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Revitalization of Rural Economies though the Restructuring the Self-sufficient Realm – Growth in Small-scale Rapeseed Production in Japan

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Abstract

According to rising social and environmental concerns, the number of small-scale oil mills growing and milling rapeseed has increased over the past decade. This study was undertaken to clarify small-scale rapeseed oil mill production, which is under pressure from mass-produced vegetable oil, and propose the application of this community-based system to developing nations. We analyzed all domestic rapeseed oil mills between 2009 and 2011, and discussed the transition from traditional mills to newly established town office-sponsored mills and its effect on the rural economy. We clarified that small-scale oil mills in rural areas have survived through strong self-sufficient production and have restructured into self-managing local communal businesses. This restructuring of local rapeseed production has had a positive effect on the local community and has revitalized the rural economy. Thus, we concluded that it may be suitable for microcredit in developing nations.

Discipline: Agricultural Economics
Additional key words: community mill, inducing production effect, local rapeseed production, restoring local production

Introduction

Nowadays, vegetable oil, one of the most essential foodstuffs, is manufactured in large-scale chemical plants from imported oilseed grown in a few exporting nations. Japan used to grow and mill rapeseed in rural areas; however, imported oilseed now dominates the domestic market and Japanese production is close to zero. Recent discussions on the growing use of bio-diesels, however, have raised public concern about domestic rapeseed cultivation, and the number of rural areas growing rapeseed has increased since 2000.

Such regional areas have established small-scale oil mills to process rapeseed that farmers in their neighborhood grow, and this growth in rapeseed production and milling activity (rapeseed production hereafter) has revitalized rural economies. Kawate *et al.*(2006), Goto *et al.* (2008) (2009), Ono *et al.* (2011), Ono and Nonaka (2011), Hirano (2008), Watanabe (2010), and Nonaka (2007) (2008) have all analyzed new rapeseed oil milling in rural areas based on field research and reported that increasing small-scale milling is established by local government and supported by local society. However, previous studies on this growth in small-scale rapeseed milling are based on specific case studies, and their structure and benefit to rural economy remain unclear.

Major oil mills, such as the Honen Corporation, started mass production in large-scale chemical plants using Chinese soybean in the late 1920s, and they sold soy oil to Japan and other overseas markets. However, domestic rapeseed oil production survived until Japan's high economic growth era (mid-1950s to 1973). Most farmers grew rapeseed as a second crop in paddy fields, while small-scale oil mills in towns processed the rapeseed, a system that resisted pressure from mass-produced goods.

Although the growth in new small-scale rapeseed oil production is attracting research interest as a method of promoting small-scale business in rural areas, there are differences and similarities between old small-scale rapeseed production and new ventures in this regard. Sasama (1981) analyzed the history of Japanese vegetable oil milling, but not small-scale rapeseed oil milling specifically. Nonaka

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(2013) discussed the history of small-scale rapeseed oil milling in Japan; however, he did not analyze its benefit for the revitalization of the rural economy. Therefore, clarifying the structure and effect of Japanese rapeseed production on the rural economy is a remaining issue. This paper aims to bridge this gap in the body of knowledge on this topic in two directions.

First, it clarifies how both old and new small-scale rapeseed oil mills have survived under pressure from mass-produced vegetable oil. Second, it proposes the application of the small-scale rapeseed production system to developing nations in order to revitalize emerging economies. Such enterprises may be suitable for microcredit in developing nations. To do so, we analyzed all rapeseed oil mills in Japan between 2009 and 2011 to understand their current status and business history. Because all domestic rapeseed growers who sell their rapeseed at market receive grants when oil mills purchase the rapeseed, grant-related documents record all oil mills that purchased domestic rapeseed. We conducted interviews with the owners of all domestic rapeseed oil mills according to these grant-related documents, expect for two or three oil mill owners that we were unable to contact. We also investigated newly established small-scale rapeseed oil mills in rural areas. In particular, we conducted intensive research using input-output analysis on the mills in Shizukuishi (Iwate prefecture) in order to clarify the costs and economic effects of local rapeseed production. Shizukuishi was chosen as a case study because of its average business size and availability of information.

The remainder of this paper is organized as follows. The next section provides a brief history of small-scale rapeseed oil mills, notes similarities and differences between old and new mills, and discusses their effect on the revitalization of rural economies.

