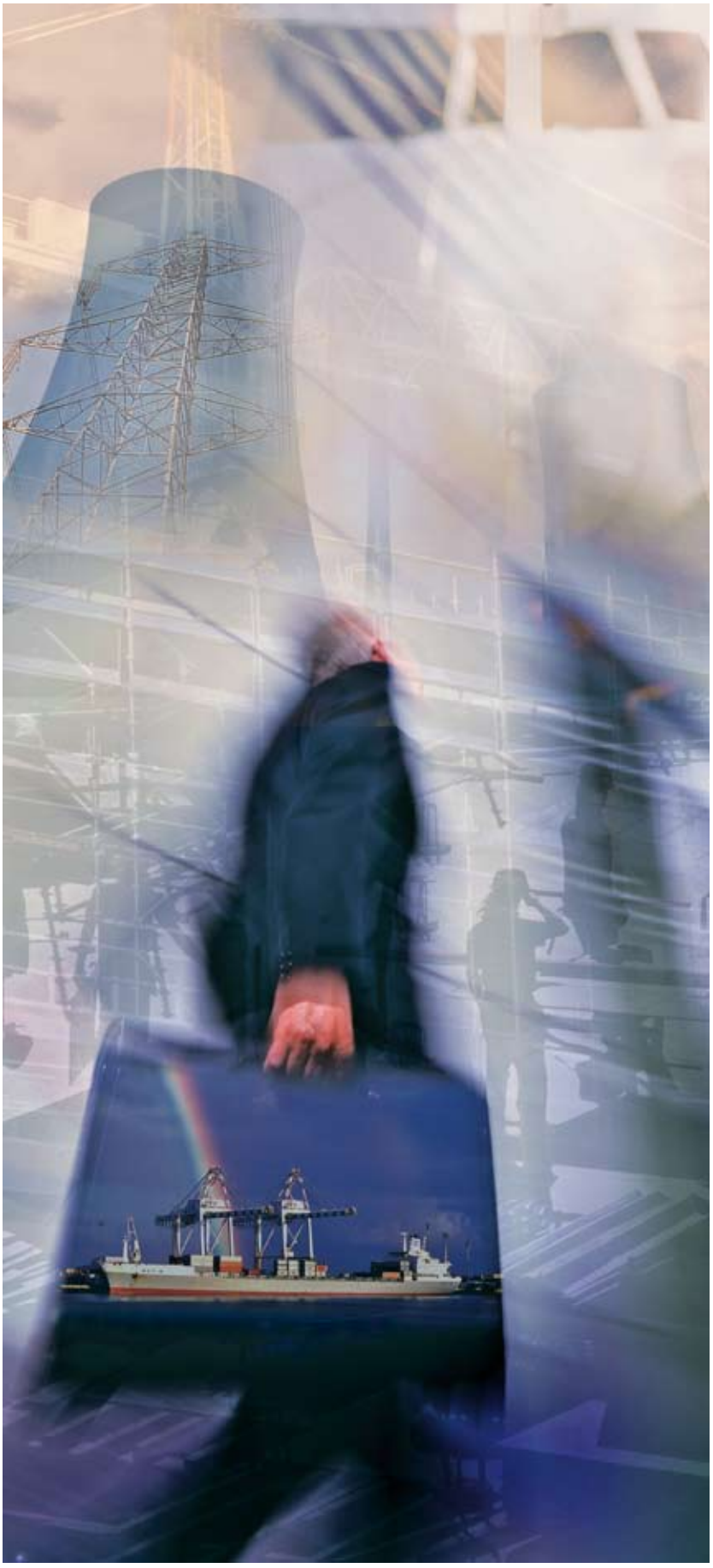

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The Economic Society of Australia warmly welcomes you to the Gold Coast, Queensland, Australia for the 37th Australian Conference of Economists.

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This year we have a large number of papers dealing with Infrastructure, Central Banking and Trade.

Matters of the greatest global importance invariably boil down to be economic problems. Recent times have seen an explosion of infrastructure spending, after world-wide population growth has seen demand outpace aging supply. The world has become more globalised than at any time since World War I but the benefits of this (and the impact on our climate) has been questioned by some.

