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Study of the Actual State and Profitability of Contract Farming in the Paddy Region of Central Taiwan

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Summary

The purpose of this paper is to examine characteristics of contract farming and its profitability based on the field survey conducted in the paddy region of Central Taiwan in 2007. The feature of mechanization of rice farming in Taiwan is characterized by contract farming. The study case is a typical example of large scale operation of the "long-distance" type contract work.

Features of contract farming are as follows. The first is introduction of imported, large and high-performance machines. The second is the operation of "long-distance" type, covering a travel distance of over 100km. The third is the different charge settings for the neighboring country and the local town. The fourth is the use of auxiliary labor force in the contract work.

Based on the actual state of contract farming in 2007, as well as the work journal and record of farm expenditures of the study case, we will examine the profitability of contract farming. The results of estimation of profitability confirms that the contract work secures profit that enables continued production, even taking into account the depreciation cost.

1. Introduction

The objective of this paper is to summarize the actual state and characteristics of contract farming and its profitability based on the field survey conducted in the paddy region of Central Taiwan in 2007 by studying the case of a large-scale contract farming household.

The mechanization of rice farming in Taiwan did not take the process in which individual farm households own medium-size machines such as in Japan. The common practice is that a small number of large-scale farm households own large machines and undertake contract farming with many farmers.

In a study by Kada [1983], one of the major studies previously conducted by Japanese researchers, the following were pointed out: First, the mechanization of agriculture in Taiwan advanced rapidly from around 1970; second, the process of mechanization was developed in the form of contract farming; third, one of the factors behind such a process of mechanization is the increase in part-time farmers; fourth, contract farming can be classified into three types according to the extent of area covered: 1) "long-distance" type covering a travel distance of over 100 km, 2) "middle-distance" type covering an area within the county or neighboring towns and villages; and 3) "short-distance" type carried out by relatives and neighbors within one village community; and fifth, the factors that make contract farming a common practice: 1) it is difficult to expand the scale of operation, thus contract farming is chosen as an advantageous measure for securing profit; 2) due to the shortage of farm labor force as a result of the increase in part-time farmers and aging of the population, there is a strong need for the use of machines; 3) farm machines are generally expensive relative to the rice price and therefore it is uneconomical for each household to own them; and 4) in Taiwan, rice is usually double-cropped and therefore the "long-distance" type of contract farming is easy to perform, taking

advantage of the time lag between crop seasons of different regions.

Thus, the contract farmers equipped with farm machines can reduce the burden of the fixed cost (overhead cost) of using machines through contract farming and earn additional income from contract charges. On the other hand, the client farmers can use farm machines at lower expenses than purchasing machines and have a side job with ease. In short, it is concluded that the contract farming that is generally practiced in Taiwan is a system advantageous both to the contract farmers and to the client farmers and realizes far more efficient use of farm machines than in Japan by saving a considerable amount of investment in machines as a whole. However, the study also pointed out the following problems: [1] there is a delay in the development of paddy field infrastructure which is prerequisite for more efficient use of machines; and [2] the prices of farm machines remain comparatively high for the income level of farm households.

The paper by Kada [1983] quite precisely summarizes the features in development of contract farming in Taiwan, which are consistent with our understanding based on the survey in 2007. However, it stopped short of specifically analyzing profitability of contract farming. Therefore, we refer to a previous study by Tsai and Kudo [1995] in this context.

Tsai and Kudo [1995] studied the economic balance of contract work involving the use of a rice combine by examining the case of a farm household in Dajia Town, Taichung County in Central Taiwan. The survey was carried out in 1994. The farm household of the study case has a paddy field of 2.52ha and engages in rice farming on a field area of 5.04ha in total for the first and second crops. It owns a tractor (60 horsepower), a 4-row rice planter, and a 4-row head-feeding combine. The contract work consists of tractor cultivation for 12ha, rice planting for 10ha, and harvesting for 57ha. The analysis of the actual state of contract farming was made on the second crop in 1994. The clients are 20 households including two in the neighboring district. It is classified as a "middle-distance" type as mentioned above based upon the area covered. The combine was operated for 28 days and the harvested area was 35.55ha including the owner's field. The harvest was carried out by the owner (head of the contractor household) and an assistant hired on a permanent basis.

