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Clustering of Small Agro-Processing Firms in Indonesia

ABSTRACT: Small-scale industries in Indonesia provide more than 65% of total manufacturing employment. Sixty-three percent of small-scale firm employment is in firms that are clustered. A cluster is defined statistically in Indonesia as at least 20 firms in a village. For some agro-processing industries, such as bamboo plaiting, clustering does not involve interaction among firms; for others, notably the furniture industry, clustering firms make joint marketing efforts, subcontract each other, and share large orders. This article uses two recent case studies in the agro-processing sector—the furniture and the palm sugar industries—in Central Java. We argue that the target market of the industry (local or international) influences the nature of the contracts and other forms of interaction in the clusters. Targeting an international market requires formal contracts, more focus on marketing, and separate roles for finishing firms and subcontracting firms. Policy should be directed at enabling clusters to shift to the international market by improving contract enforcement regulations, vocational training, and providing opportunities for group lending.

INTRODUCTION

Rural nonfarm activities tend to cluster geographically and according to economic subsector. The general literature on clusters focuses on the static productivity gains induced by clustering, such as economies of scale in purchase of raw

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materials or machinery, sale of output, and sharing the workforce. Some recent literature on clusters has explored dynamic advantages of clustering, such as sharing the costs of technological change, sharing information on new designs, processes, products, and so forth (Schmitz and Nadvi, 1999; Schmitz, 1995). Clustering may also facilitate joint marketing efforts by the small entrepreneurs themselves. Large firms and traders tend to concentrate their subcontracting networks on clustered enterprises. Clustering of enterprises is frequently to the advantage of buyers. There will be considerable transaction cost reductions if they can purchase the products at only one location.

Clustering is important for densely populated areas such as rural Java, the main island of Indonesia. There one observes many villages that specialize in the manufacture of specific products. The Indonesian case is particularly interesting because the data show that, even under the increasing competition induced by globalization and liberalized markets, Indonesian small firms are keeping up with the productivity increases of large firms since the mid-1980s (Berry, Rodriquez and Sandee, 2000). Moreover, small Indonesian firms have been if anything more resilient than large firms in the recent economic troubles in the Asian markets (Tambunan, 2000). Part of this appears to be because of clustering itself, and part because of small firms' subcontracting with larger urban and export firms in buyer-driven market channels—including some global networks—where the large firms impose standards of quality, price, and volumes, as well as finance technological upgrading. The two explanations are related: large firms subcontract to cut costs, and prefer to contract with firms in clusters to further cut transactions costs (Supratikno, 1998).

Most Indonesian research on small-firm clusters has focused on manufacturing other than agro-processing. Yet there are vast numbers of small agro-processing firms that work in clusters in rural Java. Moreover, they serve important risk management functions as farming households also operate these enterprises, sharing labor between them and diversifying their incomes, sharing equipment and buildings between the activities which allows reduction of processing costs, and adding value to their farm output thus raising their incomes (Heinen and Weijland, 1998). Such clusters consist of small firms located in the same village (using the Indonesian statistical definition of 20 or more firms producing a given product in a given village). They process soybean, palm sugar, tobacco, fish, shrimps, coffee, noodles, and so on. Part of the reason these clusters have been under-researched is that many are one- or two-person operations, based in the household, and those targeting the local markets have little interaction with other similar firms in the village.

We will show, however, that there are sharp differences in the institutional characteristics (use of contracts and standards) of agro-processing clusters according to the type of market targeted: local versus external (urban and

Table 1. Clustered Manufacturing in Central Java, 1986, 1989

ISIC		*Manufacturing employment, 1986*	*Of which in small scale and cottage*	*Share of clustered employment in total*	*Share of clustered employment in small, cottage*
31	Food processing, beverages, tobacco	631,823	514,000	49.2	60.4
32	Textiles, garments, leather, footwear	164,616	78,189	49.0	103.2
33	Wood products, furniture	225,896	219,537	75.2	77.4
34	Paper products, printing, publishing	14,358	7,358	0.0	0.0
35	Basic chemicals, rubber products, plastic products	31,395	4,928	9.8	62.2
36	Ceramics, glass products, cement products, and structural clay products	112,967	101,709	78.0	86.6
37	Basic metals	3,444	—	100.0	—
38	Fabricated metal products, (non) electric machinery	36,744	27,467	41.0	54.9
39	Miscellaneous	149,536	147,320	14.1	14.3
	A1 industries	1,370,761	1,100,508	50.4	62.7

Source: Sandee (1995: 11).

international). By using information from recent case studies, we compare palm sugar processing and furniture making clusters.

