

**THE FUNCTION OF SOCIAL NETWORKS TO CREDIT ACCESS AND
OFF-FARM WORK: A CASE OF COCONUT FARMERS IN RURAL AREAS OF
RIAU PROVINCE, INDONESIA**

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ABSTRACT

Social networks in agricultural marketing are important for both farmers and traders, since they face high risks caused by price and production fluctuation without any formal insurance. Moreover, in remote areas, the risks are even higher because of high transportation costs. This paper presents an analysis of farmer networks to support coconut marketing and off-farm work. The analysis was based on a survey of data of coconut farmers in Riau province, a coastal remote area in Sumatera island, Indonesia. We conclude: (1) that the coconut market structure is oligopolistic, with radiate vertical networks between farmers and traders; (2) that the coconut transactions was strengthened by credit arrangements where Chinese traders sell consumption commodities on trust during the lean season in exchange for payment in kind (copra), with implicit interest rates, using collateral substitutes, and unlimited time repayments; (3) that community-level horizontal networks play an important role in developing off-farm work to generate cash income so that farmers with off-farm income have less dependency on Chinese trader credit and (4) that limited financial resources force Chinese traders to give credit only to creditworthy farmers, based on head of households' age, landholding size, and participation in off-farm work that deliver short-period cash income.

Key words: credit constraint, remote areas, Chinese traders

INTRODUCTION

There is a growing amount of literature that emphasizes the role of social networks as a basis for economic activity (Lyon, 2000; Berry, 1997; Fafchamps, 1996; and Woolcock, 1998). In developing countries, social networks in agricultural production and marketing are important since both traders and farmers face a high risk for price fluctuation and poor harvest, have no formal insurance against such risks, and high transaction cost to obtain market information. Farmers should make use of various types of social networks to cope with possible risks and to improve their access to useful information. Bardhan and Udry (1999) describe the micro-foundations of network on interlinked transactions between a trader-lender and a farmer-lender in agricultural economies. Traders often lend to farmers in exchange for a promise to deliver the crop at a predetermined price discount. The interlinked contract reduces farmers' and traders' transaction costs of finding each other in the product market. Even though the farmers face credit market imperfections, interlinkages allow the trader to counteract the possible effects of the imperfection of the farmers' production efficiency and to obtain the maximum surplus over the farmers' reservation income.

The function of markets in generating social networks is still a matter of debate. On the one hand, More (1994) recognizes that markets can erode existing social networks by deteriorating social norms that constitute their basis. On the other hand, Hirschman (1982) argues that the repeated

practices of transactions at the markets, based even by purely economic incentives, can generate moral values that are shared by the people concerned, and the shared values can eventually be embodied by social networks.

In this paper, the latter idea is regarded to be acceptable as an analytical framework: This paper focuses on a remote rural area in Indonesia, where disadvantages in terms of the risks and transaction costs mentioned above are more severe. In turn, farmers and traders in the research area activate various social networks to stabilize the economic transactions. In remote rural areas, traders play a key role in mediating between farmers and outside markets. A vertical¹ working relationship between traders and farmers is often accompanied by a credit arrangement, which utilizes social networks as collateral substitutes. Previous studies found that third-party guarantees, tied contracts, and threats of loss of future access are common devices in informal financial contracts (Adams and Fitchett, 1992; Biswanger, McIntire, and Udry, 1989; Zeller, 1994). In this study, the characteristics of informal financial arrangements between traders and farmers and credit constraint problem in particular are examined in order to contribute information to the study of social networks and credit access in Indonesia (Okten and Osili, 2004; Grootaert, 1999).

The research area is at the center of coconuts production in Indonesia. Coconut production covers a total area of 3.76 million hectares and involves 20 million smallholder farmers (Ministry of Agriculture, 2001). The marketing of coconut production is conducted mainly by traders, especially by Chinese traders, who also give loans to farmers. The social networks that farmers use to develop off-farm jobs also require further investigation. Recent studies highlight a significant role of off-farm jobs for rural households in Indonesia (Booth, 2002). Households conducting self-employment activities need information on input supply (i.e., materials and labors) and market access for products. Meanwhile, casual laborer households need networks for information on labor recruitment. In the research location, a majority of farmers conduct off-farm jobs, and farmers make use of local horizontal² networks to obtain access to information and markets: Chinese traders are not involved in these networks, unlike the above-mentioned networks for coconut products marketing.

This study sought to: 1) describe the credit arrangements in coconut marketing transactions in a remote rural area, 2) describe social networks for coconut farmers' off-farm works, and 3) determine factors influencing credit constraint on coconut farmers to traders' credit.

