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THE DEVELOPMENT OF ORGANIC AGRICULTURE IN CHINA AND THE FACTORS AFFECTING ORGANIC FARMING*

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Abstract. The aim of the paper. The aim of the paper is to evaluate the impact of factors determining the transition to organic farming and provide some recommendations for government's policy relating to organic farming. Material and research method. An analysis was based on questionnaire survey on the willingness of organic farming by small farmers in the province of Jiangsu. Binary logistic regression model was used in the research. Concluding remarks. Five factors affecting organic agricultural production were discovered: farmers' age, risk preferences, labour costs, expected benefits and the environment. On this ground, the authors suggest, that Chinese government should adopt policies assisting farmers in the transition to organic farming for the sustainable development of China's organic agriculture. Cooperation of farmers' cooperatives and research institutions to improve organic farming techniques should also be promoted.

Key words: organic agriculture, influential factors in organic farming, government policy

INTRODUCTION

In order to regulate the production and certification of organic agriculture, China formulated a wide range of relevant laws and standards at the beginning of the 21st century, which have greatly contributed to the development of organic farming. At the end of 2012 China's organic agricultural land stretched over an area of 1.9 million hectares. It was ranked as the fourth in the world, represented 0.36% of the total area of agricultural production. As of the first quarter of 2013, 24 organic certification bodies granted organic accreditation to 8262 products (China's Food…, 2014). In 2012, 685 food manufacturing companies (including 12 foreign companies) and 2762 products received organic accreditations (The World of Organic Agriculture…, 2014).

In view of factors affecting organic farming, this paper analysed the willingness of farmers to run organic farming on the basis of the survey of farmers in Jiangsu, a leading province in organic agriculture. The aim of this paper is to evaluate the impact of those influential factors and provide some recommendations for government's policy relating to organic farming. The article consists of three parts and a summary. The first part presents the stages of development of organic agriculture in China. The second part describes the research project and shows the survey results. The third part discusses the main factors affecting organic production. Some suggestions for policy supporting organic agriculture in China are given in the summary.

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THE STATUS QUO OF ORGANIC AGRICULTURE IN CHINA

In the early 1980s China began to develop organic farming. In 1989 the Rural Ecological Research Centre of the Nanjing Institute of Environmental Sciences, a branch of the State Environmental Protection Agency, joined the The International Federation of Organic Agriculture Movements (IFOAM) and became its first member in China. In the 1990s organic farming was growing very slowly in China.

At the beginning of the 21st century, the State Environmental Protection Administration officially released the *Organic Food Certification Regulation*, followed by the *Organic Product Certification Regulations* and the *Organic Product Certification Implementation Rules*. These acts define organic certification and organic products, set standards for organic certification bodies and certifiers, basic principles for organic certification, organic labels, import requirements, international cooperation and regulatory initiatives; as well as specify goals of organic certification, scope of applications, standards of certification, procedures of certification, post-certification management, credentials, certification labels and certification fees.

In 2003 the State Council of the People's Republic of China issued *Certification and Accreditation Regulations of the People's Republic of China*. All certification bodies including organic certification bodies must meet these regulations. On 19 January 2005 the *Organic Product Certification Implementation Rules* and the Chinese National Organic Standards GB/T19630-2005 were officially released. In 2012 the abovementioned Chinese *organic* standards and *rules* were revised, and the organic product certification directory was enacted, establishing more stringent requirements for organic production, processing, marketing standards and certification procedures. In 2014, new *Organic Product Certification Regulations* were adopted to further strengthen the complete supervision. Those standardizations of organic product certification have substantially promoted the development of organic farming in the countryside.

As far as the regional distribution of organic agriculture China is concerned, the vast majority of organic plant production is concentrated in eastern coastal regions and north-eastern provinces, while organic animal husbandry is focused in western areas. The northeast region, including Heilongjiang Province, Jilin Province, Liaoning Province and Inner Mongolia, has the greatest variety and yield of organic agricultural production, as well as the largest area of certified organic agricultural products, where cereals and soybeans are the main types. The eastern region, including Beijing, Shanghai, Shandong, Jiangsu, Zhejiang, Jiangxi and Fujian provinces, is dominated by the production of organic fruit and vegetables, tea and processed organic products.

In 2010 the total sales of organic products was 15.19 billion yuan (2.30 billion USD), including 8.11 billion yuan (1.23 billion USD) of plant origin products sales, followed by 2.91 billion yuan (0.44 billion USD) of processed products sales. Wild collection, animal husbandry and fishery products had relatively smaller sales, i.e. 1.33 billion yuan (0.20 billion USD), 1.14 billion yuan (0.17 billion USD) and 820 million yuan (124 million USD), respectively. On the provincial level, Shandong, Jiangxi and Jiangsu are the top three provinces in organic sales, amounting to 1.62 billion yuan (0.25 billion USD), 1.16 billion yuan (0.18 billion USD), and 980 million yuan (149 million USD), respectively (Statistical Yearbook…, 2010).

