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Agricultural outsourcing: A comparison between the Netherlands and Japan

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Abstract: Outsourcing may well be a tool for increasing the efficiency of Japanese agriculture. However, outsourcing is not frequently used by Japanese farmers in their day-to-day management. This has resulted in a weakly developed market for agricultural contracting services. In order to take a closer look at the reasons for making use of outsourcing, a comparative study was carried out between the agricultural contracting sector in Japan and that in the Netherlands, where agricultural outsourcing is a regular practice. In the Netherlands, especially small, diversified farms that lack sufficient labour tend to outsource agricultural work; in Japan, the situation is far less clear. Cultural factors possibly play an important role.

Keywords: Agricultural outsourcing, farm size, diversification, labour shortage, cultural factors

Introduction

Agricultural contracting is a phenomenon found throughout the world. Today's Japanese farmers face various problems, such as the declining or stagnating price of agricultural products and the rising price of agricultural input. A decrease in the agricultural labour force, especially within young or middle generations, shows the potential for a continuous labour shortage in rural areas. However, the significance of agricultural outsourcing varies between countries.

In Japan, farmers' organizations for agricultural contracting have increasingly developed since the beginning of the 1970s. Especially, the 'operation contract' organization system (the so-called machinery bank) was imported from Germany and adopted by the agricultural cooperatives (Rural Development Planning Commission, 1996; Rural Development Planning Commission, 1986; Ishimitsu & Kajii, 1972). In recent years, cooperation among farmers has become limited due to the decreasing agricultural population and the ageing of farmers. There is a need for a new type of non-farmers' organization. 'Agricultural contracting' could be one of these new organizations. Agricultural contracting supports not only small and medium sized family farms, but also those farms that are seeking to expand. Expansion of contracting services is urgently needed, especially in dairy farming and upland farming in Hokkaido prefecture, and it will be a key in the preservation of family farming, regional agriculture and rural society (Hokkaido Regional Agricultural Research Center, 1996; Niinuma & Igata, 1999).

In the Netherlands, the contracting sector has developed strongly. A large proportion of labourers in rural areas are employed by contracting companies, which are now the second largest source of rural employment after the horticulture sector (Takano, 1992). A report on dairy farmers in the Dutch village of Lienden illustrated a farmer's use of contractor services to counter a labour shortage brought about by the introduction of the free stall barn and the resultant increase in the number of cows. The farmer mentioned the following advantages of contracting: 1) because machinery is not owned, costs can be reduced; 2) contractors provide high quality services for silage making; 3) prices of contracting services are acceptably low; and 4) the farmer can concentrate on dairy production, and have more leisure time.

In the past, the need for agricultural contracting in Japan and the Netherlands has been discussed from various points of view. The general opinion is that outsourcing is important in maintaining the specific character of the family farm. However, agricultural contracting in farm management has not been investigated in sufficient depth. Therefore, the objective of the present study was to examine the demand for agricultural outsourcing in Japan and the Netherlands and to clarify the specific characteristics of the farms that make use of outsourcing.

Theory

The UK is known as the most developed country in Europe as regards agricultural contracting systems (*Korokawa,* 1997). The results of studies of the farmers and the contractors were published in survey reports in 1987 and 1993. A number of variables seem to be crucial in taking the contracting decision; the variables are farm size, labour shortage, diversification, machinery ownership and cultural factors.

Farm size

The 1987 study concerns the agricultural contracting by 200 farms in the Midlands and north Wales (Ball, 1987a). The contract work was concentrated in dairy farming and arable farming. More than 80% of these farmers used contractors. Although farms of various sizes used contracting services, larger farms tended to be focused on highly specialized services such as spraying, drainage and hedging, while smaller farms found contracting attractive for less specialized tasks such as harvesting, sowing and ploughing. The reason for this is that smaller farms cannot maintain modern machinery that is designed for high volume use. Therefore, farm size seems to be an important indicator for clarifying the characteristics of contracting services. Although in the British case, farmers in every size group entrusted operations to contracting services, smaller farms tended to use contracting for regular agricultural work. This means that large farms can use their own machinery and provide services to other farms. Therefore, contracting services tend to be used more heavily on small than on large farms.