RESEARCH METHODS

Research Area

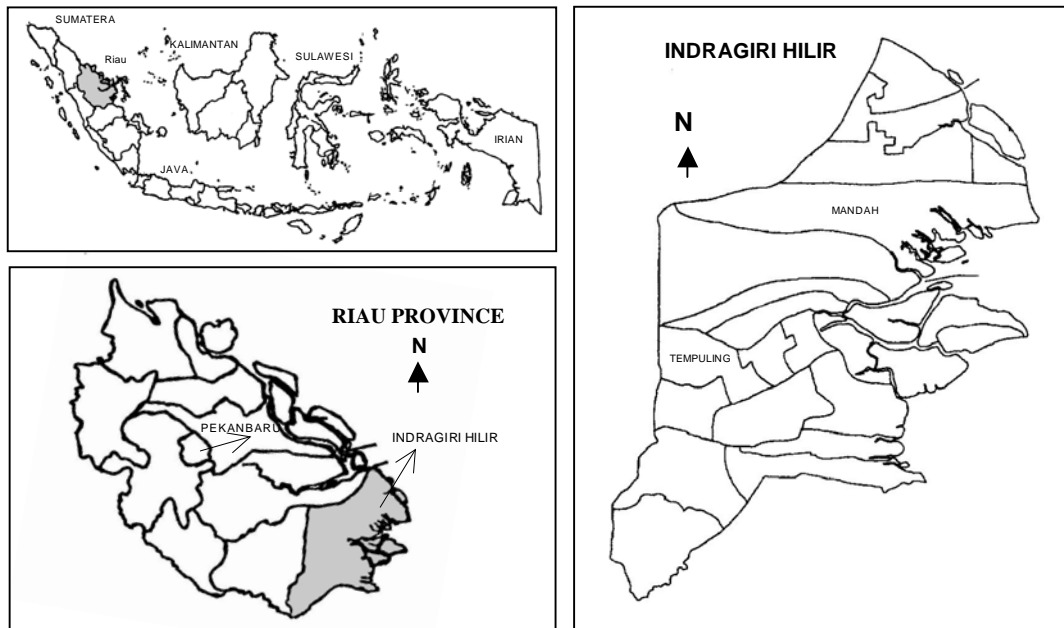
Riau province, located on Sumatera Island, is a suitable area for the improvement of coconut production (Abdurahman and Mulyani, 2003). This area is the center of coconut production (1.6 million hectares) in Indonesia. The coconuts are produced by more than half a million smallholder farmers (Ministry of Agriculture, 2001). Most of the coconut plantations are located in the Indragiri Hilir district (519 thousand hectares), of which 85.1% of the area belongs to smallholder plantations. In 2000, it contributed the highest shares to regional income (20.8%), with an export value of 408.9 thousand USD. The center of coconut production located in Riau province is situated in Indragiri Hilir district (Fig. 1). The total land mass of this district is nearly 19 thousand Km², and the distance to the province's capital is 212 km (a journey of 12 hours by car). This district is divided into 17 administrative sub-districts, and Tembilahan is the political and economic center. Most of the land

¹ A vertical network refers to the marketing network between farmers and Chinese traders, in which Chinese traders have a higher position as both price makers and lenders.

² A horizontal network refers to relationship among coconut farmers, where everyone has an equal position.

(93.3%) in this region is lowland, ranging from 0-3 meters above sea level. This district consists of hundreds of islands that are also crisscrossed by hundreds of rivers and canals. Rivers play an important role for inter-island transportation because most people live along a coast or river. People utilize ditches not only for drainage management but also for transportation. These conditions make people's mobility highly dependent on river tides. Most households have small boats for family transportation, but medium- and large-sized boats are owned only by rich households that use them for operating a public transportation service.

The development of tree crops cultivation in this area has been supported by financial institutions and the local commodity market. The formal financial institutions available there are commercial banks³ (7), cooperatives (131), and village banks (1), but most of farmers are restricted from these formal institutions because of collateral requirement and high transaction cost. Additionally, farmers only have access to informal institutions such as friends, relatives, traders, or financial self-help groups (SHGs). The local commodity market consists of weekly and daily markets (74). Weekly markets are used by farmers and traders to sell their products, particularly in remote areas, while daily markets are mainly used by farmers to get daily consumption goods, especially food. In addition, farmers also have access to small local shops (87) to get daily consumption. Other important commodity markets are fish markets (48) and fish auctions (7) (Statistic of Indragiri Hilir District, 2000).



Source: Statistic Indonesia, 2005

Fig. 1. Location of research site and of Indragiri Hilir District, Riau Province

The total population of Indragiri Hilir district in 2000 was about 556 thousand with a population growth of 1.58 % per year. The majority of the population is indigenous ethnic Malay. Immigrants in this district are ethnic Banjar (migrated from South Kalimantan), Javanese (migrated from Middle Java), Bugis (migrated from Makasar, South Sulawesi) and Minang (originally from

³ Numbers in parentheses indicate the number of institutions in Indragiri Hilir district

West Sumatra) ethnic. Most of population regardless of ethnicity is Muslim. In 2000, 74.39 % of the labor force was engaged in the agricultural sectors.