At the time of preparing for this conference we could not have known that it would have been held during the largest credit crisis since the Great Depression. The general public and politicians both look to central banks for the answers.

We are also very pleased to see a wide selection of papers ranging from applied economics to welfare economics. An A – Z of economics (well, almost).

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Commercial farming and Contract Farmers in Thailand

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Abstract

This paper investigates the sustainability of commercial agriculture on small farms in Thailand that produce asparagus for export under contract farming system. Agricultural sustainability embraces the production, economic and marketing systems; and environmental and development policies. A theoretical conceptual framework is proposed for joint venture agribusiness when making decisions about sustainability on the basis of technical and economic efficiency. The economics model incorporates the Cobb-Douglas production function. Sustainability is measured for a sample of asparagus producers contract farming with a joint venture company. The costs of the environmental impact on soil and water are considered together with development policy implications in the context of sustainability. Results indicate that the labour, inorganic and organic fertiliser, seed, fuel and agro-chemical input factors have a significant effect on asparagus production. The elasticity value is >1 indicating an increasing return to scale. The technical and economic efficiencies of each factor show that farmers should increase or decrease their use in each case, in order to reach the optimal utilisation of each factor and obtain maximum profit. The environmental costs of asparagus production are calculated and analysed.

Keywords: Cobb-Douglas production function, sustainability, efficiency, environmental cost, asparagus.

Introduction

Japan is an important partner of Thailand's agricultural sector, being both importer and large-scale investor. Thai-Japanese joint venture agribusiness is successful on many fronts. The contribution of Japanese agribusiness has been not only to standardise the supply chain of Thai agricultural products for easy access to the Japanese market; but also to improve the living standards of local farmers and to reduce the environmental impact resulting from the contract farming system.

The important issues of the use and conservation of natural resources and environment have not been clearly studied to date. Further study is needed to clarify the impact of a Thai-Japanese joint venture asparagus production agribusiness on natural resources and the environment.

Assessment of the impact on natural resources and the environment arising from growing asparagus under this arrangement will give the necessary information to enable systematic and effective management and conservation of natural resources.

Objectives of study

1. To investigate the impacts on natural resources and the environment of the marketing and production systems for asparagus export.

2. To assess the direct and indirect costs of asparagus growing on the environment and natural resources.

3. To indicate the way forward in terms of policies and mitigation of the negative impacts on natural resources and the environment resulting from asparagus production.

Methodology

An economics model for assessing environmental cost was applied. The model used in the study has four aspects:

1. Consideration of the production system of asparagus growing to show the relationship between the various production factors.

2. Consideration of the cost structure system and private profitability through analysis of the costs to farmers and the rate of return received.

3. Consideration of the environmental impact arising from asparagus farming through an analysis of the impact on soil and water resources from an economics perspective. This is done by calculating the social cost through non-market values and environmental cost methods.

4. Consideration of policy implications arising from the cost data. The environmental impact assessment includes the net social profitability and social price from growing asparagus as well as suggestions for environmental management through fiscal measures.

The study focus is in the locality of Nakhon Pathom province, Thailand. All data and information used in the analysis were gathered from detailed interviews with 60 farmers who cultivated asparagus for export in the 2003 season.

Results and Discussion

The first objective of this study was to estimate the input-output relationship of asparagus production in Thailand. This is achieved by using a Cobb-Douglas production function for estimating the technical efficiency of asparagus production for export (Cobb and Douglas, 1928).

