



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

# **Educational Function of Agriculture and Farm Diversification: Evidence from Dairy Farming Experience Services in Japan**

**Yasuo Ohe**

**Department of Food and Resource Economics**

**Chiba University**

**648 Matsudo, Matsudo, Chiba, 271-8510, Japan**

**Tel/fax: +81 (0)47 308 8916**

**E-mail: yohe@faculty.chiba-u.jp**

*Contributed Paper prepared for presentation at the International Association of  
Agricultural Economists Conference, Beijing, China, August 16-22, 2009*

*Copyright 2009 by Yasuo Ohe. All rights reserved. Readers may make verbatim  
copies of this document for non-commercial purposes by any means, provided that this  
copyright notice appears on all such copies.*

## **Abstract**

To promote multifunctional activity, it is crucial to clarify how jointness is formed in connection with farm structure. This paper examines the relationship between multifunctional activity and farm structure by focusing on the educational function of dairy farming, i.e., farming experience services, in Japan. The main findings were as follows. First, from our conceptual consideration we can say that the educational function is determined by technical and institutional jointness and there is a U-shaped relationship between farm diversification and provision of farming experience services. In addition, the national program aimed at promoting this educational function was effective in enhancing this function. Second, however, from the empirical evaluation farmers only partially internalize educational externalities by treating them as supplementary services combined with processed products. Therefore, appropriate integrated management of these newly emerging educational services to become a viable market should be fully addressed in the future, especially for family farms.

**Keywords:** multifunctionality; educational function; farm diversification

## **1. Introduction**

The importance of farm diversification is increasing under global intensive competition and the volatility surrounding agricultural production. This paper evaluates the relationship between farm diversification and multifunctionality focusing on the educational function of agriculture and asking the question “Are the two things compatible or are they competitive with each other?” The significance of the educational function of agriculture has been pointed out (Shichinohe *et al.*, 1990) and is considered as one of the functions in multifunctionality such as providing urbanite and children with a first-hand experience with agriculture and their rural heritage (MAFFJ, 2004). This service can become a new role of agriculture (Ohe, 2007a). Conventionally, city farms are a typical example of farms providing educational services to youngsters through farming and rural experiences (Garrett, 1986). Recently, public programs that strengthen the connection between educational aspects of farming and the countryside are emerging. For instance, the FACE (farming and countryside education) program in UK (Graham, 2004)), Ferme Pédagogique in France, Fattorie Didattiche in Emilia-Romagna (Regione Emilia-Romagna, 2005), Italy and Educational Dairy Farms in Japan.

To our knowledge, however, very little has been explored from the perspective of farm diversification with regard to this educational function despite recent extensive

research on multifunctionality issues (OECD, 2001, 2003, 2005; Van Huylenbroeck and Durand, 2003; Brouwer, 2004), with the exception of rural tourism (Slee, 1989; Vanslembrouck *et al.*, 2005; Skuras *et al.*, 2006; Ohe, 2007b) and ecosystem services (Heal and Small, 2002; Wolcott, 2006) or agri-environmental externalities (Lankoski and Ollikainen, 2003; Mann, 2005). Although farm diversification issues have been extensively studied by mainly focusing on topics of risk aversion in farm production and on those of allocation of time between on-farm and off-farm work (Hallberg *et al.*, 1991; Serra *et al.*, 2005) and farm family pluriactivity (Gasson, 1988; Brun and Fuller, 1991), it is now necessary to explore the extension of diversification by taking advantage of these newly emerging roles for agriculture.

In taking into account several distinctions of the educational function as mentioned below that differ from other areas of multifunctionality, it is necessary to explore how to integrate these new activities with traditional products as well as to design effective policy measures to promote farm diversification in connection with multifunctionality.

To approach this aim, firstly, we gave conceptual consideration to characteristics of the educational function and the relationship between diversification and internalization of this educational externality. Secondly, we estimated the fee-determining model of farming experience services to evaluate the degree of internalization of externalities focusing on Japanese dairy farms with an open farm policy for visitors, which are Educational Dairy Farms and Open Dairy Farms (For activities of the Educational Dairy Farms, see Ohe, 2007a). Thirdly, we discuss policy implications for promoting the educational function and farm diversification.