Labour shortage

The decisive factor determining whether a farm will contract or lease/buy is the availability of family labour. The pros and cons of machinery leasing vs ownership is also an important issue, but this is not the topic of this paper (see: *Agricultural Experiment Station Division of Agriculture* 1984; *Schwart,* 1983). Where family labour is sufficiently available, outsourcing does not occur; where family labour is not sufficiently available, contracting operations are required. Specific circumstances of the farm are crucial for the availability of family labour and thus for taking the outsourcing decision (for example, ageing of the farmer, and the increasing number of part-time farmers). The supply of labour is explained by the relation between the number of working hours and the wage (*Stiglitz,* 2000). Therefore, the increasing availability of part-time jobs and the increase in wages also has an indirect influence on the supply of family labour and the number of contracting operations. Further, farmers will try to get part-time jobs if the wage level is higher than the expenditure on contracting operations. Thus, the availability of labour seems to be an important variable in clarifying outsourcing.

Diversification

On a diversified farm, the labour force is likely to be engaged with core activities. If a farmer wants to reduce costs, he will dismiss the labour that is engaged in supplemental work if outsourcing is cheaper than the cost of the labour and machines required to carry out the operations. For example, the harvesting task was widely outsourced in dairy farming in the UK and Japan. Simultaneously, the management of the dairy sector on diversified farms was intensified by introducing modern machinery and technology. Particularly harvesting is often outsourced by dairy farmers who produce high added value products (such as cheese), because of their desire to reduce the time they spend on caring for feed crops. Thus, when farms maintain several farming sectors, operations of the dairy sector or arable sector are outsourced more often than is the case with single sector farming, in order to maintain one heavily intensive farming sector. Therefore, diversification is an important indicator of contracting.

Machine ownership

If the return from investment in agricultural machinery is below the market interest rate, investment becomes over-investment. Over-investment is distinguished from the appropriate investment level by the existence of idle capacity. Outsourcing is a means to avoid over-investment and the concomitant cost. Expenditure on agricultural implements and machinery is responsible for a large share of the agricultural production cost: in the British case, a farmer's outlay for contracting services is reported to be 14% of total machinery cost. It is generally assumed that farmers are able to greatly reduce the machinery cost by outsourcing. Generally speaking, outsourcing is a substitute for the ownership of machines. If one owns machines suitable for a specific task, there is no need to outsource this task (and vice versa). If the ownership of machines induces higher costs than outsourcing, the farmer will decide to outsource certain tasks. Therefore, machinery ownership is an important indicator of contracting.

Cultural factors

In Japan, labour-intensive agriculture is still widespread; therefore, there are a lot of farmers who think that productivity will increase by increasing the amount of manual work performed, even on large farms. However, compared to Japan, in the Netherlands agriculture is mainly labour extensive and contracting has been used for a long time. In any case, continuous outsourcing depends also on farming traditions and on good results from contracting services. Therefore, cultural factors are one of the important variables of contracting.

Regression equation

The following regression equation is based on the above theory.

$$O = \alpha + \beta F + \gamma D + \delta L + \varepsilon M,$$

Where: O: quantity of outsourcing operations
F: farm size
D: diversification
L: labour use
M: machine ownership

Because it was not possible to measure the variable 'cultural factors', it was included in the constant α

Method

Quantitative agricultural data were collected in the Netherlands and in Japan. In the former country, in 2004 the Farm Accountancy Data Network (FADN) system collected data for an impact study of the European Union's Common Agricultural Policy (http://europa.eu.int/comm/agriculture/rica/index_en.cfm). In total, the FADN provided data on 826 farms. On some points, the data had to be adjusted to get the variables to fit the theoretical model. The variables 'quantity of outsourcing operations' and 'farm size' could be used without any adaptations (*LEI,* 2004). For the variable 'diversification', a rate of diversification was set: for a specialized farm with one division of farming, the rate of diversification is 0%, while for a mixed farm, the rate is 100% minus the percentage of the largest division of the farm. For example, if the DSU of the largest division of the mixed farm accounts for 70% of the total DSU of the farm, the rate of diversification is 100% – 70% = 30%. (DSU= 'Dutch Standard Unit', a standardized measure for farm size.) The variable 'labour use' was measured in man years (in the FADN statistics, one man year is 1700 hours). The variable 'machinery ownership' was measured for the new state of the machinery.