Taking this case as an example, a study was made of economic balance of contract work using a rice combine. The total fixed cost was 257,000 yuan, which consists of the depreciation cost of the combine and the garage. The variable cost is based on the actual figures for the second crop in 1994. The wages for the hired worker amounted to 65,000 yuan, and the total wages including those for the owner was estimated at 130,000 yuan. Together with the fuel cost (including the cost of oil) and repair cost, the variable cost totaled 155,000 yuan. Based on this, the variable cost of the first crop (harvested field: 30ha) was estimated and then the annual total of the variable cost was estimated at 297,000 yuan. As a result, the total cost amounted to 554,000 yuan and the cost of using the combine was 8,857 yuan/ha. Considering that the income from contract charges was 9,000 yuan/ha, the economic balance of the use of the combine was slightly profitable.

This analysis by Tsai and Kudo [1995] provides a valuable result of a study in profitability of contract farming which we used as reference data for our analysis. However, as mentioned later, the subject case of our study is a large-scale operation whose contract work consists of rice planting covering 78.7ha and harvesting covering 119.6 ha in total for the first and second crops in 2007. This is a typical "long-distance" type large-scale contract farming operation. As follows, We analyze the actual state of contract farming and examine its profitability.

2. Description of the Study Case

2. 1 Description of the Study Region

The farming operation which was the subject of this study is located in Dajia Town, Taichung County, which was also the subject of the above-mentioned study by Tsai and Kudo [1995]. The survey was conducted two times, in March and December of 1997.

Dajia forms a paddy region in the basin of two great rivers and most of the land is categorized as paddy field. According to the 2005 Agricultural Census of Taiwan, there are 3,947 farm households in Dajia with a cultivated acreage is 3,023ha. The average cultivated acreage per household is 0.8ha. In terms of number of full-time and part-time farm households, part-time households occupy 86.9% of all farm households. By age of the owners of farming operations, those in their 60s occupy the majority, accounting for 29.1%, followed by those over 70 (26.3%) and those in their 50s (26.0%), indicating an aging population. In terms of cultivated acreage, farm households with a cultivated acreage of less than 0.5ha account for 47.4% and those with an acreage of 0.5-1ha and 1-2ha account for 31.6% and 16.3%, respectively. Less than 5% of households have a cultivated area of over 2ha. This region shows typical features of the structure of rice farming in Taiwan such as diminutive farm operations, an increase in part-time farmers, and aging of the farming population.

In connection with the development of contract farming, we need to examine the state of ownership of farm machines comparing the results of the same census as mentioned above. The number of cultivators owned by farm households is 724, or 3.8 per 100 households. That the number of tractors is 3.8, rice planters 14.4, combines 2.6, drying machines 9.0, and agricultural transport vehicles 0.7 per 100 households demonstrates that ownership of farm machines is uncommon. However, compared with the figures for the whole of Taiwan and Central Taiwan, the number of rice planters is larger, which is a characteristic of the region. According to our survey of 24 selected full-time farming households, almost all full-time farming households own tractors and agricultural transport vehicles, while only one-third of all households own rice planters and only 2 households own combines. These results indicate that contracting out rice farming has become a common practice.

Also based on the result of the survey of 24 households, 7 households, or approximately one-third of all households, contract for farm work. Among them, 3 households contract for cultivation with tractor, 4 households contract for rice planting, and 2 households contract for harvesting. In addition, 2 households operate seedling centers and contract for seedling raising for some 600ha when converted to rice planting acreage. With respect to the work with machines, the contract cultivation is only for several ha. As for rice planting, however, 2 households including the study case engage in large-scale contract work covering over 60-70 ha. The area of contract harvesting is over 100ha for the study case and 30ha for the other household.

The distinctive feature of the farm household of the study case is that it engages in large-scale contract work both in rice planting and harvesting.

2. 2 Description of the Study Case

The study case is a farm household of 6 family members including the head of the family (owner of the farming operation) aged 34. The owner and his 73-year old father engage in farming. Only the owner does contract farming.

The farming area is 5.6ha, of which only 1.0ha is the owner1s land and 4.6ha is rented. It exclusively raises rice and the total rice farming area is 11.2ha for the first and second crops.

The owner started farming in 1996 primarily by growing vegetables on a 2ha-scale. Because of the unstable income, he began to stabilize the operation by mainly farming rice. Then he started to introduce machines for rice farming around 2000 and thus started contract farming.

2．3　Features of Contract Farming

The first feature is the introduction of imported, large and high-performance machines.