## **2. Conceptual considerations**

### *2.1. Characteristics of the educational function*

We can point out three main differences in the nature of the educational function as multifunctionality in comparison with other functions such as land preservation, landscape forming, bio-diversity, etc. The first difference is the object of its effects. Land preservation and landscape forming functions directly affect rural resources and the environment, but indirectly affect human resources as economic units. In contrast, the effects of the educational function directly work on human resources.

Education itself has externality (Arai, 1995). Typical examples of this externality are literacy and the ability to apply basic arithmetic, which form fundamental social conditions for economic development and efficiency of the whole society. Likewise, it is expected that the educational function lets people recognize the significance of rural

resources, such as rural heritage, farm life and knowledge of where food comes from, and eventually leads to a well-balanced resource allocation nationwide between urban and rural areas.

The second point is that we should examine not only technical but also institutional jointness (For institutional jointness, see Hagedorn, 2003), which has been little explored because the educational function is more connected with institutional aspects that define farmers' behaviour, unlike other technically defined aspects of multifunctionality in the environment. For instance, the educational function in farming is generated only when a farmer accepts people into the farmyard. This fact means that the institutional framework will work for socializing jointness as externality.

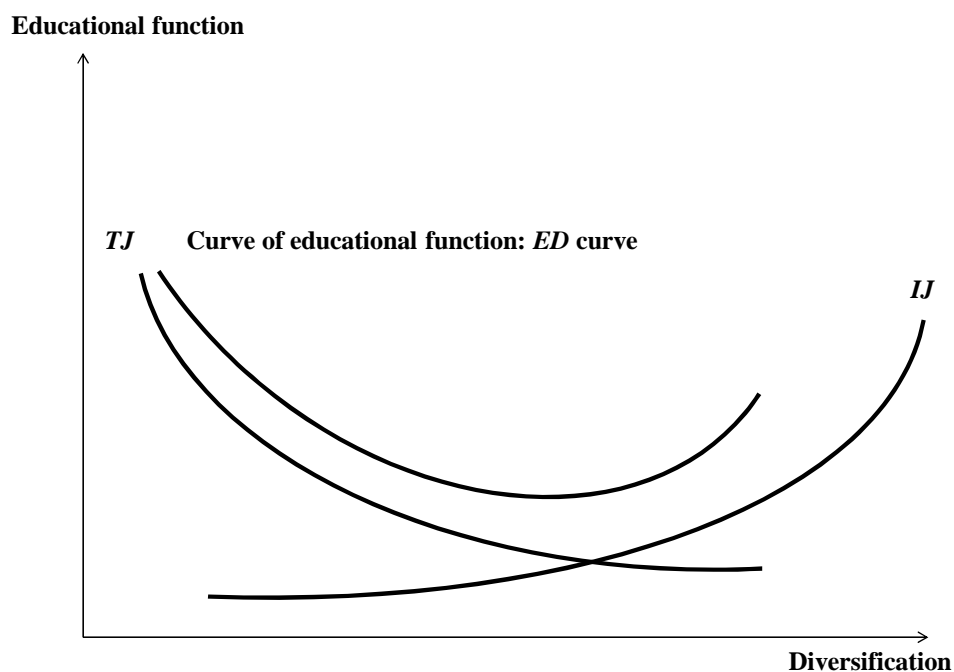
This also means that externality generated from jointness is not constant, but can be variable. Durand and Van Huylenbroeck (2003) pointed out that jointness between multifunctionality and agricultural production is considered not as fixed but as variable. This is because jointness is determined by technical and institutional aspects of the farm structure and it is not uncommon that the farm structure is heterogeneous. The heterogeneity issue in agricultural externalities has been considered in the evaluation of environmental externality in agriculture (Lichtenberg, 2002) but not in the educational function of agriculture.

This function will increase in significance since the educational capability of households and local communities in society at large has tended to decline. Nevertheless, it is often difficult for farmers to completely internalize the educational function into the farm business at this stage. The reason for incomplete internalization is that the market for educational services is not yet fully established (Ohe, 2007a). Because this market is at an initial stage, people do not always fully appreciate its significance. This constraint is a common social background for those farmers who offer educational services such as farming experiences.