Analysis

1. Overview of domestic rapeseed cultivation

Fig. 1 shows the historical trend in rapeseed growing acreage in Japan from the Meiji (1868) era to 2000. The figure shows that there were approximately 150,000 ha around 1900, an area that more than halved to 70,000 ha in the 1920s and declined further during World War II. The acreage reached its highest level in the 1950s, but then declined rapidly since the mid-1960s. This paper focuses on the rapid decline from the 1960s onwards due to the high economic growth era.

Table 1 shows the average rapeseed growing acreage by farm household in 1960. The national average in 1960 was just 12.2 a, which is a similar size to one traditional paddy field. The prefectures of Hokkaido and Aomori had much larger acreages (49.4 a and 30.4 a, respectively); however, rapeseed still represents a minor crop in these regions. Further, although Tokai and Kyushu were known as the main rapeseed growing regions at that time, their averages (14.4 a and 17.9 a) are similar to the national average.

Table 2 indicates the ratio of farm households that sold rapeseed to households that grew it. Aomori, Mie, Shiga, and Fukuoka, the main growing prefectures, have ratios greater than 70%. However, the national average is only

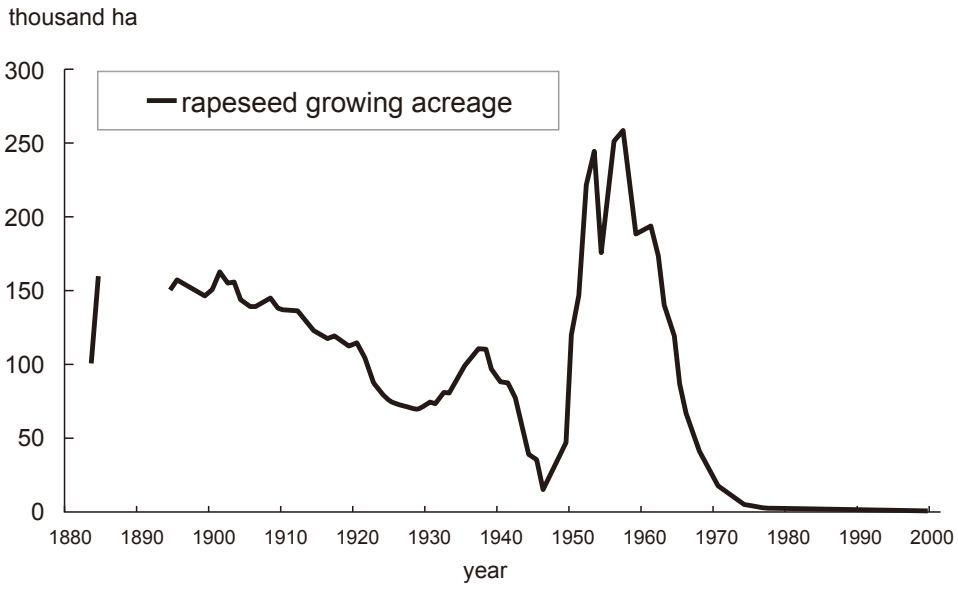


Fig. 1. Trend in rapeseed growing acreage

Source: Ministry of Agriculture and Fisheries (MAF) *Handout of Soy and Rapeseed* (*Daizu·Natane ni kansuru Shiryou*) (1965), MAF, Ministry of Agriculture Forestry and Fisheries (MAFF) *Crop Statistics* (*Sakumotu Toukei*) (each year)

39.2% in other words, 60.8% of households grew only for their own consumption. Although the main growing prefectures had high selling ratios, their acreage was still only one paddy field, which strongly suggests that they also grew rapeseed for self-consumption and sold the surplus. These facts, and the findings gathered from the interview data, indicate that domestic rapeseed was mostly a self-sufficient crop at that time.