The primary data used in this study were collected through in-depth interviews with coconut farmer households in two sub-districts of the Indragiri Hilir district, Tempuling and Mandah. The two sub-districts were chosen because they represented the general condition of the district that consists of both mainland and islands. The Tempuling sub-district is located in the inland area; therefore, it functions as the economic and political center for the districts. This sub-district has better transportation and financial infrastructure. Meanwhile, the Mandah sub-district represents the outland area; it consists of small islands, and it is a place where the majority of the poor farmers are located. This area can only be reached by water transportation (4 hours by boat from the central district), and a farmer's transportation is highly dependent on river tides.

The investigation was conducted from April to October 2002 in these two sub-districts. In the Mandah sub-district, research was conducted in the villages of Igal (31 farmers) and Belaras (28 farmers). In the Tempuling sub-district, research was conducted in the villages of Tempuling (31 farmers) and Sei Ara (14 farmers). The ethnicity of the respondents in this study consist of indigenous Malay (66 households), Banjar (25 households) and Javanese (13 households).

A profile of the respondent farmers is described in Table 1. First, the average age of the heads of household was 46.2 years and 44.9 years in Mandah and Tempuling, respectively. The old ages observed reflects a general trend of aging farmers in Indonesia. Second, the average household head's level of education was only 2.7 years, meaning that the majority of farmers in both areas did not complete a formal basic education. Third, the average number of dependent family members in both areas was 4.2 persons. Fourth, the majority of farmers in the Mandah sub-district were ethnic Malay, while the majority of farmers in Tempuling sub-district were Banjar. Tempuling was one of the destinations for the government's transmigration programs; as such, there are many Javanese farmers who came to the area. Fifth, the landholding size between farmers in the two sub-districts was significantly different. The average landholding size in Tempuling was much larger than in Mandah. Farmers of Banjar ethnicity in Tempuling have the highest landholdings, averaging of 7.1 hectares per farmer.

Table 1. Profile of coconut farmers interviewed in Indragiri Hilir District, 2002.

Variables	Mandah			Tempuling		
	Total	Average	SD	Total	Average	SD
Number of farmers (HHs)	59			45		
Age of head of household (years)		46.2	9.5		44.9	11.7
Formal education of head of households (years)		2.7	1		2.7	0.8
Number of dependent (persons)		4.2	1.7		4.2	1.9
Farming experience (years)		25.7	12.8		21.9	11.9
Ethnicity (HH)						
Malay	55			11		
Banjar	1			24		
Javanese	3			10		
Landholding (ha)		4.5	3.3		6.3	10.8

Model of Credit Constraint by Chinese Traders

The previous section already described that marketing relationships between coconut farmers and Chinese traders are strengthened by tied credit arrangements. However, some farmers may

receive credit constraint from Chinese traders. Although a tied marketing-trade contract may secure coconut supply, Chinese traders might conduct credit constraint because of their limited financial resources to less creditworthy farmers.

In this study, households' access to Chinese traders' credit will be measured by asking farmers about their credit experience during the last one year. Households are identified as unconstrained if they received credit from Chinese traders. Among non-borrower, indirect method was used to classify who are likely to be credit constrained from Chinese traders; households are classified as unconstrained if their total income exceeds the mean total income of total respondents.

A logit probability model is used to determine factors influencing farmers' probability of being credit constrained by Chinese traders. The dependent variable has binary value of 0 if households were unconstrained and 1 constrained. Determinant of factors influencing probability of credit constrained compute using following equation:

$$\text{Prob (Y)} = f (\text{I, H, A, L, In})$$

Where:

I = a vector of households individual characteristics, such as age (+), number of dependent (+)

H = a vector of human capital, such as education (-)

A = a vector of asset, such as landholding (-) and total asset (-)

L = Location characteristics

In = a vector of income characteristics, such as dummy short periodical income⁴ (-)

RESULTS AND DISCUSSION

The Income Structure of Coconut Farmers in the Indragiri Hilir District

This section examines the income structures of coconuts farmers (Table 2). Larger landholding does not necessarily mean a higher total income. The larger landholders (more than 4 hectares) in Mandah have a higher income than those farmers with mall landholding; however, in Tempuling, the situation is the opposite. This fact highlights the important role of off-farm work towards a household's total income. Most farmers, regardless of their landholding size, conduct pluriactivities (Table 2). The off-farm income earned through these activities significantly contributes to farmer's total income. The choice of off-farm activities may differ due to capital endowment, level of education and location.