## *2.2. Relationship between diversification and the educational function*

Lack of complete internalization of the educational function and the variable educational externality, or externality that has an educational function, generated from jointness means that diversification and internalization of the educational externality are not identical. Now we should examine how both technical and institutional jointness determine this variable relationship between diversification and internalization.

Technical jointness is normally observed in the educational function as in other multifunctional activities because it is jointly produced with farm products and is technically inseparable from the agricultural production process determined by its biological, technical and geographical nature. Conversely, institutional jointness is rooted in socio-cultural and institutional factors. For instance, rural-community work such as collective maintenance of waterways and roadside weeding is unmanageable or very hard to manage by an individual farmer because it has been conducted as a group activity for generations in this country (Fukutake, 1980; Jussaume, 1991). We can assume that this traditional aspect is the *ceteris paribus* condition because of the identical cultural background in this case. What we deal with here is national and local institutions that are related to educational externality as described below in detail.



**Figure 1. Educational function and technical and institutional jointness**

Conceptually, these two jointnesses determine the educational externality. Figure 1 depicts a curve for educational externality by measuring the degree of diversification horizontally. Vertically, the educational function is obtained from the vertical sum of externalities generated by technical jointness and institutional jointness. As diversification activity increases, the contribution by technical jointness will decline. This is because at the early stage of diversification, ordinary production, milk production in the case of dairy farming, still constitutes a large part of farm activity. At

this stage, technical jointness connected with simple milk production is much tighter and less substitutable than at a higher stage of diversification in which farmers can integrate products at their discretion. Thus, the curve of externality of the educational function by technical jointness will be right-downward (*TJ* curve).

On the other hand, externality originating from institutional jointness will increase as diversification progresses, such as through production of processed products. This is because the progress of diversification will enhance the educational function because a greater variety of activities might create an educational function that does not exist in the initial stage. A typical example is that a farming experience program is now considered part of the school curriculum in elementary and junior high school. Thus, as diversification progresses, new possibilities will be created for an educational function because the opportunities increase for interchanges between farmers and the non-farming public in the farmyard. To put it another way, externality of the educational function is now institutionalized as a local educational activity and its significance is increased. This is locally generated institutional jointness. Thus, the curve of externality of the educational function by institutional jointness will be right-upward (*IJ* curve). Consequently, in total, the curve for the educational function will have a U-shape (*ED* curve), which means that the externality of educational function has U-shaped jointness. We term this the hypothesis of U-shaped jointness.

As a third factor, there is a national institutional framework that enables farmers to raise educational externality. This framework will shift the entire educational externality upward. Specifically, the Educational Dairy Farm program is one policy instituted for the promotion of educational services. The attitude of farmers toward this program determines the management policy they use to provide educational services. For instance, consider a farmer with a good understanding of the program and a motive for providing educational services to visitors. The jointness between this multifunctionality and farm production will be stronger than when a farmer does not have such an understanding and motivation. This program provides an opportunity for highly motivated farmers to raise this multifunctionality.

Another institutional framework that we should take into account is the type of farm in terms of type of management or institution. For instance, it is very likely that corporate farms act differently from family farms in terms of their educational function and different management policies.

In short, we can summarize that national and local institutional jointness plays more important roles in generating educational externality than does technical

jointness. Nevertheless, the above model rather focused on not economic but on technical and institutional aspects, which did not reveal any internalization process of educational externality as economic behaviour. Hence, we need to address the process of internalization further.

### 2.3. Relationship between diversification and internalization

As an indicator of the relationship between diversification and internalization, we look at the fees for experience services to examine how the process of internalization will occur. To this end, we consider two factors working on the fee level: the supply shift representing the internalization process and the demand shift.