Table 1. Average rapeseed acreage by farm household in 1960

unit: a

region	/prefecture	average acreage
Hokkaido		49.4
Tohoku		10.5
	Aomori	30.4
Kanto		8.5
Hokuriku		6.1
Tousan		9.7
Toukai		14.5
	Mie	17.8
Kinki		11.3
	Shiga	18.9
Chugoku		4.9
Shikoku		8.2
Kyushu		17.9
	Fukuoka	21.3
	Saga	16.8
	Miyazaki	19.1
	Kagoshima	21.1
Entire Country		12.2

Note: Rapeseed growing acreage is divided by harvested farm household

Source: MAF *Crop Statistics* (1960), MAF *Census* (1960)

Table 2. The ratio of farm households that sold rapeseed to those that grew it (1960)

unit: %

	selling/growing farm household
Aomori	77.0
Mie	74.1
Shiga	79.5
Fukuoka	67.4
Saga	55.6
Miyazaki	60.8
Kagoshima	57.8
Main growing prefectures	61.9
Whole of Country	39.2

Notes:

1) Farm households that grow rapeseed are represented by 100
2) Main growing prefectures are calculated as the sum of the prefectures in the table Source: MAF *Census* (1960)

2. Current status of domestic rapeseed oil mills

Sasama (1981) indicated that small-scale oil mills in rural areas processed domestic rapeseed because it was not considered to be material for major oil mills; therefore, the survival of small-scale rapeseed farming ensured the survival of small-scale oil mills. Although domestic rapeseed decreased drastically in the latter half of the 20th century (see Fig. 1), some small-scale oil mills survived. Additionally, the number of newly established mills began to rise. Tables 3 and 4 show the historical features and current status of domestic rapeseed oil mills. We number each oil mill according to its annual processing tonnage (lower numbers indicate smaller tonnage); No.14 onwards are new oil mills. Since new oil mills have been established by local governments and are supported by the community, we term them "community" mills in contrast to "traditional" mills.

First, as is the tendency of traditional mills, smaller mills have larger ratios of contract processing. Contract processing is a common transaction style for self-sufficient rapeseed production. Farmers deliver their rapeseed to the nearest oil mill after drying, and oil mills return oil at a certain agreed rate, so that the oil mill is able to charge a fee in kind. Further, oil milling generates so-called "oil cake" as a by-product, which the oil mills retain as part of the contract fee. According to our interviews, the fees have varied by era and location; some oil mills keep two thirds of the oil as a fee in kind and return a third of the oil and oil cake to farmers, other oil mills keep all the oil cake as the contract fee and return all of the oil. When we evaluate the fees in kind as monetary prices, the range was a third to a half of the produced rapeseed oil and oil cake.

Oil mills generate revenue by selling the rapeseed oil to the local community and the oil cake to other farmers as a commodity. In this aspect, oil mills run their business as local commodity supplier. However, rapeseed growing farmers do not need cash for milling oil, and oil mills do not need money for the purchase of their raw material. Hence, it also works as a barter exchange system, and the rapeseed industry in the local community is mostly self-sufficient. The "fee in kind" system in which traditional oil mills contract processing started long ago in the Meiji era; however, the present contract processing that Table 3 shows employs the same system.

Although No.1 and No.7 have a remarkably low ratio of contract processing on Table 3, the other traditional mills have ratios above 30%, and sometimes above 50%. No.7 mainly processes corn oil in a chemical plant as a subsidiary of a major oil mill; however, it started the production of domestic rapeseed oil during the Meiji era and it continues to do so. For this reason, it is not a traditional small-scale oil mill. No.1 has a much larger annual process tonnage

Table 3. Types of domestic rapeseed oil mills (1)

No.	prefecture	annual process tonnage		year of starting oil milling	ratio of contract processing during high economic growth era
		total	ratio of contract processing		
1	saitama	750	0%	1892	small (purchased in Kanto region)
2	kagoshima	300	5%	Meiji era	high
3	shimane	110	0%	pre-war	?
4	shiga	55	45%	1930’	almost all
5	kagoshima	50	30%	1936	almost all
6	kumamoto	48	50%	1949	almost all
7	aichi	40	0%	1937	small (shifted to corn oil)
8	kagoshima	30	40%	pre-war	almost all
9	fukushima	25	52%	Meiji era	almost all
10	kagoshima	17	71%	1948	almost all
11	fukushima	8	38%	1950’	almost all
12	fukushima	8	63%	1954	almost all
13	okayama	?	100%	1947	almost all
14	iwate	21	52%	2005	–
15	iwate	20	100%	2009	–
16	hyougo	12	100%	2007	–
17	shiga	10	20%	2003	–

Note: Listed in the order of processing material quantity.
Source: Survey data, 2009-2011

Table 4. Types of domestic rapeseed oil mills (2)