The Japanese data generation was done in Yubetsu, Hokkaido; the data were partly acquired by the Yubetsu agricultural cooperative, and partly by surveying (*Niinuma & Igata,* 2000). In total, 65 farm samples were available. As in the Dutch case, the Japanese data had to be adjusted to get the variables to fit the theoretical model. In Japan, too, the variable 'quantity of outsourcing operations' could be used without any adaptations. For the variable 'farm size', although the Japanese agricultural statistics do not have an index comparable to the DSU index in the Netherlands, data in terms of 'area of management' were available. This index concerns the ratio between the agricultural area used for feed production (grass and forage) and the number of milking cows. Therefore, in the Japanese case, farm size was measured in terms of 'area of management'.

In Japan there are only three types of farms, namely arable, dairy, and mixed vegetable farms. Therefore, for the variable 'diversification' there was no need to work with an index, such as was used in the Dutch case. In the analysis, 'diversification' in the Japanese case was set as a dummy variable. The variable 'labour use' was measured by the labour force working on the farm. Family labourers who work on the farm for more than 150 days a year are called 'regular farm workers', while family labourers who work for between 60 and 149 days a year are called 'quasi-regular workers'. According to this classification, in the analysis a regular farm worker was counted as 1, a quasi-regular worker was counted as 0.5 and family labourers who work fewer than 60 days a year on the farm were counted as 0.3. The variable 'machinery ownership' was measured by the number of machines in ownership.

After defining the theoretical variables, a SPSS statistical analysis program was used to perform a regression analysis. All samples were used for a normal linear regression analysis. However, it soon became clear that not all variables were significant. In order to be able to test the hypotheses in a well-founded manner, some adjustments of the data were inevitable.

First, five dummies for diversification were added to the regression equation. These dummies were demonstrated for all the non-diversified farms. Therefore, the rate of diversification showed only the diversified farms. In the case of Japan, only two farming sectors remained; it was therefore decided to use a dummy for the variable 'diversification'. Second, a non-linear regression expression was adapted for an analysis. A natural logarithm function type is generally used to estimate non-linear correlation. It worked out that the adoption of natural logarithm function was useful for testing the hypothesis. Third, in the Dutch case, farms without contract work were excluded. The main reason was that contract work is constant to all farm sizes, which means that the correlation between contract work and farm size will not be significant. In the Japanese case, two farms that had used scarcely any contract work were left out according to case-wise diagnostics. In the end, 790 Dutch farms and 63 Japanese farms were used for the analysis.

Results

The results of the Dutch case are shown in *Table 1* and of the Japanese case in *Table 2.* The values of the coefficients, the t-values and the significance of the structural equation are also given in the tables.

Table 1: OLS regression results for the Dutch case

Independent variable	Dependent variable: contract work / DSU			
		β	t-value	signifi-cance
Constant	α	4.239	5.807**	0.000
Farm size	F	-0.634	-6.192**	0.000
Labour use	L	-0.453	-2.997**	0.003
Diversification	D	0.102	2.060*	0.040
Machine ownership	M	0.150	2.679**	0.008
Dummy arable single farming	D1	0.841	1.690	0.091
Dummy horticulture single farming	D2	0.990	2.167*	0.030
Dummy permanent crop single farming	D3	-0.346	-0.527	0.599
Dummy grazing livestock single farming	D4	0.982	2.127*	0.034
Dummy intensive livestock single farming	D5	-6.684	-12.342**	0.000
Adjusted R square	R^2	0.452		

* the value of the coefficient is significant on the 0.05 level.
** the value of the coefficient is significant on the 0.01 level.