Figure 2 illustrates how the subjective equilibrium points of a farmer move in accordance with the progress of diversification. If there is positive externality that is not internalized, then theoretically the social marginal cost ( $SMC$ ) moves below the private marginal cost curve ( $PMC$ ). The initial private optimal point is  $e_0$  while the social optimal point is  $e_n$ . The vertical difference between the two curves indicates positive externality. Unless this externality is internalized, the social optimal level of

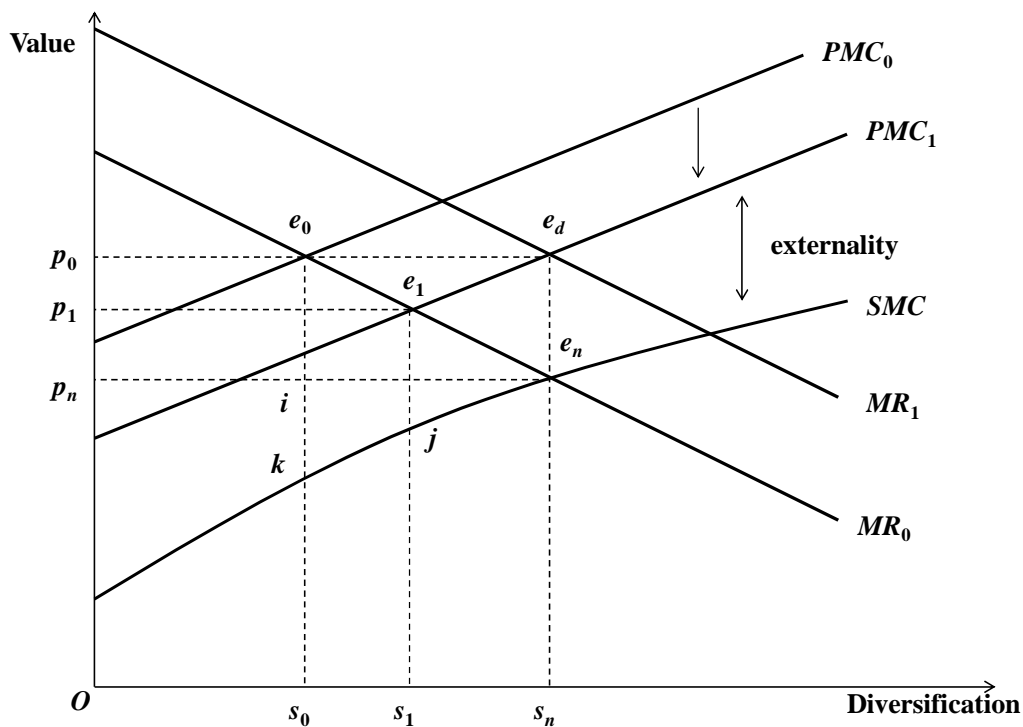


Figure 2. Diversification and internalization of externality

activity is not realized. The  $SMC$  curve is depicted as an inverse U-shaped curve based on the conceptual considerations described above.

First, if the internalization effort is made through diversification, then the



integration of products will deepen. As a result, the *PMC* curve will come down closer to the *SMC* curve and therefore externality will shrink from  $e_{0k}$  to  $e_{1j}$ . This downward shift of the *PMC* curve results in the reduction of the equilibrium fee from the initial  $p_0$  to eventually  $p_n$  through  $p_1$ . This process is caused by the progress of integration among farm products through diversification. This is because at this stage a farmer sells not only simple raw farm products, but the sale of raw and processed farm products is combined with services such as farming and food processing experiences and the farmer eventually offers integrated farm products. We term this process an internalization hypothesis.

The second is the institutional factor that raises the fee. This factor causes the upward shift of the marginal revenue curve (*MR*), which is determined by the demand side. If people better understand the issues related to the educational dairy farm program, an underestimation of educational services will be rectified. This effect is translated into demand upward shift from  $MR_0$  to  $MR_1$ .

Consequently, the fee level will be determined by the two factors above and we can consider four cases of the path of the fee movement, depending on both signs of parameters of a possible quadratic relationship between the fee level and the degree of diversification as tabulated in Table 1. If the internalization effect is larger than the demand shift effect, then the path of the curve for the fee, or the fee-diversification curve, will be right downward (Case 4), but, if not, it will be right upward (Case 3). The internalization hypothesis applies to Case 4. Cases 1 and 2 represent a mixture of the two effects. Empirical results will clarify which case is happening in reality.