The on-farm income contributes the highest share of the total income of the larger landholding farmers, 49.8 and 68.3 % in Mandah and Tempuling, respectively. The agricultural income is mostly derived from coconuts, 48.6 % in Mandah, and 59.8 % in Tempuling. As compared with a significant difference in average landholding between the larger and smaller landholding farmers in both areas, the coconut income difference is rather small. A few larger landholder-farmers did not harvest all their coconuts because of the decreased price of copra. They abandoned the furthestmost plots since the harvesting cost was too high compared to the potential coconut income.

The income structure of smaller landholding households between two areas is different (Table 2). In Mandah, off-farm income has a higher contribution to total income, especially from self-employment activity. The most common self-employment activity conducted by farmers is

⁴ Dummy of short periodical income will be explained in next section (framework for analyzing off-farm work)

fishing because they have an advantageous location and because it delivers daily cash income. Some farmers conduct an agribusiness of sago processing since it is a staple food for the majority of households in this remote area.

Meanwhile, in Tempuling, on-farm income still contributes the highest share of smaller landholder farmers' total income, while the second biggest share comes from self-employment. Many of the farmers also engaged in fishing and in the brown sugar home industry⁵. A few farmers in Tempuling generate income from their capital by conducting a renting business, particularly of copra processing tools and boats. While farmers in both areas also participate in casual labor work, farmers in Mandah mostly worked as agricultural laborers, particularly in harvesting coconuts, while farmers in Tempuling have the opportunity to work as industrial or construction laborers.

As for larger landholding households, on-farm income contributes the largest share to total income. The off-farm income structure of larger landholder-farmers in Mandah was different from that in Tempuling. In Mandah, fishing as self-employment plays an important role in generating cash income. Some farmers, who can take advantage of their educational background, have access to work in the public sector. In Tempuling, larger landholding farmers specialize in renting processing tools and boats. The larger landholder farmers in both areas, especially those with low formal education, also engage in casual work as agricultural laborers.

Table 2. Total income of coconut farmers by landholding in Indragiri Hilir District, 2002.

Source of Income	Mandah				Tempuling			
	<=4 Ha (n=33)		> 4 Ha (n=26)		<=4 Ha (n=25)		> 4 Ha (n=20)	
	Value	%	Value	%	Value	%	Value	%
On-farm Income	2,897.3	38.9	3,896.8	49.8	3,854.5	46.4	5,379.6	68.3
- Coconuts	2,866.0	38.5	3,800.9	48.6	3,529.5	42.5	4,706.9	59.8
Off-farm Income								
Labor	695.7	9.3	873.8	11.2	703.4	8.5	934.1	11.9
- Agric Labor	458.8	6.2	667.5	8.5	244.7	2.9	590.4	7.5
Salary	77.1	1	1,033.3	13.2	401.7	4.8	469.1	6.0
Self-Employed	3,387.6	45.5	1,763.7	22.5	2,704.0	32.5	708.8	9.0
Rent	17.0	0.2	0	0	503.0	6.1	380.5	4.8
Others	369.6	5	260.0	3.3	143.5	1.7	0	0.0
TOTAL	7,444.3	100	7,827.6	100	8,310.1	100	7,872.1	100
Landholding (Ha)	2.2		7.5		2.4		10.7	
Productivity (ton/Ha)	1.6		1.5		1.6		1.5	
Number of borrowers (HH)	18 (55)		17 (65)		10 (40)		12 (60)	
Average loan of borrower (000 IDR)	1,350		2,176.4		845.0		1,756.3	

Note : Net income was calculated by considering the depreciation cost ($\square=0.1$). Labor incomes consist of industrial, agricultural and construction labor. Self-employment activities consist of fishing, agribusiness and trading. Households categorized as smaller and larger landholders with respect to the 4 Ha border. Productivity was calculated only for harvested land.

⁵ Farmers produced brown sugar from coconut liqueur. The liqueur is tapped daily from young coconut trees and processed into brown sugar with traditional methods in the farmer's home.

Copra Marketing and Credit Access in Indragiri Hilir District

Most farmers have limited market access due to a naturally poor location and high transportation costs. The poor access to more profitable markets is especially a problem for farmers living in Mandah. Most of them sell copra only to the village trader since the central sub-district market can only be reached by a four-hour boat ride, which would incur a high transportation cost. In contrast, farmers in Tempuling have a more favorable location⁶, so they can sell not only to village and sub-district traders but also directly to the copra processing industry.