The following section provides an overview and a categorization of small-firm clusters in Indonesia, highlighting the nature and importance of agro-processing clusters. Additionally, we present results of two recent case studies of clusters.

Small-Firm Clusters in Indonesia: Overview and Categorization

Statistical Overview

Indonesia is one of the few developing countries with data that distinguish clustered manufacturing employment. Table 1 shows estimates of the share of clustered employment in manufacturing subsectors of Central Java. Data on total manufacturing employment are derived from the Economic Census of 1986. Unfortunately, there are no data on *clustered* employment for the same year. However, we use a list of clusters prepared by the provincial office of the Ministry of Industry. The list provides estimates for 1989 of employment in clusters (*sentra industri).* The Ministry of Industry defines a cluster as a group of at least 20 similar enterprises in one place, mainly the *desa* or village, and occasionally the smaller unit of a hamlet (*dusun*), but rarely a larger unit such as several villages together (Klapwijk, 1997). The concept *sentra industri* plays an important role in the promotion of small-scale and cottage industries in Indonesia (Sandee, 1998).

Table 1 shows that roughly 50% of total manufacturing employment in Central Java is in small-firm clusters. Shares are calculated from 1989 data on cluster

employment, and 1986 data on total employment. Small-firm cluster-based employment is particularly important in the subsectors of wood products, structural clay products, and basic metals. Clustering provides between 40% and 50% of employment in the subsectors of food processing, textiles and footwear, and fabricated metal products. Some 45% of *total* cluster-based employment is concentrated in food processing, beverages, and tobacco.

The *sentra industri* data from the Ministry of Industry provide information on the average size of firms in clusters, measured by the number of workers. The data suggest that there are very limited differences in average firm size in clusters among the main industrial subsectors in Central Java, such as food processing, textiles, wood products, and structural clay products. Firms employ on average 2 to 3 workers.

Categories of Clusters

This section classifies clusters by their degree of reliance on the local market (as opposed to the urban or export markets). We distinguish four types. The first two aim at local markets, the second two at external markets.

Clusters Targeting Local Markets

On the one hand, there are clusters that use local inputs and sell to the local market. An example is food preparation for rural workers who eat lunch at the local market.

On the other hand, there are clusters that use inputs purchased from external markets and process them for sale to local markets. This is a rare case in rural Indonesia. An example is where local firms buy soybeans from regional collection points from rural soybean cooperatives, and process them into *tempe* for local sale. The advantages of clustering are associated mainly with lower transaction costs of bulk delivery of the inputs. This is carried out by specialized traders, and requires some concerted action among the clustered producers to coordinate the timing of input deliveries.

The capacity and incentive to cooperate (inter-firm) appears to be weak in clusters targeted at the local market. Such cooperation is difficult, since they are competing for a limited pool of consumers. This is borne out in the findings of Weijland (1994) and Klapwijk (1997), who undertook a field survey in Central Java. They show that “local inputs, local markets” firms cooperate little with others in their cluster, and cites the examples of bamboo and grass (*mendong*) plaiting, and meat preservation.

Clusters Targeting External Markets

On the one hand, there are clusters in which firms use local inputs but sell to an external market (in urban areas or in the export market). Examples are clusters that use raw materials gathered from the natural environment, such as bamboo and

wood, and build furniture, as well as the palm sugar processors discussed later, or clay to make tiles and ceramics. Firms cluster near the location of the raw materials to reduce transport costs. External economies spur cooperation to assemble and transport output to the external market, and to associate to find and negotiate with external buyers.