Table 1  
Relationship between fee level of farming experience services and diversification

Case	Parameter of diversification variable		Shape of fee curve	Fee level	Magnitude relation of the two effects	
	Quadratic term	Linear term				
1	Plus	Minus	U-shape	Down, up	<, >	
2	Minus	Minus	Reverse U-shape	Up, down	Effect of demand shift >, <	Effect of internalization shift
3	Plus	Plus	Right upward	Up	>	
4	Minus	Plus	Right downward	Down	<	

This conceptual model, however, cannot tell how integrated diversification was achieved and in which direction: that is, whether a new market for farming experience services was created or whether it was a measure of differentiation of processed products. We need to empirically examine factors that determine service fees in detail.

### **3. Data and methods**

Data were obtained from the membership list of Open Dairy Farms (as of March 2004, 129 membership farms, Japan Dairy Council). Open Dairy Farms is a national group of dairy farmers who conduct an open-farm policy for visitors from the outside, which started in 2000 in Japan. Most of these farmers are also certified as operators of Educational Dairy Farms, which started in the same year with the aim of providing farming experience services to visitors, in particular to school children and other youngsters. Generally speaking, among the Open Dairy Farms, Educational Dairy Farms are considered more inclined to offer educational services to visitors (Hereafter, Educational Dairy Farms= E-farms, other Open Dairy Farms= NE-farms).

Data obtained include the size of the dairy herd, activities offered as a farming experience and rural tourism activity. However, data on factor input relationships, such as land holdings and kinds of facilities, land use, family labour, and information related to production costs, are not available. For this reason, direct estimations of the production function and other cost functions for economies of scope and scale are not possible. Only indirect conjuncture on these points is possible after the statistical analysis described below, which is a constraint of these data. Despite this constraint, no other data are available for detailed examination of the relationship among farm diversification, educational function and farm structure from a nationwide perspective.

We assume that the educational function is reflected on nine farm experience services that Educational Dairy Farms provide. These services are divided into the two types: Types 1 and 2. Type 1; related to an ordinary dairy and farming operation, i.e., dairy operation experience, farming experience, tour of farmyard, contact with livestock and milking, and all consist of only services. These services have tighter technical jointness. Type 2; diversification-related services, i.e. horseback riding, butter-making, cheese-making and ice cream-making; these are all related to farm products.

### **4. Evaluation of charging for farming experience services**

Now we examine to what extent and how farmers charge for their farming experience services for internalization of educational externality. First, we look at the difference in reservation and charging systems between E-farms and NE-farms (Table 2).

As a whole, educational farms have higher ratios of implementing a reservation system and charging for services. In particular, milking and butter-making experience

services have higher ratios (1% significance). The reason is thought to be that farmers must recover a part of opportunity costs of milking and butter-making, which originally generate income through sales of these products. To this end, farmers usually have to coordinate their main job of dairy farming with offering educational services because they must make preparations to offer these services. This is why a reservation system is needed. The number of farms that adopt a charging system, however, is less than half of the total sample. This means that over half of the farms do not charge for educational services, so that these services are offered free of charge.

Table 2  
Comparison of reservation and charging systems between educational and non-educational farms

Measure	Farming experience service	Entire data of open dairy farms				Test result
		Dairy educational farm		Non-educational farm		
		% farms	Sample size	% farms	Sample size	
Having reservation system	Dairy operation experience	62.8	59	22.9	8	***
	Farming experience	34.0	32	20.0	7	+
	Tour of farmyard	38.3	36	22.9	8	+
	Contact with livestock	29.8	28	11.4	4	**
	Milking	62.8	59	22.9	8	***
	Horseback riding	10.6	10	2.9	1	n.s.
	Butter-making	53.2	50	17.1	6	***
	Cheese-making	17.0	16	5.7	2	+
	Ice cream-making	29.8	28	11.4	4	**
	Having charge system	Dairy operation experience	26.6	25	2.9	1
Farming experience		17.0	35	0	0	***
Tour of farm yard		11.7	11	2.9	1	+
Contact with livestock		9.6	9	2.9	1	n.s.
Milking		43.6	41	11.4	4	***
Horseback riding		16.0	15	5.7	2	+
Butter-making		43.6	41	14.3	5	***
Cheese-making		13.8	13	8.6	3	n.s.
Ice cream-making	23.4	23	8.6	3	*	

Source : Membership list of the open dairy farms, as of March 2004, Japan Dairy Council.