The currently used rice planter is a Japanese-made 8-row planter which was newly purchased in 2004. The purchase price was 715,000 yuan and the service life of the machine was estimated at 8 years. The rice combine is also a Japanese-made 6-row combine purchased in 2001. The purchase price was 2.4 million yuan and the service life was estimated at 8 years. The trailer to carry these machines is a 10.4 trailer purchased second-hand in 2000. The purchase price was 600,000 yuan and the service life was estimated at 20 years. In addition, a garage was built to store them in 2004 as an annex to the house. The construction cost was 300,000 yuan and its useful life was estimated at 20 years. No subsidy was received for the introduction of this equipment.

The second feature is the operation of "long-distance" type contract farming.

The total contract area in 2007 was 78.7ha for rice planting and 119.6ha for harvesting the first and second crops. For one crop only, rice planting covered 49.5ha and harvesting covered 64.2ha, indicating that the operation of the machine was very efficient. The number of farm households engaging in contract work of single-crop rice farming is 44 for rice planting and 50 for harvesting. The average contract area per household is 1.1ha for rice planting and 1.3ha for harvesting, suggesting the diminutive scale of their operations.

The farm household of the study case undertakes "long-distance" type contract work in the neighboring county, approximately 130km south, in addition to Dajia Town taking advantage of the time lag between crop seasons of different regions. As for the first crop, the rice planting season in this neighboring county is from early to mid-February whereas that in Daijia Town is from late-February to early- or mid-March. The harvesting season is up to the end of July in the neighboring county and July in Daijia Town. Thus, there is a time lag of one month.

Of the total contract area of 49.5ha for rice planting of the first crop, 28.3ha is in the neighboring county and 21.2ha is in Dajia. The former is a little larger than the latter. The total contract area for harvesting, 64.2ha, consists of 29.8ha in the neighboring county and 34.4ha in Dajia. In this case, the latter is a little larger than the former. For the second crop, unlike the first crop, all of the contract area for rice planting, 29.2ha, is in the neighboring county. This is because the second crop in Daijia Town is so-called "ratoon" crop. The harvesting was carried out for the second crop on an area of 55.4ha, including 21.9ha in the neighboring county and 33.5ha in the local town. In this way, the study case secures a large amount of contract work by actively undertaking "long-distance" type contract work. For the expansion of contract work in the neighboring county, the study case make good use of "intermediaries", who are involved in contract relationships. In the study case, the contract relationship is established each year through the mediation of an intermediary or, for rice planting, a seedling center. Thanks to this intermediary, it is possible to secure a stable amount of contract work. No intermediary charge is paid to this intermediary, who is a friend.

The third feature is the different charge settings for the neighboring county and the local town taking into account the regional conditions, particularly arable land conditions and regional quotation of contract charge.

The contract charge for rice planting in 2007 was 6,000 yuan/ha for Dajia Town and 5,000 yuan/ha for the neighboring county. The charge for harvesting was 10,000 yuan/ha for Dajia Town and 8,000 yuan/ha for the neighboring county. The charges for the neighboring county in the south are lower by approximately 17% for rice planting and 20% for harvesting. The reasons pointed out are that the price level in the south is generally lower than that in the central area, and that cultivated fields are well maintained in the region where the contract work

is performed and therefore high work efficiency with machines is achieved.

The fourth feature is the use of auxiliary labor force in the contract work.

For rice planting of the first crop, one auxiliary worker was hired in Dajia and two were hired in the neighboring county. In the neighboring county, these workers engaged in the work of supplying seedlings to the rice planter and planting seedlings in the corners of the field. In Dajia, only one auxiliary worker was hired because planting of seedlings in the corners was performed by the client farmer. However, since the cultivated fields and farm roads are not well developed, the rice planter has to cross ridges between paddy fields, and additional work of placing a ladder was necessary.

On the other hand, no auxiliary worker was hired for harvesting in the neighboring county whereas one worker was hired in Dajia Town for reaping in the corners prior to the harvesting by combine. This work is not necessary in the neighboring county where the cultivated fields are well maintained. The use of hired workers reflects such differences in the conditions of cultivated fields.

Wages of hired workers are paid by the day. Wages are 1,600 yuan/day in Daijia and that in the neighboring county is 1,500 yuan/day, approximately 6% lower than in Daijia, reflecting the lower wage standard in Southern Taiwan.

Based on the actual state of contract farming in 2007 as described above, as well as the work journal and the record of farm expenditures of the farm household of the study case, we will examine the profitability of contract farming. For that purpose, considering that it would be meaningful to make separate calculations for the contract work in Dajia and the "long-distance" type contract work in the neighboring county, we only take up the first crop of 2007 for the study of both rice planting and harvesting.