No.	employee ○: hire ▲: non	purchaser	plan for future business
1	○	nation wide co-ops	as-is
2	○	nation wide co-ops	enlarge
3	○	Tofu factory and other	enlarge
4	○	consumers group	as-is
5	▲	direct marketing	as-is as oil, enlarge related products
6	○	regional co-ops	enlarge
7	○	retail shop	as-is
8	▲	direct marketing	as-is
9	▲	direct marketing	as-is
10	▲	direct marketing	reduce
11	○	direct marketing	as-is
12	▲	direct marketing	as-is or reduce
13	▲	–	reduce
14	○	regional co-ops	enlarge
15	○	direct marketing	as-is
16	○	regional co-ops	enlarge
17	○	direct marketing	as-is or enlarge

Source: Survey data 2009-2011

than others; however, its business is run as a nationwide food company, and it does not have any local communal relationship. All of the other small-scale oil mills are family businesses that carry out contract processing.

As the second feature, traditional mills — except for No.1 and No.7 — indicated that they carried out contract processing for “almost all” of their business during the high economic growth era. No.1 ran larger businesses than the others, while No.7 had already shifted to corn oil production at that time. This result indicates that traditional oil

mills were mostly self-sufficient at that time, which agrees with the low selling ratio of rapeseed shown above. Following the decrease in domestic rapeseed cultivation, contract processing by each small-scale oil mill also decreased; therefore, such mills survived by purchasing rapeseed from the market. However, many retained contract processing for self-sufficient farmers as much as possible and remained rapeseed oil suppliers for the local population. This represents the basic structure of the high ratio of contract processing among small-scale traditional mills.

Third, larger traditional oil mills expanded sales to regional areas. Larger mills began to sell products to nationwide co-operatives, while others continued to sell directly to the local population and rarely to regional retailers. Thus, traditional oil mills were polarized into two groups, with some becoming suppliers for national wide market, while many remained local semi-commercial food producers.

The fourth feature is the similarity between community and traditional mills in terms of the high ratio of contract processing and regional sales. However, new community mills have been established for processing local rapeseed, which indicates their locality. Further, although community mills conduct contract processing, it is a different feature from that of traditional mills because it involves a monetary contract compared with the old-style cashless contracts.

Nonaka (2013) indicated that traditional small-scale oil mills have disappeared from many rural areas since the 1970s, leaving mass-produced vegetable oil (mainly soy oil) to dominate local oil markets. Although this decline helped shrink local economies, Nonaka (2008) (2013) concluded that this decrease was overlooked because non-farming jobs were increasing at a faster rate. However, some rural areas have started restoring local rapeseed production in order to revitalize their local economy. Indeed, small-scale traditional and community mills share certain similarities such as their business size, their status as suppliers of local food, and being under pressure from mass production.

Local governments help establish community mills by providing facilities and machinery. Farming groups usually grow rapeseed in rice fields as a set-aside crop. Therefore, local governments now play an important role in this process because farming groups require adjustments such as land usage, governmental grants, and communal facilities. Nowadays, the farming system organized by small-scale farm households cannot work without local government support and agreement from the local community.

Hence, community mills form a crucial part of a local government's farming plan, notably its communal activity. However, because local governments are not able to take business risks, they hedge this risk through contract processing between growers and community mills or other rapeseed oil marketing organizations and community mills. Thus, even though contract processing is different from that conducted by traditional mills, it has similarly strong relationships with local people.

Additionally, community mills utilize local resources to increase their processing. For example, neighborhood associations (*Chounai-kai*) in the local town where No.16 is located buy its products; citizens order rapeseed oil for their own consumption and purchase seasonal gifts advertised by the local government. Thus, No.16 sells oil to the local population and its surplus to regional cooperatives. Local residents are usually the first customers for community mills. In this respect, such mills run their businesses for monetary gain while retaining an aspect of non-commercial community-based activity.

As the fifth feature, some traditional mills are declining and going out of business. This occurs particularly if the operators of such mills are aged over 60 and have no successor in place. This declining trend of small-scale traditional mills contrasts with the increase in community mills. When we focus on the non-commercial aspects of local rapeseed production systems, we can even see that community mills are taking over small-scale traditional mills given they use the same milling method and the same performance machinery.