Notes : \*\*\*, \*\*, \*, + show significance levels, 1%, 5%, 10%, 20% (reference), n.s. shows no significance. Chi-square or Fisher's Exact test was used.

In summary, those educational farms that are eager to give educational services tend to practice reservation and charging systems to allocate their time and to partially compensate for the opportunity cost of providing educational services.

Here, we estimate the fee-determining model of farming experience services to evaluate the degree of the internalization. Structural model based on the above considerations.

$$F=f(s, me, ed) \quad (1)$$

Where,  $s$ =vector of variables representing diversification

$me$ = vector of farm attribute

$ed$ =vector of variables representing educational farms

The estimation model is as below.

$$F=\gamma_0 +\gamma_1SL^2 +\gamma_2SL +\gamma_3FFDM +\gamma_4EDDM +\gamma_5TYPEDM +\gamma_6HR +\varepsilon \quad (2)$$

Where,  $F$ =charge level of adult fee (yen per capita)

$SL$  = number of directly marketed dairy products

$FFDM$  =dummy variable of family farm (family farm=1, others =0)

$EDDM$  = dummy variable of E-farms (Educational Dairy Farms) (yes =1, no=0)

$TYPEDM$ =dummy variable of type of services (Type 1=0, Type 2=1)

$HR$ = duration of educational service (minutes)

$\gamma_i$ =parameters to be estimated,  $\gamma_0$ =constant ( $i=0, \dots, 6$ )

$\varepsilon$ =stochastic error

The explained variable is the adult fees of farming experience services.

We assume a quadratic form for the fee-diversification curve as assumed in Table 1. The first explanatory variable  $SL$  is number of direct marketed products for the diversification variable. There, we can suppose 4 cases so the sign conditions of  $\gamma_1$ , and  $\gamma_2$  are determined by the empirical result. We can see whether the shift effect of diversification is large enough to bring down the fee level.

The dummy variable  $FFDM$  (family farm=1, others = 0) is used to test the family farm premium  $\gamma_3$ , which is supposed to be positive. This is because family farms tend to be less diversified, which means that their equilibrium fee is supposed to be higher than that of non-family farms as shown in Figure 2.

As variables of the educational farm, the dummy variable  $EDDM$  (yes =1, no= 0), as already mentioned, is used to test the difference in whether or not a farm is an E-farm. The dummy variable  $TYPEDM$  is used to test the difference in types of experience services. Since Type 2 services need to be compensated by at least a material fee, the fees in Type 2 are supposed to be higher than those of Type 1. The duration of the services,  $HR$ , is to explore the hourly marginal fee for the educational service. The parameter  $\gamma_6$  is the marginal fee that must be positive. The marginal fee is a criterion to judge whether a factor input relationship is formed. Although the

duration of time is not labour input itself, we can use it as a proxy variable for labour input because of the tight data constraints. If this parameter is positive with significance, then we can guess whether or not the market for the service is viable. Thus, the sign conditions are  $\gamma_4, \gamma_5, \gamma_6 > 0$ .

The explained variable is left-censored cases, in which the services are provided free of charge, so we used the Tobit model with OLS estimation. However, from the result of OLS estimation heteroscedasticity was observed due to large differences in variance among fees, so we conducted bootstrap standard error estimation.

Although we estimated the case of a child's fee as well, the parameters did not show statistically significant results. These results suggest that service fees are determined based on fees for adults but not for children.