The marketing of copra is dominated by Chinese traders (*taukeh*). The village copra market structure is oligopsony because only two or three traders exist. Most of traders in both areas are under contract supply with Coconut Oil Processing Company⁷ so they have to develop networks with farmers to secure copra supply. These networks also include a credit arrangement for coconut farmers. Traders own shops that sell food, clothes, and other daily necessities. Farmers usually take goods from a trader's shop to smooth out their consumption. Farmers suffer from a cash income shortage since they have to wait four months between harvests. Traders will take note of a farmer's credit and charge an implicit interest rate with an indefinite time repayment schedule. The Chinese traders thus act as informal lenders, using copra market contracts and the threat of loss of future coconut market and credit access as collateral substitutes.

The form of copra marketing networks between farmers and traders was radiate: traders are at the center of transactions, while farmers have little contact with each other. Only traders provide the price information since most of farmers, regardless of their location have no other access to market information (Table 3). A small number of farmers received market information from other farmers and from the radio (only in Tempuling). The close tie in the working relationship between farmers and traders is shaped by the credit arrangement. This condition especially occurs in remote areas like Mandah due to low market competition. Judging from the percentage of borrowers and the amount of credit, farmers in Mandah are more dependent on Chinese traders than those in Tempuling (Table 2). The majority of farmers in Mandah sell copra to village traders because of a credit agreement⁸ (Table 3). This dependency can be strong since credit repayment can be extended by a farmer's requests. Such credit arrangements require farmers to sell copra to Chinese traders because they are afraid to lose future access to both copra market and credit. Farmers also have close friendships with Chinese traders since they live in the same community. In contrast, the most important factor for farmers in Tempuling, concerning copra marketing, is location. They prefer to sell copra in the most convenient place since they are not tied by any credit arrangement.

Farmers in both sub-districts are highly dependent on informal credit from Chinese traders (Table 4). Credit from strong network ties (family, relatives and friends) is low since most of them have limited contact with family members due to naturally poor location and high transportation cost. The geographic isolation and irregular cash income prevented financial self-help groups from developing among coconut farmers. Meanwhile, formal credit is only accessible by farmers who work as government employees.

⁶ Farmers can carry the coconuts not only by boats but also by bicycles, motorcycles, or chart.

⁷ The Sambu Group today has emerged as the single largest integrated coconut industry in Indonesia, showcasing three factories and a massive plantation (100 thousand Ha of hybrid coconuts plantation and pineapples). The factory is situated in Guntung and Pulau Burung sub-districts, neighboring the Tempuling sub-district. The company produces crude coconut oil, virgin coconut oil, desiccated coconuts, coconut cream, creamed coconuts, and copra extraction pellets.

⁸ In reality, even non-borrowers farmers in Mandah sell to village traders but with different reasons than non-borrowers farmers. The reasons to sell copra to village traders are remoteness of location (53 %) and history of receiving credit (23%). In contrast, all non-borrowers farmers in Tempuling sell copra to sub-district traders due to convenient locations (78%).

Table 3. Farmers' market counterpart and information source in Indragiri Hilir District, 2002.

Variables	Mandah		Tempuling	
	Marketing Counterpart		Marketing Counterpart	
	Village traders	Sub-district traders	Village trader	Sub-district Traders
Source of market information				
1. None	4 (7.5)	0 (0)	4 (12.1)	1 (3.0)
2. Other farmers	10 (18.8)	3 (5.7)	3 (9.1)	1 (3.0)
3. Traders	33 (62.3)	3 (5.7)	21 (63.6)	3 (9.1)
4. Radio	0 (0)	0 (0)	1 (3.0)	2 (6.1)
Reason of copra market counterparts				
1. No other options	8 (15.1)	0 (0)	0 (0)	0 (0)
2. Price	2 (3.8)	3 (5.7)	4 (12.1)	2 (6.1)
2. Loan	25 (47.2)	2 (3.8)	8 (24.2)	0 (0)
3. Location	12 (22.6)	1 (1.9)	13 (39.4)	3 (9.1)
4. Low transportation cost	0 (0)	0 (0)	1 (3.0)	2 (6.1)

Note : Research to market access was answered by only 53 HH in Mandah and 33 HH in Tempuling.
All answers were singular as most of farmers sell copra to single counterparts.

Table 4. Credit access by source and landholding in Indragiri Hilir District, 2002.