3. Study of Profitability

3. 1 Calculation of Fixed Cost

The fixed cost consists of the depreciation cost of the rice planter, combine, trailer, and garage owned by the farm household of the study case. The respective depreciation cost of per year is calculated based on the purchase price and the service life estimated by the farm household of the study case.

The trailer is used not only for the contract work but also for general purposes. The ratio used for each type of work is determined according to what the farmer said based on his experience (rice planting: 30%; harvesting: 40%). The garage occupancy ratio of each machine is also determined in the same manner (rice planter: 25%; combine: 25 %; trailer: 50%). The depreciation cost of the rice planter and the trailer is allocated to the rice planting work, while the depreciation cost of the portion of garage occupied by the combine and the trailer is allocated to the harvesting work. In the tables below, the totals are shown.

Then proportional shares between the first and the second crops, between the contract work and their own work, and between the contract work in Dajia and that in the neighboring county are calculated according to the total work area. In order to know the exact shares of the depreciation cost of the trailer, calculations must be done based on the actual travel distance, which is difficult. Therefore, the shares are calculated based on the fuel costs actually expended for the work in the neighboring county and that in Dajia. The share of Dajia is further divided into the portion of the contract work and that of their own works, proportionally, according to each work area.

3. 2 Calculation of Variable Cost

The variable cost consists of the fuel, oil, repair, and hired labor costs.

As already stated, it is possible to divide the actual expended fuel cost into the share of the work in Dajia and that in the neighboring county. Therefore, the share of Dajia is divided into the portion of the contract work and that of their own work proportionally, according to each work area. The

Table 1 : Profitability of Contract Rice Planting (First Crop in 2007)

	Total	Total of Contract Work	Dajia	Neighboring County	Own Work
Work Area (ha)	55.1	49.5	21.2	28.3	5.6
Unit Contract Charge (yuan/ha)	—	—	6,000	5,000	—
Income from Contract Charges (yuan)	—	268,790	127,440	141,350	—
Total Cost (yuan)	155,953	143,212	48,324	94,888	12,741
Total Fixed Cost (yuan)	87,699	78,851	33,559	45,292	8,848
Depreciation of Rice Planter	77,894	69,979	30,021	39,958	7,915
Depreciation of Trailer	5,883	5,349	2,026	3,322	534
Depreciation of Garage	3,921	3,523	1,512	2,011	398
Total Variable Cost (yuan)	68,254	64,361	14,765	49,597	3,893
Fuel and Oil	11,954	10,777	4,464	6,313	1,177
Repair	10,300	9,253	3,970	5,284	1,047
Hired Labor	46,000	44,331	6,331	38,000	1,669
Profit from Contract Work (yuan)	—	125,578	79,116	46,462	—
Total Cost per ha (yuan)	2,830	2,893	2,275	3,357	2,275
Profit from Contract Work per ha (yuan)	—	2,536	3,725	1,643	—

Table 2 : Profitability of Contract Harvesting (First Crop in 2007)

	Total	Total of Contract Work	Dajia	Neighboring County	Own Work
Work Area (ha)	69.8	64.2	34.4	29.8	5.6
Unit Contract Charge (yuan/ha)	—	—	10,000	8,000	—
Income from Contract Charges (yuan)	—	582,300	343,900	238,400	—
Total Cost (yuan)	407,342	372,587	213,424	159,163	34,755
Total Fixed Cost (yuan)	177,706	163,664	86,233	77,431	14,043
Depreciation of Combine	167,252	153,832	82,416	71,416	13,420
Depreciation of Trailer	6,690	6,371	1,963	4,408	320
Depreciation of Garage	3,764	3,461	1,854	1,607	302
Total Variable Cost (yuan)	229,635	208,923	127,192	81,732	20,712
Fuel and Oil	83,700	77,142	40,277	36,865	6,558
Repair	105,075	96,644	51,777	44,867	8,431
Hired Labor	40,860	35,138	35,138	—	5,722
Profit from Contract Work (yuan)	—	209,713	130,476	79,237	—
Total Cost per ha (yuan)	5,837	5,804	6,206	5,341	6,206
Profit from Contract Work per ha (yuan)	—	3,267	3,794	2,659	—

(Source: Field Survey)
(Note) See the text for the basis of calculation.

same is applied to the fuel cost of the rice planter, combine, and trailer.