Estimation result is tabulated in Table 3. The parameter of the linear term was positive while the parameter of the quadratic term was negative for diversification and both parameters showed statistical significance. This result means that the fee level

Table 3

Educational service fee determinant factors (Tobit model)

Explained variable	Adult fee for service
<i>SL</i> <sup>2</sup> : (Number of direct marketed milk products) <sup>2</sup>	-29.2737** (-2.00)
<i>SL</i> : Number of direct marketed milk products	246.802*** (2.68)
<i>FFDM</i> : Dummy of family farm (family farm=1, others=0)	348.6527*** (2.63)
<i>EDDM</i> : Dummy of dairy educational farm (yes=1, no=0)	421.7372** (2.30)
<i>TYPEDM</i> : Dummy of type of service (Type 2=1, Type 1=0)	516.8974*** (3.41)
<i>HR</i> : Duration of farming experience services (minutes)	0.8500 (0.86)
Constant	-883.3714*** (-3.64)
Log likelihood	-1602.5624
Wald $\chi^2$ test	***
Sample size	301

Source: Same as Table 2.

Note: (1) Signs of significance level are same as in Table 2.  
(2) Standard errors were estimated by the bootstrap method due to heteroscedasticity.

comes down when diversification progresses, corresponding to Case 4 in Table 1, meaning that the downward shift effect of *SMC* by internalization is larger than the upward shift by demand. Thus, we can confirm the internalization hypothesis. Nevertheless, the result does not tell how the diversification is made. So we look into the rest of the parameters.

Parameter of the family farm indicates that there is a premium for the family farm. This is because they need this premium to compensate difficulty in diversification due to their tighter jointness. On the other hand, the other two parameters work to shift the fee level upward. An educational farm has the effect of an upward shift in demand. Type 2 services have a higher fee because of the higher material cost than Type 1 services. The parameter of marginal fee, however, has no difference statistically from zero, which implies that the factor input relationship has not formed and therefore that the market for farming experience services is not yet viable. The constant with significance suggests that lump-sum fee fixing is practiced.

To summarize, it is safe to say that externality of the educational function is incompletely and partially internalized. Rather, farmers act to collect at least material cost and internalize the part of externality through diversification. Whereas it cannot be denied that farmers act rationally at this stage, what matters in the long run is how diversification is conducted.

Especially, the family farm has difficulty in internalization of educational externality through diversification. Even if farming experience services are integrated, they are provided as auxiliary services combined with dairy products rather than as independent services. Thus, the integration of these newly emerging services should be addressed and policy measures should be supported that enable farmers to provide educational services as a viable market in the future.

## **5. Conclusions**

The aim of this paper was to clarify conceptual and empirical characteristics of the educational function of agriculture by focusing on Open Dairy Farms in Japan.

The educational function has the following unique features: its effects directly influence human resources and it has not only technical but also institutional jointness. It is technically difficult to separate production from the educational function especially in farming operation experiences. Family farms have firmer technical jointness, therefore there can be less substitution of other similar educational services.

Thus, there was a u-shaped relationship between farm diversification and provision of educational service.

The estimated marginal fee for farming experience services explains that farmers do not completely but only partially internalize their production externalities through diversification. However, the internalization of educational externality is made through integration as supplementary services combined with processed products and not yet as viable services.

Consequently, variable internalization measures will be needed for family farms and the issues of integrated diversification of new educational service activities such as farming experience services should be more fully addressed in the future.

## References

- Arai, K., 1995. *The Economics of Education: An Analysis of College-Going Behavior*. Springer-Verlag, Tokyo, 15-16.
- Brun, A. H. and Fuller, A. M., *Farm Family Pluriactivity in Western Europe*. (Oxford: The Arkleton Trust, 1991).
- Brouwer, F., (eds.), 2004. *Sustainable Agriculture and the Rural Environment: Governance, Policy and Multifunctionality*. Edward Elgar Publishing, Cheltenham.
- Durand, G. and Van Huylenbroeck, G., 2003. Multifunctionality and rural development: A general framework, in Van Huylenbroeck, G. and Durand, G. (eds.), *Multifunctional Agriculture: A New Paradigm for European Agriculture and Rural Development*. Ashgate, Aldershot, 1-16.
- Fukutake, T., *Rural Society in Japan*. (Tokyo: University of Tokyo Press, 1980, pp. 131-132).
- Garrett, R., 1986. Making an ecological place: city farm Byker (Newcastle), *Bulletin Environmental Education* 184, 4-7.
- Gasson, R. 1988. *The Economics of Part-time Farming*. Longman, Harlow.
- Graham, B., 2004. The work of farming and countryside education (FACE), *Journal of Royal Agricultural Society of England* 165, 1-8.
- Hagedorn, K., 2003. Rethinking the theory of agricultural change in an institution of sustainability perspective, in Van Huylenbroeck, G., Verbeke, W., Lauwers, L., Vanslembrouck, I. and D'Haese, M. (eds.), *Importance of Policies and Institutions for Agriculture*. Academia Press, Ghent, 33-56.
- Hallberg, M.C., Findeis, J. L. and Lass, D. A., 1991. Multiple Job-holding among Farm Families. *Iowa State University Press, Ames, IA*, 239-262.

