were held to identify farmers' current practices and problems. Market surveys were conducted to identify exist market channels, marketing problems, market specifications, market opportunities and traders willing to work with farm communities. Visits to markets and with traders were held so farmers could gain awareness and experience with marketing. Workshops and mini-trainings were held to enhance farmers' banana production and handling skills. *Farmer Demonstration Trials* were designed by Team Kebun and farmers to demonstrate the advantages of quality germplasm and deliberate management. ICRAF and Winrock were responsible for organizing all activities and implemented technical, marketing and community organizing activities. RMI assisted with community organization. District agriculture officers participated in all technical activities. The subdistrict government supported all activities. Banana specialists from the Center for Tropical Fruit Studies, Bogor Agricultural University and Winrock specific technical input on how farmers

could enhance their banana production systems. Farmer groups provided an avenue through which Team Kebun could reach larger number of farmers. Farmer specialist help convey technical and marketing information in terms that could be readily understood by the farming community. This series of activities culminated in the following recommendations to help farmers improve their banana crop production.

1. **Variety and germplasm selection** – use only good quality germplasm of the five banana varieties that have a strong and steady market demand: Ambon (Gros Michel), raja serah, raja bulu, tanduk and uli. Demand for these varieties is higher than supply. There is little if any commercial demand for ‘local’ banana varieties commonly grown Nanggung¹.
2. **Simple management** – i) remove grass and herbaceous weeds growing under and near bananas; ii) thin bananas to retain only 2-3 stems, a leader in fruit, a main follower to replace the leader upon harvest, and a young follower; iii) remove all green leaves that may touch and potentially damage the hanging fruit; iv) remove male flowers; and v) propped the stems that are endangered of falling with wooden or bamboo poles.
3. **Post-harvest handling** – fruit should be harvested based on maturity and specifications provided by market agents. Fruit should be harvested immediately before the pre-arranged arrival of collectors/traders and hung on tripods after harvesting not stored on the ground for several days. Farmers should also sort and grade bananas by variety and quality.
4. **Collective marketing** – farmers should form a group and arrange with traders weekly or biweekly visits to the village to purchase bananas in large quantities. The days of the visits must be pre-arranged and regular. Both farmers and the trader must maintain a tight schedule.

These recommendations can be implemented with nearly no incremental direct costs. Farmers agree that little additional labor is required as most of these activities can be implemented while they visit their gardens for other reasons. While these measures may have a positive impact on productivity, they are intended to produce a high quality banana crop. Although only recently initiated (starting in June 2004), these recommendations have already had significant impacts. By organizing themselves and proactively engaging with traders, participating farmers roughly double the gross income received from their banana crops without incurring additional direct cost. Farmers and traders have effectively developed a ‘new’ innovative market channel, providing mutual benefits to both parties. Traders have explained market specifications and grading criteria for bananas in terms farmers can understand and offered a price differential based on these specifications and criteria (Table 3).

¹ There is commercial demand for banana varieties mas and kepok, but it is much lower than the five other varieties.

Table 3. Market specifications and average prices for different grades of banana in Nanggung.

Grade	Description	Price/ Bunch (Rp)
Bulk sales	Pre-program norm for Grade A and B	Rp 6,500
Grade C²	Less the 13 fingers/bunch; uniformity not necessary and a lot of surface stain allowed	Rp 5,600
Grade B	13-18 fingers/bunch; limited size difference between rows, minor deformities and minor surface stains allowed	Rp 19,600
Grade A	18-20 full fingers/bunch; front-row and back-row fingers of equal-size; no surface stains	Rp 22,800

Farmer have assumed the role of collection, sorting and grading; and begun to understand and meet traders' time requirements. While discussion continue regarding market specifications, grading criteria and other details both parties are happy. The additional effort by traders and their staff is justified by the time saved in dealing with a 'group' of farmers (instead of individuals), receiving bananas that are already sorted and graded, and procuring larger quantities of bananas. (Collaborating traders are still unable to meet market demand due to a shortage of supply). Farmers estimate their workload has increased by 2 days/week to meet traders' requirements. This is easily justified by their additional income received. Apparent losers in the new market channel are some local collectors. However, this is not necessarily true, as currently only 58.0% of local banana production is purchased by collectors. Additionally, collectors operate opportunistically and do not promise to purchase farmers banana crops.

The benefits already achieved by farmers are based almost exclusively on improving market linkages and farmers assuming additional market roles. Agronomic management improvements are just now having an impact, with traders noting higher quality bananas being procured through the new market channel. Once farmers have replaced some of their local banana varieties with the five priority varieties and implemented the simple management measures recommended above, it is likely they will achieve additional income increments. Additionally, there are other measures farmers can implement to further enhance banana production and quality – the use of fertilizers, other agricultural inputs, and irrigation or expanding the area of production. While promising, these options need to be tested under the constraints and conditions faced by Nanggung farmers.

CONCLUSIONS

Tree gardens are a common farming system in Nanggung, West Java averaging about 0.5 hectares in area. These multi-species systems are traditionally intended to provide multiple products for household needs. More recently they have become commercially oriented, but management remains traditional. Surveys indicate that only 12.5% of the systems benefit from management of any type and average labor input is only 29 days/year/ha. However, tree garden systems provide 48.4% of the agricultural incomes and 15.1% of total incomes for tree farming households in Nanggung. These systems

² Commercial demand for grade C is very low. These bananas are generally sold in local markets.

hold great market potential that is not being realized. Farmers are interested in intensifying tree garden management but are not sure where to focus. Experience indicates that farmers are best served by: 1) focusing on a limited number of species that are appropriate for local biophysical conditions and have a high market value/demand; 2) utilizing high quality germplasm (provenance, varieties, etc) to increase productivity and profitability; 3) managing tree gardens to yield tree products that meet market specifications; and 4) developing permanent market linkages.

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