On the other hand, there are clusters that use external inputs and sell to external markets. It is common for producers in these clusters to participate together in trade networks that are managed by traders or large urban firms. The latter make decisions on quality, price, and destination of the output. The small firms operate as subcontractors, sometimes essentially as 'disguised' wage workers. Examples are the many rural garment clusters that are embedded in trade networks linked to foreign markets. The advantages of clustering are associated with external economies as buyers find it efficient to contract out jobs to groups of small firms that are geographically clumped rather than dispersed. Other product clusters, however, may show more independence. Brass producers do their own marketing, and furniture manufacturers may do their own purchasing and selling outside the local region. In these cases, joint action is much more common.

The capacity to cooperate is greater when targeting the external market, because the demand curve is more elastic, and intracluster competition is limited except perhaps for particular clients. The incentive is also greater when the size of a buyer's order is uncertain (which tends to be the case more often for external market buyers), which creates market risk that can be minimized by cooperating and pooling resources to meet orders that are occasionally too large for the typical small firm to meet. Klapwijk (1997) shows that firms in "local inputs, external markets" clusters indeed cooperate more closely, to the extent of active subcontracting and order-sharing (for example, the manufacture of brooms and furniture), and the cooperatives in these subsectors are active. Some clusters have collaboration "organized" by the large urban firms that buy their product. An example is the production of soy crisps (*criping, emping*).

It is beyond the scope of this paper to explore why firms or clusters choose to target a local versus an external market. We merely note here that, where firms and clusters have the capacity to do so, there appears to be a strong incentive to target the external market. This is, in part, because it appears to be more profitable. Partly this is because the external market is to a certain extent less risky than the local market. The local market is risky because demand, as well as labor supply to nonfarm firms, fluctuate with the crop harvest. If the harvest is poor, labor is pushed out of farming into nonfarm firms (so labor costs fall), yet the demand for the output of the latter drops with falling incomes because of local crop failure. By contrast, when the local harvest is poor, those focused on the external market (assuming the latter is insulated from the effects of the poor harvests in rural areas) will see rising profits because labor is cheaper. Table 2 summarizes the cluster categorization.

Table 2. Classifying Rural Industry Clusters According to Origin of Input and Destination of Output

Type	*LL*	*LX*	*XL*	*XX*
Input	Local	Local	External	External
Output	Local	External	Local	External
External economies	Weak	Strong	Strong	Strong
Joint action	Weak	Strong	Weak	Weak
Examples	Cooked food	Tiles, Agro-processing	Soybean processing	Textiles, shoes, brass handicrafts

In What Types of Clusters Does Agro-Processing Figure?

Klapwijk (1997) analyzed *sentra industri* data for the 4,000 rural industry clusters in Central Java, and the results are summarized in Tables 3 and 4. Several points regarding agro-processing emerge.

First, small-firm clusters are dominant in the food, beverage, and tobacco industries. Interestingly, a substantial share of them use "external inputs" rather than "local inputs." This is the case for the majority of clusters in textiles, garments, leather goods, and even for a quarter of wood processing clusters. Overall, 39% of the clusters process external inputs. The significance of food processing clusters among these is partly because of the government-sponsored cooperative system for crop processing in Indonesia. Many clusters processing key food crops (soybeans, cassava, and rice) acquire their inputs through regionally concentrated distribution points of the cooperative movement, and seldom buy directly from local farmers. In many cases, the cooperatives undertake first-stage processing before selling at the regional distribution points.

Table 4 also shows that clustered soybean processing (at least the simple *tempe* production), bamboo plaiting, palm sugar, and pottery focus on local markets. These activities are spread throughout most districts of rural Central Java, and get their inputs from the local surroundings of the clusters, except for soybean processing as noted previously. The dispersed location of the activities is

Table 3. Classification of Rural Industry Clusters to Type of Raw Material Linkage in Central Java, Indonesia, 1989

Sector	*Local inputs*	*Non-local inputs*
31 Food, beverage, and tobacco	922	837
32 Textiles, wearing app. Leather goods	16	405
33 Wood, wood products	910	215
34 Paper products, printing, publishing	—	—
35 Chemicals	—	31
36 Nonmetallic mineral products	534	—
37 Basic metals	—	—
38 Fabricated metal products	—	70
39 Other industries	79	18
Total	2461	1576

Source: Klapwyk (1997: 82).