With regard to the oil cost, only the total amount is known. Therefore, the total amount is divided proportionally, according to each work area. However, only the oil cost of the rice planter and the combine is included in the calculation and the oil cost of the trailer is not included due to data limitations. In the tables below, these fuel and oil costs are referred to collectively.

As for repair costs, only the total amount is known and therefore it is likewise divided proportionally. Also, the repair cost of the trailer is not included in the calculation.

With regard to the hired labor cost, like the fuel cost, the amount actually expended for the work in

the neighboring county (rice planting only) and that for Dajia are known, and therefore only the share of Dajia is divided into the portion of the contract work and that of their own work proportionally, according to the work area.

3．3 Profitability of Contract Work

Table 1 and Table 2 present estimations in profitability of contract work for rice planting and harvesting on the basis described above.

For rice planting, the total income from contract charges is 268,790 yuan, and the total cost is 143,212 yuan. Therefore, the profit from contract work is estimated at 125,578 yuan. For harvesting, the total income from contract charges is 582,300 yuan, the total cost is 372,587 yuan, and the profit from contract work is 209,713 yuan.

According to the farm household of the study case, the number of days worked for rice planting is 23 days in Dajia and 15 days in the neighboring county. After dividing the number of days worked in Dajia into the portion of the contract work and that of their own work proportionally, according to each work area, the number of days spent for the contract work totals 33.2 days. The number of days worked for harvesting is 22 days in Dajia and 34 days in the neighboring county. In the same manner as above, the total days spent for the contract work is calculated to be 52.9 days. Based on these results, the profit from contract work per day is estimated at 3,782 yuan for rice planting and 3,963 yuan for harvesting. There is little difference. These amounts are more than twice the standard daily wages of the workers hired for rice planting in Dajia, which is 1,600 yuan, showing that contract work is a gainful work opportunity.

Looking into the difference between the contract work in Dajia and the neighboring county, the cost of rice planting per ha is higher in the neighboring county than in Dajia and the contract charge is higher in Dajia than in the neighboring county. The profit from contract work per ha is 3,725 yuan in Dajia and 1,643 yuan in the neighboring county. That in Dajia is 2.3 times higher than in the neighboring county. The high cost in the neighboring county is attributable to the high cost of hired labor. On the other hand, the total cost of harvesting per ha in Dajia is higher. However, since the contract charge is lower in the neighboring county, the profit from contract work per ha is 3,794 yuan in Dajia and 2,659 yuan in the neighboring county. Although the difference is not so great as in the case of rice planting, the profit in Dajia is 1.4 times higher than that of the neighboring county.

As far as this analysis is concerned, profitability per unit area of the "long-distance" type contract work is lower than that of the "short-distance" type contract work. However, from a comprehensive perspective, without undertaking the "long-distance" type contract work taking advantage the time lag between crop seasons of different regions, such a large amount of contract work would not be secured and consequently it would be impossible to reduce the fixed cost. Also, given that the "ratoon" crop is commonly used for rice planting of the second crop in the region where the farm household of the study case is located, it would be nearly impossible to secure the contract work in the first place.

The farm household of the study case evaluates the "long-distance" type contract work highly because of the ease of work in the neighboring county due to the well maintained fields in the region. In Taiwan, the continuing adjustment of rice production generates serious competition in the contract work of rice farming. Considering that it is difficult to take measures such as raising the contract charge, the situation concerning the profitability as described above is expected to remain unchanged. However, as already stated, in spite of its low profitability per unit area, the "long-distance" type contract work is considered significant for securing a certain amount of contract work and reducing the fixed cost.

4. Conclusion

In this paper, we examined features and profitability of contract farming using a typical example of large-scale operation of the "long-distance" type contract work. The conditions supporting large-scale contract work are [1] the youth and enthusiasm for farming exhibited by the owner of the operation,[2] large and high-performance machines,[3] combined contract work including both rice planting and harvesting,[4] securement of a certain amount of contract work and reduction of the fixed cost through active engagement in "long-distance" type contract work, and [5] use of an auxiliary work force. The result of estimation of profitability confirms that the contract work secures profit that enables continued production, even taking into account the depreciation cost.

However, as pointed out in previous studies and by the farmer of the study case, for efficient use of large and high-performance machines which support the operational development of contract work, field infrastructure is indispensable. As of 2007 when we conducted the survey, infrastructure development projects started gradually in Dajia where the farm household of the study case is located and the need for large machinery may increase. If such situations lead to scale expansion of contract work in the local town of Dajia, it would generate an opportunity for such contract work to further increase the profit.

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