3. Mill machines of small-scale oil mills

Table 5 indicates the type of milling machine used by each oil mill. Machine types can be divided into "cage presses" and "expellers." The cage press system is older than the expeller, which has lower productivity but is used to emphasize the production of oil in a traditional way that is exceptional. Although expellers come in different sizes, most of the expellers in Table 5 are almost the same size (see also Pictures 1, 2, and 3). Traditional mills have been using the same machines since the height of their production. Although machine manufacturers no longer exist today, expellers are simple enough to repair and maintain, which keeps these machines in operation. No.3 and community mills No.15, No.16, and No.17 use "Hander" (see Picture 1) products. This is the only manufacturer producing expellers that are the same size as the older machines. All interviewees stated that there is no difference in basic performance (processing speed and rapeseed oil quality) between Handers and the older expellers.

Community mill No.14 uses an old expeller (see Picture 3) because its operator is an apprentice of traditional mill No.12, and he received a set of older machines when No.14 was established. No.14 could have purchased new machines from Hander but No.12 stated that he believed that the machine offered to No.14 had superior performance. This similarity in basic performance between old and new machines supports the characterization that community mills are taking over traditional mills.

Table 5. Mill machines of domestic rapeseed oil mills

No.	type of mill	mill machine maker	How to get replacement parts
1	expeller	×	made-to-order
2	expeller	×	made-to-order
3	expeller	Hander	purchase
4	expeller	×	made-to-order
5	expeller	×	made-to-order
6	expeller	×	made-to-order
7	expeller	?	purchase
8	expeller	×	made-to-order
9	cage press	×	made-to-order
10	expeller	×	made-to-order
11	cage press	×	made-to-order
12	expeller	×	made-to-order
13	expeller	×	made-to-order
14	expeller	×	made-to-order
15	expeller	Hander	purchase
16	expeller	Hander	purchase
17	expeller	Hander	purchase

Source: Survey data 2009-2011

Picture 1. Expeller (No. 3)

Picture 2. Expeller (No. 4)

Picture 3. Expeller (No. 14)

4. Community mills; structure and benefits

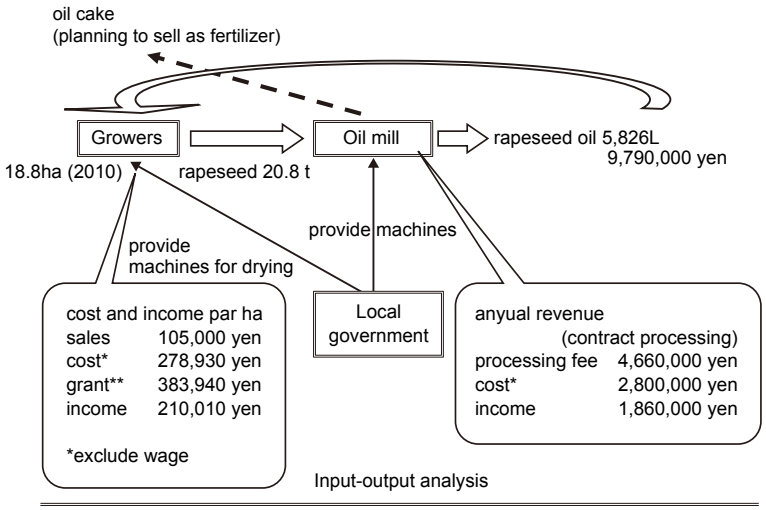
Community mills require many kinds of support, mostly from the local government in terms of facilities, machinery, and governmental grants. In Shizukuishi, farming groups grow rapeseed over approximately 20 ha like other set-aside crops, and they have established oil mill processes (as shown in Fig. 2). Although mechanized rapeseed cultivation and the establishment of a new oil mill requires a large budget, people expect new mills to able to revitalize the rural economy.

Fig. 2 shows rapeseed production in 2010. According to the input-output analysis, budget and governmental grants totaled 150,000,000 yen for starting the system, after which it provided 287,051,000 yen to induce production and 92,255,000 yen to induce income in the town. This indicates that major public investment brought about an improvement in production. Further, the local government provides 13,285,000 yen toward improving production and 3,780,000 yen toward improving the income effect annually. Moreover, the governmental grant for growing rapeseed is 7,218,072 yen for 18.8 ha. This means that the annual amount to improve production is larger than the grant. Since the inducement in the production effects is bigger, we can say that this is effective for revitalizing the rural economy.