The estimated production function of asparagus exporting farms can be written in Cobb-Douglas form as:

$$Y = 0.325\, X_1^{0.155\,*}\, X_2^{0.204\,*}\, X_3^{0.414\,*}\, X_4^{0.175\,*}\, X_5^{0.820\,**}\, X_6^{0.031\,**} \quad (1)$$

$$\ell nY = A(=-1.123) + 0.155\ell nX_1 + 0.204\ell nX_2 + 0.414\ell nX_3 + 0.175\ell nX_4 + 0.820\ell nX_5 + 0.031\ell nX_6$$

R^2 -adjusted = 0.85, F-test = 59.36 *

Where:

Y = Asparagus yield (kg/ha)

X_1 = Human labour (man-days/ha)

X_2 = Chemical fertiliser used (kg/ha)

X_3 = Organic fertiliser (kg/ha)

X_4 = Pesticide (US$/ha)

X_5 = Seed (US$/ha)

X_6 = Fuel (US$/ha)

A = Constant coefficient = -1.123

ln = natural logarithm

* = Significant at p = 0.05

** = Significant at p = 0.10

All variables were expressed in natural logarithms, the F-tests indicated the joint significance of all independent variables; and the value of the adjusted R^2 was relatively high at 0.85. All the input variables had the expected signs and their coefficients were statistically significant at the 5 percent level or 10 percent level. From the Cobb-Douglas production function (equation 2) 'A' = -1.123. This constant, as it is negative, indicates that without the use of the six inputs; labour, chemical fertiliser, organic fertiliser, pesticide, seed, and fuel in the production process we would expect an asparagus yield of 0 kg per ha.

Heady and Dillon (1961) state that the Cobb-Douglas production function can be used to measure the returns to scale. The returns to scale show the change in output relative to a proportional change in all inputs. The regression coefficient for each factor can be interpreted directly as elasticity. The sum of regression coefficients of production is a measure of return to scale. This is a functional form of the Cobb-Douglas production function:

$$f(K,L) = bK^aL^c$$

Where:

K = capital

L = labour

- If a+c = 1, production function has constant return to scale.
- If a+c < 1, returns to scale are decreasing, and
- If a+c > 1, returns to scale are increasing.

Assuming perfect competition, 'a' and 'c' can be shown to be labour and capital's share of output.. The result reveals that the production function shows increasing returns to scale. That is, an increase of one percent of each of the six inputs would result in a greater than one percent increase in asparagus output. Equation 2 shows a positive relationship between all variables and asparagus produced. This is due to an increasing effect on asparagus yield as a result of applying the variables.

The Cobb-Douglas production function can be applied to utility. Economic efficiency occurs when the ratio of the marginal value product (MVP) of each input to its marginal factor cost (MFC) is equal to one (MVP/MFC = 1). If the magnitude of the ratio deviates from one, it indicates inefficient allocation of resources (Heady and Dillon, 1961). A situation in which the MVP of an input is less than its price would mean that the factor of production is over-utilised. On the other hand, if the MVP of an input is greater than its price, then the factor of production is being under-utilised. The relationship can be expressed mathematically as:

$$MVPxi = Pxi$$

$$MVPxi = (MPPxi)\,(Py)$$

Then $(MPPxi)\,(Py) = Pxi$

Or $MVPxi / Pxi = 1$

Where:

MVPxi = Marginal value product of input i

MPPxi = Marginal physical product of input i

	Py	=	Output price
	Pxi	=	Price of input i
	i	=	1, …….n
If	MVPxi / Pxi < 1	=	The input i of production is over-utilised
	MVPxi / Pxi = 1	=	Absolute efficiency has been achieved in the economics of the particular input of production.
	MVPxi / Pxi >1	=	The input i of production is under-utilised.

The profit maximising conditions require the MVP to equal the respective unit factor prices (Debertin, 1986). In other words, the maximum efficiency of resource use occurs when revenue gained from using one additional unit of input is equal to the cost of that additional unit. In the case of the labour, organic fertiliser, pesticide seed and fuel inputs, these are inefficiently used as their allocative efficiency coefficients equal 1.97, 7.63, 19.52, 170.21 and 6.44 respectively (Table 1), which are all greater than one. This denotes that labour, organic fertiliser, pesticide seed and fuel are under-utilised in production. It suggests that the profits of asparagus production could be increased by increasing these inputs. Chemical fertiliser is also inefficiently used, the MVP is less than the input price or the allocative efficiency coefficient equals 0.84. This implies that chemical fertiliser is over-utilised and profits of the asparagus enterprise could be increased by reducing the quantity of the input in production (Table 1).