In 2010 China's export of organic products to more than 20 countries reached 6.5 billion yuan (0.99 billion USD). Europe, North America and Japan were the main destinations. According to statistics, the exports of organic products ranging from the highest to the lowest are as follows: planting, fishery products, wild collection, processed goods, and animal husbandry. In terms of products varieties, beans are the product with the highest exports, making 42% of China's total exports of organic agricultural products. They are followed by grains, nuts, vegetables and tea. In organic products exports, Shandong, Fujian and Jiangsu are the top three provinces, amounting to 2.64 billion yuan (0.40 billion USD), 1.16 billion yuan (0.18 billion USD) and 980 million yuan (149 million USD) respectively (Statistical Yearbook…, 2010).

FACTORS TAKEN INTO CONSIDERATION WHEN DECIDING FOR TRANSITION TO ORGANIC FARMING

Some influential variables can change the velocity and direction of organic agriculture development. Government's policy might be one of these variables. For example, the EU supports its member countries with numerous funds to encourage farmers to run organic

production and the USA provides financing, insurance and technology, which have greatly contributed to the development of organic farming in this country. A lot of papers have discussed those influential factors in organic farming, including farmers' age and education, price of organic products, expected income, the environment benefits and food quality.

For example, Burton et al. (1999), Läpple and van Rensburg (2011), Genius et al. (2006), as well as Zhu (2007) used a binary logistic model and found that age of farmers had significant negative impact on the adoption of organic production, while Cheng et al. (2009) and Wang (2012) drew the opposite conclusion. Anderson et al. (2005) discovered that age did not have significant impact on organic farming.

Burton et al. (1999), Läpple and van Rensburg (2011), Genius et al. (2006) and Ceylan et al. (2010) observed that the environmental factors were one of the most important factors affecting farmers' decisions on organic production. Additionally, according to local farmers' characteristics and various research purposes other variables were also chosen by them, including family size, income level, the area of arable land, sales methods, sources of information, types of land ownership, farm machinery, membership in rural or environmental organisations, sponsorship by government or non-government groups, experience of receiving relevant training, satisfaction about the price of organic products, difference between organic products and ordinary products, etc.

Besides, Fairweather (1999) applied the game theory and the decision tree to analyse different motivations and constraints when households made decisions for or against transition to organic farming. Läpple and Kelley (2013) surveyed Irish farmers, applying planned actions theory, clustering methodology and principle component analysis to find that changes in economic incentives and technical barriers, as well as social acceptance of organic agriculture would constrain farmers' selection of organic farming. Chen et al. (2009) built a quality investment model of food producers and found that the main factors affecting the behaviour of organic producers were the prices of organic food, coefficient of productivity variation, capital adequacy of producers, costs of investment and government support.

However, due to the high costs of transition to organic farming and because of uncertainty on the market, instead of complete reliance on market mechanism two methods must be supplemented to induce farmers' preference to organic farming, including farmers' environmental responsibility and government subsidies. Zhang (2011) found that organic products have to secure relatively high market prices to maintain sustained production. Therefore, government should step up support policy to develop organic farming.

To sum up, the abovementioned studies primarily focused on farmers' own endowments and market factors affecting organic farming. But the authors assume that a number of factors including funding, risks, and barriers to transition to organic farming are also variables of vital importance in farmers' decisions concerning organic production. Therefore, the authors focused on Jiangsu, the top organic province in China, and used the binary logistic model to discuss the transition barriers and expected revenue from organic farming.

THE RESEARCH DESIGN AND SAMPLE DESCRIPTION

The Research Design

Jiangsu is one of China's fastest growing organic farming provinces in terms of the number of companies making organic products, the amount of processed organic products, domestic sales and exports. Local governments have introduced many policies to support and encourage farmers to switch to organic farming. Initially, the authors chose peach farmers in their research facility and had a small talk with them. They interviewed 160 farmers, but the effective sample was 140. The survey was conducted from 1 March to May 2013.

The contents of the questionnaire was as follows:

a) general characteristics of rural households, including age, educational status of householder, the number of family members, the number of farm workers, the average annual household income, etc.;

b) data on production of orchardists, including planting varieties, entitlement to agricultural preferential policies, farm loan history, and agricultural insurance experience, etc.;

c) information about awareness of organic farming, including knowledge about the organic production technologies, production standards, certification systems and traceability systems, and farmers' expectation of risks and returns in organic production.