Table 4. Clusters: Market Range and Employment in Rural Central Java 1989

Subsector	*Market range*	*Employment*
Soybean processing (tempe)	Local	28,067
Bamboo plaiting	Local	102,428
Palm sugar	Local	7,987
Pottery	Local	7,891
Soybean processing (tahu)	Regional	11,325
Roof tiles	Regional	42,324
Agricultural tools	Regional	6,093
Garments	National, Export	9,213
Furniture	National, Export	27,008
Weaving	National, Export	5,578
Tailoring	National, Export	2,982
Embroidery	National, Export	7,967
Salt making	National, Export	16,676

Source: Klapwyk (1997: 93).

explained, in part, by the high transport costs of raw materials and output. Moreover, most villages and towns need the products they supply as part of basic diets and household needs.

In the next section we present two recent case studies of clusters that focus on the local and on the external market, respectively, and explore the advantages that are associated with clustering.

Case Studies: Palm Sugar and Furniture

Palm Sugar Processing

Kameo's (1999) study of palm sugar processing in rural Java is summarized here. This processing activity is usually thought of in Indonesia as a marginal activity that is carried out by poor households that lack access to better opportunities. The profit is indeed low, averaging less than a dollar a day. Yet despite the rapid modernization of the Indonesian economy and agriculture, palm sugar processing has not lost ground. This is, in part, because it is a part-time activity that fits into the interstices between other jobs. Moreover, the work burden is shared via gender division of labor: men tap the sap from the coconut trees (sugar palm) before they go to their fields, and women cook the sap while they do household chores. This part-time, traditional, and low-input palm sugar processing is sufficient to produce low quality sugar for the local rural market. The sugar output is contracted informally, and collected from the household-firms by hamlet collectors, and sold in the village and nearby rural towns. The incentives for inter-firm cooperation in the cluster are relatively weak: limited external economies are generated through

collective marketing of output to nearby village markets, and joint action by the households during production is limited.

Recently, however, a subset of producers and clusters have succeeded in producing high quality palm sugar that is good enough to be sold in urban retail outlets, and used in the urban food processing industry. The quality upgrade is costly compared to the traditional activity. It requires closer attention (relative to traditional practices) to cleanliness of sap collection receptacles, to careful straining of the sap before boiling, and more precise and longer boiling/evaporation. These changes in practice require more labor and cash outlay for new equipment.

High-quality sugar is targeted to external markets. Urban supermarket orders specify quality standards and packaging requirements. Buyers from the food industry and pharmaceutical firms buy direct. Bulk buying is the norm (a far cry from the buying in small lots typical of the traditional form of the business). Inter-firm cooperation on the production side is weak, as was the case traditionally, but cooperation in transport and marketing is much stronger, to reduce transaction costs for the urban buyers, a key element of competitiveness. Moreover, there is a need for strict coordination of the chain; retailers and food industry firms impose strict subcontracting arrangements, specifying price and quality for the producing firms in the rural clusters. As an additional incentive, buyers offer consumption and inputs credit.

Furniture Manufacture

Furniture manufacture is widespread in the district of Jepara on the north coast of Jepara. Sandee, Andadari, and Sulandjari (2000) estimate that in the mid 1990s the furniture cluster in Jepara employed more than 40,000 workers in 2,000 small enterprises, and 100 larger firms scattered across the district. Teak and mahogany, the main inputs, are grown on plantations in Java, and are also imported from other Indonesian islands. Access to wood is controlled by the Department of Forestry. High-quality wood is reserved for exporting firms and sold by tender.

Beginning in the mid-1980s, the cluster received a major boost from the emergence of a furniture export industry. Widespread interest in the products was driven by product exhibitions in Indonesia and abroad. The strong exports allowed the cluster to weather the drop in domestic demand during the recent economic crisis in Indonesia.

Small firms are important in the cluster both for the domestic and the export markets. They act as subcontractors and are involved in production networks managed by large firms and traders. Furniture for the domestic markets is sold through a network of furniture shops throughout Java. Foreign buyers and wholesalers play leading roles in the supply of furniture to international markets. Subcontracting allows the small firms to concentrate on production and leave the

management and the risk of the market, with its changing tastes and fashions, to the lead firms and merchants.