Table 1. Marginal Physical Products (MPP), Marginal Value Products (MVP) and Marginal Factor Costs (MFC) for six asparagus production inputs

Variable	Elasticity	MPP	MVP (US$)	MFC or Price (US$)	MVPxi / Pxi (US$)
Labour	0.155	4.9592	5.90	3	1.97
Chemical Fertiliser	0.204	2.3420	2.79	3.34	0.84
Organic Fertiliser	0.414	0.5161	0.61	0.08	7.63
Pesticide	0.175	16.3997	19.52	1	19.52
Seed	2.909	143.0306	170.21	1	170.21
Fuel	0.031	5.4073	6.44	1	6.44

Source: Authors' calculations, 2003 field survey

The marketing system of asparagus has two elements: i.e. an open market and a contract system. The Thai-Japanese joint venture companies made contracts with farmers' groups (not with individual farmers) under witness of the district agricultural extension officers. The officers acted as coordinators and witnesses to arrange meetings between companies and committees from the farmers' groups, to supervise the formulation of contracts and to ensure that both parties agree to the contract. Some joint venture companies provided financial support, new knowledge and new technical information for farmers. The meetings were organised by extension officers for the benefit of farmers.

With regard to the costs, returns and profitability for the farmers, the profitability analysis in Table 2 reveals that asparagus farming is profitable (both per ha and per kg).

Table 2. Yields, prices, production costs, returns and profitability of asparagus production in 2003, US$

Item	Value
Yield per ha (kg.)	25227.35
Farm-gate price (US$ per kg.)	0.95
Gross return per ha (US$)	30020.55
Total cost (US$ per ha)	8307.01
Net profit (US$ per ha)	21713.54
Net return per ha (US$)	22017.75

Source: Authors' calculations, 2003 field survey

Contract farming gives advantages to both farmers and the joint venture company. Farmers have an assured market, stable income, access to the company's services, including credit and technical expertise. The joint venture companies have an assured supply of high quality asparagus with less fixed investment and at lower cost.

The analysis of total environmental cost (TEC) arising from growing asparagus will consider two elements: the cost of soil improvement (TEC_1); and the cost of impact on water (TEC_2). TEC_1 can be calculated by:

$$TEC_1 = Ld + Kr + Kd + La \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Where

Ld = The cost of improvement in soil nutrient status (US$/ha/year)

(Based on the organic fertiliser used).

Kr = The opportunity cost of agricultural equipment used for the improvement of soil (US$/ha/year)

Kd = The depreciation cost of agricultural equipment used for improvement of soil (US$/ha/year)

La = Labour cost of rehabilitating the soil to its original condition (US$/ ha/year)

TEC_2 can be calculated by using the concept of the reduction in productivity of the neighbouring area as a result of asparagus irrigation water becoming contaminated with

agro-chemicals and fertiliser (although, of course, fertiliser in run-off water may have a positive effect on yield). When the water from asparagus fields is released and flows through the adjacent industrial sugarcane field it induces changes in the soil's natural fertility. Sugarcane output is affected negatively, leading to a reduction in value of sugarcane output.

$$TEC_2 = (Y_1 - Y_2)(P_1 + P_2) / 2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where:

Y_1 = Sugarcane yield (at price P_1) before the impact

Y_2 = Sugarcane yield (at price P_2) after the impact

$(P_1 + P_2) / 2$ = Average price of industrial sugarcane product.

The field survey revealed that the TEC from growing asparagus for export can be expressed as the following simple linear regression:

$$TEC = TEC_1 + TEC_2$$

$$TEC = a + bY$$

From the analysis it becomes

$$TEC = 1.459 + 0.065Y \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$R^2 = 0.80$, F-test = 4.637* , D.W. = 1.923

The estimated model can be interpreted as follows:

The F-test of the joint significance of all independent variables is significant at $p = 0.05$. The high adjusted R^2 value in the model indicated that the variable Y (asparagus yield (kg/ha) accounted for 80 percent of the variation in total value of the environmental cost. Durbin-Watson (D.W.) is used for testing first-order autocorrelation in equations. The value of the Durbin-Watson (D.W.) statistic was below the critical value at the 5 percent level. The environmental cost function in Equation (5) shows that a 1 kg increase in asparagus yield will increase the environmental cost by US$ 0.065. Equation 5 allows calculation of the marginal environmental cost (MEC) that is equal to US$ 0.065 from the production of 1 kg of asparagus.