Source	Mandah			Tempuling		
	≤ 4 Ha (n=33) 000 IDR	> 4 Ha (n=26) 000 IDR	Total (n=59) 000 IDR	≤ 4 Ha (n=25) 000 IDR	> 4 Ha (n=20) 000 IDR	Total (n=45) 000 IDR
Formal Credit	8,500 (2.34) (n=2; 6.1%)	15,000 (24.8) (n=1; 3.8%)	24,500 (25.0) (n=3; 5.1%)			
Informal Credit						
Family & Friends	1,540 (4.2) (n=5; 15.2%)	3,100 (5.1) (n=2; 7.7%)	4,640 (4.8) (n=7; 11.9%)		2,520 (10.7) (n=4; 20%)	2,520 (7.6) (n=4; 8.9%)
Input Traders	2,000 (5.5) (n=1; 3.0%)	4,000 (6.6) (n=2; 7.7%)	6,000 (6.1) (n=3; 5.1%)	1,000 (10.6) (n=1; 4%)		1,000 (3.0) (n=1; 2.2%)
Coconut Traders	24,300 (66.9) (n=18; 54.5%)	36,992 (61.0) (n=17; 65.4%)	61,292 (62.6) (n=35; 59.3%)	8,450 (89.4) (n=10; 40%)	21,072 (89.3) (n=12; 60%)	29,522 (89.4) (n=22; 48.9%)
Financial SHG		1,500 (2.5) (n=1; 3.8%)	1,500 (1.5) (n=1; 1.7%)			
Total	36,340 (100)	60,592 (100)	97,932 (100)	9,450 (100)	23,592 (100)	33,042 (100)

Note : Number in parenthesis represents the share of credit by source to total credit

The most important factor differentiating copra price is location. Copra prices in Mandah are significantly lower than in Tempuling at $\alpha=1\%$ (Table 5). The low prices are caused by high transportation costs and less market competition, which in turn has led to farmers becoming highly dependent on credit arrangements with traders. Meanwhile, there is no price difference by landholding size. Neither small nor large landholders have any bargaining power, since transaction units are too small. None of the respondents joined agricultural cooperatives or farmers' groups for joint-marketing activity.

The negative impact of a credit arrangement on copra price occurs only in remote areas. The cost of a loan is determined by the bargaining power between traders and farmers. In Mandah, traders charged an implicit interest rate⁹ of 30.3% per year on credits by offering a lower price to borrower farmers.

There is a significant price difference between borrower and non-borrower farmers ($\alpha=10\%$) (Table 5). This agreement is less harmful to farmers since the price difference is still lower than the informal market interest rate (36-120% per year), although most of them are restricted to other financial institutions. In addition, credit repayment is flexible and can be extended upon a farmer's request. In contrast, traders in Tempuling did not charge an implicit interest rate because they have to keep a working relationship with farmers by providing credit under tight market competition.

Table 5. Copra price difference by location and landholding in Indragiri Hilir District, 2002.

No	Differences	Price	Mean	T
1	Location	Price in Mandah	813.7	-4.2***
		Price in Tempuling	880.9	
2	Landholding	Price of Small Farmers	842.9	-0.6
		Price of Large Farmers	851.7	
3	Loan and Location	Price of borrower in Mandah	801.5	1.7*
		Price of non-borrower in Mandah	842.5	
		Price of borrower in Tempuling	880.5	0
		Price of non-borrower in Tempuling	880.5	

Note : *** Significant at $\alpha=1\%$. ** Significant at $\alpha=5\%$. * Significant at $\alpha=10\%$

Credit Access and Off-Farm Work

A framework for analyzing off-farm work in the Indragiri Hilir district

A coconut farmer's dependency on traders' loans for consumption goods is related to his opportunity to conduct off-farm work that delivers cash income. As mentioned above, most of coconut farmers regardless of their landholdings engage in several kinds of off-farm activities. This section examines the relationship between the farmers' credit dependency the types of their off-farm work.

A matrix serves as a framework to categorize off-farm work. Off-farm work is categorized as either remote market oriented (RM) or local market oriented (LM), depending on where farmers get the information and resources needed for their off-farm work and on where farmers sell the products of their off-farm works (Table 6).

Fishing is categorized as RM; farmers, who fish, sell their catch to Chinese traders. Chinese traders process it into salty fish and sell them to the remote market. Farmers often sell fish to the same trader to whom they sell copra. In addition, women and children from fisherman-farm households sometimes work as laborers in the Chinese traders' salty fish business. They are paid in kind (fish) rather than with cash. Basically, a farmer's fishing activity is dependent on Chinese traders, as the case of copra. However, the dependency seems to be weaker with fishing than it is with copra. Farmers can transport fish with their own small boats; copra, on the other hand, would require bigger boats for transport, in addition, in Tempuling, fresh fish can be sold at the local

⁹ The implicit interest rate is calculated by the income loss of farmers due to price discrimination.

daily/weekly markets for local consumption.

Table 6. Types of off-farm works of coconut farmers in Indragiri Hilir District, 2002.