Quality control and standards are important in the export industry. Larger firms have emerged to finish the products bought from the small firms, and thus control quality for export. Foreign firms are prominent among these larger firms. Foreigners have become a major intermediary between Indonesian firms and international customers, and have played an important role in the expansion of order-driven production, tailored to the quickly changing customer preferences.

In both the domestic and the export industry, joint action among producers is crucial and well developed. Small firms participate in networks that share workers, equipment, and market channels. Clustering facilitates such inter-firm collaboration. Marketing furniture for the domestic market is based on contacts between networks of small firms and specific traders that are linked to specific furniture shops. In the export trade, joint marketing is practiced to facilitate bulk export by container to international markets. Clustering allows larger export firms to concentrate on specific stages in production, while contracting out other stages to specialized small firms. Specialization and division of labor contributes to collective efficiency and cost reduction, as each tier of firms and workers concentrates on the tasks it performs best. Furniture manufacture clustering also facilitates access to high-quality inputs at relatively low cost. In addition, it allows large firms to minimize their own use of labor because small firms and mobile skilled workers can be called on as necessary.

Conclusions

The recent literature on clusters has indicated both static and dynamic advantages to small firms of clustering. In general, the advantages are increased by effective cooperation among firms in the cluster, and coordination between the cluster and the buyers. Less studied has been the interaction of choice of target market of the cluster and the advantages of clustering. We showed, both conceptually and with examples from agro-processing case studies in Indonesia, that the strongest advantages, arising from the most effective cooperation and coordination, occur in clusters targeting external markets, not local markets. These advantages have helped small-firm clusters to weather recent economic storms by promoting resiliency, flexibility, low costs, and high quality.

Intra-cluster cooperation and cluster-buyer coordination are driven by both push and pull factors when urban and export markets are the target of rural clustering firms. On the one hand, the firms need to cooperate to lower collective costs and emphasize their individual comparative advantages; the firms need to coordinate with buyers to receive financing, market and technical information, and lower transaction costs and risks for the buyer. On the other hand, firms want

to cooperate because urban and export markets tend to be more profitable and, although they can be risky, their risk is not strongly correlated with local conditions, such as the crop harvest, in contrast to local rural markets.

The implications for small-firm managers and development projects that want to support them are that targeting urban and export markets requires producing higher quality products, meeting quality standards and cost criteria, and being linked to leader firms in urban areas. The good news is that there is much evidence of small firms in clusters helping themselves meet those requirements. But there are significant challenges for the government and business associations in Indonesia, as well as with other developing-country governments with similarly enterprising small-firm clusters. The small-firm clusters need help if their development is to be as rapid and inclusive as possible. Several actions would help.

First, Sandee (1998) estimated that, in the early 1990s, less than 6% of small firms in Central Java had received either technical or financial assistance. Clustering of small firms offers scope for assistance that is not aimed at individual producers, but which is directed to *groups* of small firms and which aims at stimulating joint action. Adequate legislation can be put in place to promote such types of lending.

Second, those that process and sell local inputs, such as palm sugar processors, may benefit from support that is aimed at improving linkages between producers and buyers. Group visits to buyers, retailers and wholesalers, markets and fairs are useful to establish trade networks which are outlets for current or new products. There are also many clusters, including furniture clusters, that import their inputs while selling beyond local markets. In such buyer-driven marketing chains, it may be most relevant to concentrate promotional efforts *not* on the clustered small producers themselves but on the buyers who are the key agents in decision making processes on product designs, quality, price, and destination. The government itself, in tendering its orders for goods and services, could come some way towards opening such tenders to small firms who can present themselves embedded in a cluster.

Third, provision of business development services (BDS) for small-firm clusters would be especially valuable. This involves the provision of nonfinancial services on a *sustainable* basis: fees are charged for the services. Services may include training, counseling and advice, developing commercial entities to fill an identified gap in the existing market structure, technology development and transfer, provision of information, strengthening business linkages, and so forth (Harper and Finnegan, 1998).

Finally, governments can improve the business environment for such clusters by the provision of information on transport costs, quality characteristics, examples of successes elsewhere, and on market opportunities. Regulations and services that facilitate contract enforcement are crucial.

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