The price established for asparagus for export should reflect the marginal social cost (MSC) by adding the farmer production cost and environmental cost. The MSC is used for making decisions on production planning at farmer level and at government level for determining agricultural policy. The relationship of price level of asparagus arising from the marginal cost (MC), marginal environmental cost (MEC), and marginal social cost (MSC) is shown in Figure 1.

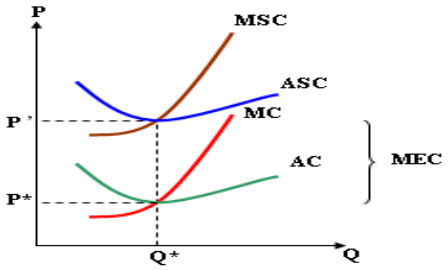

Figure 1 Market equilibrium and price (P) determination of asparagus production (Q). (MSC = marginal social cost; ASC = average social cost; MC = market cost; AC = average cost; MEC = marginal environmental cost)

In the open market, the average cost (AC) (sometimes also called average total cost - ATC) is used to explain the average cost to the private sector farmer and does not include any environmental cost. The market price of asparagus derived from the private cost (MC) for the farmer is P* = MC = 0.95 US$ per kg when the average cost (AC) is minimum that is the appropriate minimum price level which does not include an environmental cost (MEC). When the environmental cost is added, the asparagus price will increase from P* to P' where the average social cost (ASC) is at a minimum. The optimum price of asparagus produced for export under contract, taking the environmental and social costs into account, should be equal to P' = MSC = MC (0.95 US$) + MEC (0.065 US$) = 1.015 US$ per kg.

The appropriate environmental tax level of growing asparagus for export should take this environmental cost to society into account.

Conclusion

This study provides an overview of the development of a joint venture agribusiness involving asparagus production in Thailand for export to Japan. The sustainability of asparagus production under contract farming conditions depends on the collaboration of farmers to produce a high quality product by using local natural resources. Farmers' groups can centralise production from individual farmers and exercise bargaining power

in marketing. The joint venture company and government officials should be encouraged to give training to farmers in the new technique and knowledge for producing high quality products. It is hoped that the results of this study will provide guidance to the policy makers concerned regarding the sustainable development of agriculture.

Bibliography

Cobb, C.W. and Douglas, P.H. (1928). A theory of production. American Economic Review, 18 (Supplement): pp139-165.

Debertin D. L. (1986). Agricultural Production Economics. Macmillan Publishing Company. pp 261-264

Division of Horticulture Promotion (2000). Asparagus. Department of Agricultural Extension, Bangkok, Thailand.

Heady, E.O., and Dillon, J.L. (1961). Agricultural Production Functions. Ames, Iowa : Iowa State University Press.

Ikerd, J. (1993). Two related but distinctly different concepts: Organic farming and sustainable agriculture. Small Farm Today 101. pp 30-31.

Jitsaguan, T. (1999). A study of sustainable vegetable production systems in Central Thailand with implications on export potential to Japan. International Seminar on "Japan-Southeast Asian Agricultural Research Cooperation: Past Accomplishments and Future Needs" (November 18-23, 1999).

Matsuda,T. and Fujimoto,A. (1998). Commercial farming in Thailand, World Planning, 1998.

Toshiro, O. (1989). Economic Analysis of Rice Production on Large and Small Farms in Niigata, Japan. Bangkok: M.A. Thesis, Kasetsart University.

OAE (Office of Agricultural Economics), Agricultural Statistics of Thailand, 2004

White, B. (1997). Agro-industry and contract farmers in upland west Java. The Journal of Peasant Studies. Vol. 24, No. 3, April 1997. pp 100-136.