- Heal, G. M. and Small, A. A., 2002. Agriculture and ecosystem services, in Gardner, B. L. and Rausser, G. C. (eds.), *Handbook of Agricultural Economics*, 2A. Elsevier, Amsterdam, 1341-1369.
- Lankoski, J. and Ollikainen, M., 2003. Agri-environmental externalities: a framework for designing targeted policies, *European Review of Agricultural Economics* 30, 51-75.
- Lichtenberg, E., 2002. Agriculture and the environment, in Gardner, B. L. and Rausser, G. C. (eds.), *Handbook of Agricultural Economics*, 2A. Elsevier, Amsterdam, 1249-1313.
- MAFFJ, 2004. Annual Report on Food, Agriculture, Rural Areas in Japan FY2004, The Ministry of Agriculture, Forestry and Fisheries of Japan, [http://www.maff.go.jp/hakusyo/kaigai/2004a\\_rep.pdf](http://www.maff.go.jp/hakusyo/kaigai/2004a_rep.pdf).
- Mann, S., 2005. Farm size growth and participation in agri-environmental schemes: a configural frequency analysis of the Swiss case, *Journal of Agricultural Economics* 56, 373-384.
- OECD, 2001. *Multifunctionality: Towards an Analytical Framework*. OECD, Paris.
- OECD, *Multifunctionality: The Policy Implications*. (Paris: OECD, 2003).
- OECD, 2005. *Multifunctionality in Agriculture: What Role for Private Initiatives?* OECD, Paris.
- Ohe, Y., 2007a. Emerging environmental and educational service of dairy farming in Japan: dilemma or opportunity?, in Tiezzi, E., Marques, J. C., Brebbia, C. A. & Jørgensen, S. E. (eds.), *Ecosystems and Sustainable Development VI*. WIT Press, Ashurst, 425-436.
- Ohe, Y., 2007b. Multifunctionality and rural tourism: a perspective on farm diversification, *Journal of International Farm Management* 4, 1-23.
- Regione Emilia-Romagna, 2005. *Fattorie Didattiche dell' Emilia-Romagna: Guida ai Percorsi Didattici nelle Aziende Agricole*. Bologna.
- Serra, T., Goodwin, B. K., Featherstone, A. M., 2005. Agricultural policy reform and off-farm labour decisions, *Journal of Agricultural Economics* 56, 271-285.
- Shichinohe, C., Nagata, K. and Jinnouchi, Y., 1990. *Educational Function of Agriculture (in Japanese)*. Rural Culture Association (Nobunkyo), Tokyo.
- Skuras, D., Petrou, A., and Clark, G., 2006. Demand for rural tourism: the effects of quality and information, *Agricultural Economics* 35, 183-192.
- Slee, B., 1989. *Alternative Farm Enterprises 2nd Edition*. Farming Press Limited, Ipswich.



- Van Huylenbroeck, G. and Durand, G., 2003. Multifunctional Agriculture: A New Paradigm for European Agriculture and Rural Development. Ashgate, Aldershot.
- Vanslebrouck, I., Van Huylenbroeck, G., Van Meensel, J., 2005. Impact of agriculture on rural tourism: A hedonic pricing approach, *Journal of Agricultural Economics* 56, 17-30.
- Wolcott, R. M., 2006. Prospects for ecosystem services in the future agricultural economy: reflections of a policy hand, *American Journal of Agricultural Economics* 88, 1181-1183.