Market Category	Type of works	
	Short Periodical Income (SPI)	Long Periodical Income (LPI)
Remote Market (RM)	Fishing	(Coconuts)
Local Market (LM)	Sago and brown sugar processing, government official, industrial labor, trading, fishing	Construction worker, agricultural labor, tool rental

Other off-farm work is categorized as LM. In the case of sago processing, farmers utilize local networks with neighboring farmers, to get information about the location of materials (e.g. the location of matured sago trees) and to recruit the laborers for processing. The product, a staple food, is sold in the local market. Farmers who process brown sugar utilize material from local coconuts and sell the product to the local market. Industrial laborers, construction laborers (who mainly build local houses), and agricultural laborers, are recruited through the local information network, and their working sites are in the local area. The renting of tools (copra processing tools, sago processing tools and big boats) as an off-farm work is closely related to the local market as just explained. Additionally, there are some fisherman-farmers who can be considered independent from Chinese traders.

Another pair of categories - short period income (SPI) and long period income (LPI) – based on the frequency of opportunities for cash income. Generally speaking, as far as a loan for daily necessities is concerned, LPI group farmers have a greater need for loan to smoothing consumption than SPI group farmers. The SPI group includes activities that generate a relatively constant monthly income, such as employment as a government official or as an industrial laborer. The self-employment off-farm works such as trading, fishing, and sago and brown sugar processing are conducted regularly all year round and are expected to bring constant cash income; fishermen can get fish constantly and get cash income shortly after selling them to local traders. Brown sugar and sago processing farmers receive daily/weekly cash income since they usually sell their product at a daily/weekly local market.

In contrast, the LPI group includes activities that generate cash income over a period longer than one month. Some LPI off-farm works is related to coconut harvesting activity, such as harvesting labor and renting tools for processing and boats for transporting coconuts. Meanwhile, the demand for artisans and construction workers is fluctuated due to the small number of the construction sites. Many of the farmers in both areas engaged in fishing because it generates steady cash income with only a small capital requirement. Farmers in Tempuling have more options to conduct SPI and LPI off-farm activities since they have more opportunities to work as industrial or construction laborers. The type of agribusiness activity in each area is different. Farmers in Mandah mainly process sago processing, the staple food in that area, while farmers in Tempuling mainly process brown sugar.

By combining the two types of the categorization mentioned above, a matrix can be constructed (Table 6). In the joint category of RM-LPI, no off-farm work is included. The following discussion, places farmers who do not conduct off-farm work into this group, taking into consideration that coconuts are the main products of their agricultural activities and that coconuts are regarded as RM-LPI products.

Types of Households Income and Dependency on Traders' Credit

This section will analyze SPI and LPI households' dependency on credits from Chinese traders. Each household was categorized as either SPI or LPI, based on their highest off-farm income. Table 7 shows both SPI and LPI households' income and credit dependency to Chinese traders. Four indexes are adopted to show the extent of credit dependency (e.g., percentage of borrowers, loan/land value, loan/asset value, and loan/income). In Mandah, as shown in Table 7, SPI households have a higher total income than LPI households, and, as expected, SPI households have a higher SPI income than LPI households, and less LPI income than LPI households. The dependency on traders' credit, measure as the percentage of borrowers, is higher for LPI households because they need credit for smoothing consumption. LPI households have twice as many loans as SPI households. There are also significant differences on loan/land value, loan/asset value, and loan/total income between two groups.

In general, access to formal credit institution is limited. In Mandah, LPI households have as twice as much credit as SPI households. In contrast, LPI households in Tempuling have less credit but a higher dependency compared to SPI households.

Table 7. Household income and dependency on trader credits of SPI and LPI households by location in Indragiri Hilir District, 2002.

Variables	Mandah			Tempuling		
	SPI (n=38)	LPI (n=21)	t-value	SPI (n=19)	LPI (n=26)	t-value
Total Income (000 IDR)	7,359.1	5,519.3	1.53	7,872.9	6,656.4	0.72
Total SPI (000 IDR)	4,836.8	113.7	6.59***	3,372.9	170.5	4.2***
Total LPI (000 IDR)	23.8	1,503.7	-4.09***	481.1	562.0	-0.29
Loan (000 IDR)	707.1	1,621.4	-1.52	1,163.2	559.2	1.22
Borrower (HH)	19(68)	16 (76)		7 (36)	15 (58)	
Loan/Land value	22.7	57.9	-2.21**	16.3	26.5	-0.74
Loan/Asset value	33.0	77.4	-1.93*	22.3	29.5	-0.50
Loan/Total income	103.0	309.0	-1.86*	102.0	91.0	-0.04

Note: LPI income does not include coconut income.*** Significant at $\alpha=1\%$.** Significant at $\alpha=5\%$.

*Significant at $\alpha=10\%$. Number in parentheses is percentage.

Determinants of Factors Influencing Credit Constraint on Coconuts Farmers

The previous section described the dependency of farmers, most of whom are restricted from formal credit, on credit from traders. However, many farmers are also restricted from informal credits. The number of households with access to a trader's credits was 57 households, or 55% of total respondents. The other 47 households had no credits from traders. By looking at their total income, those households can be classified as either credit constrained or non-credit constrained. Eight households received no loans from Chinese traders but were classified as non-credit constrained households since their total income was higher than the mean total income. These households can be regarded as households with no need for loans. Thirty-nine households had no credit and can be regarded as credit constrained households.