Table 2: OLS regression results for the Japanese case

Independent variable	Dependent variable: contract work			
		β	t-value	signifi-cance
Constant	α	5.933	2.940*	0.005
Farm size	F	0.048	0.177	0.860
Labour use	L	-0.869	-0.030	0.047
Machine ownership	M	-0.157	-0.268	0.790
Dummy diversification	D1	0.710	0.308	0.759
Adjusted R square	R^2	0.210		

** the value of the coefficient is significant on the 0.01 level.

In the Dutch case, there is a positive relationship between the total value of contract work and farm size. However, there is a significant negative relationship between the value of contract work per DSU and the farm size. This means that large farms outsource more than small farms. Per DSU, however, large farms outsource less than small farms. It can therefore be concluded that contracting services tend to be used more on small farms than on large farms, which means that our hypothesis with respect to the relationship between outsourcing and farm size is confirmed.

Second, the amount of outsourcing per DSU is negatively related to the use of labour. This means that the contracting is effective in reducing the number of working hours for farm workers, which means a confirmation of this hypothesis. Third, both the total amount of outsourcing and the total amount of outsourcing per DSU are positively related to diversification. This means that diversified farms outsource more than single farming farms, which is in agreement with our hypotheses. Fourth, there is a significant positive relationship between the value of outsourcing per DSU and the value of the machinery (machine ownership), which is contrary to our expectations. In our hypothesis, the value of the machinery should have a negative relation to contract work, at least to contract work per DSU. A possible explanation is that because the value of machinery per DSU in horticulture is smaller than in arable farming and grazing livestock farming, and arable farming and grazing livestock farming operations are outsourced more than horticultural operations, there is a positive relationship between contract work per DSU and the total value of machinery per DSU.

In the Japanese case, the value of adjusted R square is not high, and, apart from the t-value of constant the coefficients are not significant. First, total amount of contract work has a positive relationship with farm size. However, the total value of outsourcing per ha does not have a significant relation with farm size, which is contrary to our expectations. Second, in terms of the total number of man years, the labour force in the Japanese case has a negative relation to contracting work, although the significance level is not high. This means that the contracting is effective in reducing the working hours of farm workers. Third, machinery ownership (here, the number of machines) and diversification do not have a significant relation to contracting work. The cultural aspect is included in the constant, which, as in the Dutch case, is highly significant. This may imply that in both the Dutch and the Japanese case, cultural aspects play a dominant role in the outsourcing of agricultural work.

Conclusions

In the Dutch case, we looked at the relationship between outsourcing on the one hand and farm size, labour use, machinery ownership and diversification on the other. Based on the statistical results, we can conclude that contracting is used significantly more by smaller farms, diversified farms and farms with a shortage of labour. These results confirmed our hypotheses. However, the relationship between contracting work and machinery ownership produced an effect contrary to our expectation (a negative relationship between the amount of outsourcing and machine ownership). In short, the advantage of contracting for the saving of labour is clear, while the advantage of the reduction of the cost of machinery is far less clear.

In the Japanese case, we applied the same model as in the Dutch case but for a much smaller sample size (790 Dutch farms versus 63 Japanese farms). Unfortunately, this produced almost no significant results, perhaps because of the modest sample size. Only the constant was significant, which may imply that cultural aspects are of major importance in Japan. Still, we may tentatively state that outsourcing is an effective means to deal with a shortage of labour.

We may therefore conclude that labour shortage occurred because of the increase in farm size, and contracting expanded as a result of that. However, in the Japanese case, both the demand and the supply side of the agricultural contracting sector need to develop further before outsourcing can become a major tool for increasing the efficiency of Japanese agriculture. In order to overcome any possible cultural obstacles to outsourcing, extension might be a good way to stimulate the demand for it.

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