Rapeseed growing without the grant would place growers into debt because of its low price. The rapeseed price in Shizukuishi is adjusted downwards. Indeed, the usual market price in 2010 was 1.6 times higher than the price in Shizukuishi. Nevertheless, the market price still does not bring sufficient revenue for growers. Additionally, the rapeseed oil price in Shizukuishi is 1,900 yen/L, which is much higher than the price of one of its competitors, canola oil produced by major oil mills. Although there are consumers who prefer local agricultural products and they purchase domestic rapeseed oil but their tolerance regarding price has a limit, something all interviewed oil mill owners mentioned. Hence, raising the rapeseed price for growers is a challenge.

The oil mill in Fig. 2 receives an annual income of 1,860,000 yen; however, this could not be achieved without support from the local government. Not only has the rapeseed production system in Fig. 2 received consensus from residents, they are also the main customers, so the whole system is based on the local community. Hence, the local community overcomes the difficulty in the monetary reproduction process despite not having any commercial characteristics. Once the system works, it revives local production, which was taken by mass-produced vegetable oil before, and brings about a positive effect on the revitalization of the rural economy.

Although the initial investment is high, there is an alternative way for smaller towns to start the system using existing facilities and used machinery. However, in this case, the induced product/income effects generated by establishing oil mills would be much lower than those



		yen
Effect of establishing rapeseed oil business	induce production effect	287,051,000
(Effect from investing for facilities)	induce income effect	92,255,000
Annual effect of rapeseed oil	induce production effect	13,285,000
(Effect from rapeseed oil production)	induce income effect	3,780,000

Fig. 2. Case of community business type No.15

Note:

1) Local government invests 150 million yen to establish the rapeseed oil business

2) Estimating induce production effect and induce income effect is based on 2009 Input-Output Tables for Iwate Prefecture (187sector). We assume all materials for producing rapeseed oil as final demand; and we also assume the materials as local products.

Source: Survey data 2010-2011

shown in Fig. 2. Nevertheless, we would still expect positive annual effects on the rural economy as long as rapeseed cultivation was secured.

Discussion and conclusion

The research results on domestic rapeseed oil mills presented herein indicate two main findings. The first finding is the strength of the self-sufficient realm in rural areas. Even during the peak production era, when there was a huge consumer boom across Japan, farmers grew rapeseed for their own consumption in huge plots of land. Further, the contract processing used by traditional mills represents the self-sufficient realm in rural areas, as it works by combining agriculture and related small-scale industry in each town. Small-scale rapeseed oil mills used contract processing to survive until the 1970s under pressure from mass-produced vegetable oil. After 1970, the acreage of domestic rapeseed decreased rapidly, and oil mills had to shift their businesses from contract processing for self-consumption to selling oil as a commodity. However, traditional mills kept their original contract processing systems and survived as local semi-commercial producers. This re-emphasizes the strength of the self-sufficient realm.

The second finding is that traditional mills are decreasing and community mills are taking over local rapeseed oil production. Community mills do not have barter exchange systems, but each type provides local food for local consumption. In this aspect, community mills are taking over small-scale traditional mills and restructuring the self-sufficient realm in rural areas.

In summary, this paper first clarified that the self-sufficient realm in rural areas has endured over time and that small-scale oil mills survived by mutually depending on the self-sufficient realm. Second, we clarified that new small-scale rapeseed oil mills have been restructured to become local community-type businesses. The strength of the self-sufficient realm and its restructuring as a modern system has thus led to the survival of small-scale oil mills in rural areas.

Further, community mills have a positive effect in terms of revitalizing the rural economy. As long as local oilseed production is revived, it brings about a positive effect for the rural economy. Many developing nations also

have hollowed out local economies; therefore, applying a community mill/local food production system to emerging nations may be possible because the basic structure of mass production, the hollowing out of the local economy and the factors presented herein are common.

First, as well as being crucial to the survival of community mills, the self-sufficient realm in rural areas plays an important role in developing nations. Second, the collective characteristics and communal management styles of community mills are suitable for a microcredit finance system. In particular, using community resources and restructuring traditional non-commercial food systems into monetary systems suit microcredit lending, while using existing facilities and used machinery has also been shown to work. Thus, applying the small-scale rapeseed production system to developing nations for revitalization of the rural economy is a possibility. However, we have not researched this opportunity in developing nations and so this remains a topic for future research.

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