The determinants of being credit-constrained by the traders are shown in Table 8. The Logit estimation results show four variables have significant influence a household's probability of being credit constrained from Chinese traders' loans. Those variables are the head of household's age, landholding, total asset, and a dummy variable of short period income (SPI).

Table 8. Determinants of being credit-constrained by Chinese Traders (Logit estimate).

Predictors	Coefficient	Odds Ratio
Constant	0.644	1.904
Age	0.047	1.048*
Education	-0.614	0.631
Landholding	-0.165	0.848*
Total asset	0.000	1.00**
D_Short period income	-1.468	0.230***
D_Location	0.647	1.910
-2 Log likelihood 107.640		
Cox & Snell R Square 0.250		
Nagelkerke R Square 0.341		
Percentage Correct Prediction 74 %		

Note: *** Significant at $\alpha=1\%$. ** Significant at $\alpha=5\%$. * Significant at $\alpha=10\%$

The age of the head of household has a positive coefficient and significant at $\alpha=10\%$. It implies that an older household head has a higher probability of being credit constrained. A farmer's creditworthiness relates to his ability to manage a coconut plantation, since credit was paid in copra. Older farmers were considered to be less productive since coconut production requires physical work.

Landholding is significant at $\alpha=10\%$ with an odds ration of less than 1. It means the smaller landholder households have a higher probability of being credit constrained. In research area, traders have clear information on farmers' landholding since they are living in the same community. Chinese traders expect loan payment in kind (copra) so larger landholder farmers are more creditworthy to them. As a result, smaller landholder farmers are less preferable because they produce fewer coconuts.

Total assets is significant at $\alpha=5\%$ with an odds-ratio of 1. This means that all farmers regardless their total assets, have the same probability of being credit constrained. Traders use tied contracts and threats of loosing future access to copra market and credit transactions as collateral substitutes. A farmer's total assets are meaningless for traders since they do not have legal rights to confiscate a farmer's assets in case of defaulted loans.

The dummy of SPI is significant at $\alpha=1\%$ with an odds ratio of 0.228. The SPI households have lower probability of being credit constrained. There are two reasons behind this fact. First, the Chinese traders value them as creditworthy borrowers since they have steady cash income. Second, traders want to secure not only coconut but also fish supply. Chinese traders own salty fish processing companies and need the fish supply from farmers. Credit arrangements with farmers will guarantee supply input for coconut and fish. Among 57 households who received traders' credit, some of them (32%) fished. Farmers have an incentive to sell their fish to the same Chinese traders who also own a salty fish business. They have low probability of violating a Chinese trader's expectations since they are afraid to lose future market access to both coconut and fish.

In contrast, Chinese traders regard coconut farmers with long periodical income, LPI-RM in Table 6, as non-credible borrowers. In spite of repeated market transactions, they do not have

access to Chinese traders' credit. Chinese traders' capital is limited, so they can only provide credit to creditworthy farmers. Although LPI households need credit for consumption, many of them are restricted from credit and have to survive on subsistence level.

CONCLUSIONS

In a coastal remote area in Sumatra Island where coconut is the main crop, Chinese traders play a key role as intermediaries for coconut transactions between farmers and a huge coconut oil company. The structure of the local coconut market is oligopolistic because of the high transportation cost, and Chinese traders developed radiate vertical networks with farmers to secure copra (dried coconuts) supply because they have to fulfill their supply contract obligation with a big coconut oil processing company. The vertical networks are strengthened by Chinese traders' credit arrangements. Chinese traders sell daily necessities on trust and get repayment in kind (copra) with implicit interest rates. Although payment can be easily rescheduled, farmers will try not to betray credit-for-copra trade arrangement because they are afraid to lose future access to the coconut market and credit. .

Meanwhile, farmers are making use of both vertical and horizontal networks within the communities to develop off-farm work. The fishing marketing structure, where farmers sell fish to Chinese traders, is similar that of the coconut market. In sago processing, farmer make use of horizontal networks among neighboring farmers to get information on input location and sold the product in local market. Many farmers received credit constraint from Chinese traders. Older farmers are more likely to be credit constrained since they are considered to be less productive because coconut production requires physical labor. Small landholder farmers have a high probability of being credit constrained. Chinese traders put priority on larger landholding farmers so they can collect copra more efficiently. Coconut farmers who do not have off-farm work or having periodical income have higher probability of being credit constrained because Chinese traders regard them as non-creditworthy. However, these types of farmers are the ones who are really need credit for consumption during the lean season.

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