Table 1. Description of the sample of farmers
Tabela 1. Charakterystyka próby rolników

Statistical characteristics Zmienna	Index Jednostka	Number of farmers Liczba rolników	Structure of the sample (%) Struktura próby (%)
Age Wiek	≤40	11	7.86
	40–49	30	21.42
	50–59	46	32.86
	≥60	53	37.86
Years of education Liczba lat edukacji	≤9	105	75.00
	10–12	35	25.00
	≥12	0	0.00
Number of family members Liczba członków rodziny	≤2	28	20.00
	3	21	15.00
	4	31	22.14
	≥5	60	42.86
Number of farm workers Liczba pracujących w gospodarstwie rolnym	1	28	20.00
	2	92	65.72
	3	10	7.14
	4	10	7.14
Annual average income (yuan) Przeciętny roczny dochód (yuan)	≤30000	55	39.28
	30000~69999	46	32.86
	70000~100000	18	12.86
	100000–150000	10	7.14
	≥1500000	11	7.86

Source: own elaboration based on the questionnaire survey (n = 140).
Źródło: opracowanie własne na podstawie wyników badań ankietowych (n = 140).

The sample description

The study showed that 70.7% of the respondents were aged over 50 years. 75% of them completed less than nine years of education. About 42.9% households had more than 5 members, whereas households with 1 or 2 farm workers made up 85.7% of the sample. In addition, 39.3% of surveyed households earned annual income less than 30 000 yuan[1], 32.9% had annual income between 30 000 and 70 000 yuan, and 27.9% households reached annual income exceeding 70 000 yuan (Table 1). What is important, 15% of the respondents said that agricultural income made over 70% of the total income in their households.

Knowledge about organic farming among the surveyed farmers can be described as follows:

a) Answering the question: Have you ever heard about organic farming?, 36.43% of the farmers said that they had heard about organic farming before;

b) As far as understanding the organic production standards, technologies, certification system, and traceability system of organic food is concerned, 74.3% of the farmers had no idea about production standards and technologies of organic farming, while none of surveyed

[1] 1 USD = 6,13 yuan (according to the exchange rate of the NBP on May 31, 2013, when the survey was completed).

Table 2. Farmers' cognition in organic agriculture (%)
Tabela 2. Stopień znajomości systemu rolnictwa ekologicznego (%)

Evaluation Ocena	Organic production standards and technologies Standardy i technologie produkcji ekologicznej	Organic certification system System certyfikacji produkcji ekologicznej	Organic food traceability system System identyfikacji i śledzenia pochodzenia żywności ekologicznej
No idea Żaden	74.28	84.29	83.58
Some Znikomy	19.29	13.57	15.71
A little Niski	6.43	2.14	0.71
Familiar Dobry	0.00	0.00	0.00

Source: own elaboration based on the questionnaire survey (n = 140).
Źródło: opracowanie własne na podstawie wyników badań ankietowych (n = 140).

farmers did not understand organic farming thoroughly. Moreover, 84.3% and 83.6% of the surveyed farmers showed a total lack of understanding the organic certification system and organic food traceability system, respectively (Table 2);

c) Farmers' experience of receiving organic production training or guidance was also investigated. The study showed that only 1.43% of the farmers had ever taken part in trainings or received guidance on organic production. These data suggest that the farmers' knowledge about organic farming was very limited.

THE EMPIRICAL ANALYSIS

Model selection

To implement the logistic regression, which is well developed in model diagnosis in recent years, the dependent variable has to be binary and the independent variable can be of various types. Those demands on variables just serve the purpose of our analysis. Therefore, authors chose the binary logistic regression method (Binary Logistic Regression, BLR) as the empirical research method to assess the factors affecting farmers' willingness to engage in organic agricultural production.

The logistic regression model consisting of n independent variables can be described as:

$$\text{logit}(P) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n$$

$$\text{logit}(P) = \ln(P(Y_1)/P(Y_0))$$

$$\text{logit}(P) = \ln(P(Y_1)/P(Y_0)) = \\ = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n$$

In the equation above, Y_1 means the farmer is willing to engage in organic production, Y_0 means the farmer is reluctant to engage in organic production. The left side of the equation denotes the natural logarithm of likelihood which corresponds to the ratio of the occurrence and non-occurrence of events. The independent variables X_1 to X_n on the right side of the equation represent various possible influential factors affecting the farmers' willingness to conduct organic agricultural production. β_0 is the constant (intercept), and β_1 to β_n are the regression coefficients (sloaps), which are the estimated parameters measuring the resultant change in log likelihood for a one-unit change in the independent variable. Therefore, this model can reflect the influence and significance of each independent variable on the dependent variable.

The selection and definition of the variables

According to the purpose of this study, combined with the abovementioned theory of planned behaviour, as well as domestic and foreign research results and the reality of Chinese countryside, this article classifies the factors affecting farmers' decision to engage in organic agricultural production into the following three

Table 3. Definition and assignment of variables
Tabela 3. Definicja zmiennych wykorzystanych w modelu

Variables Zmienne	Definition Definicja
X_1	<40 = 1,40–49 = 2, 50-60 = 3, >60 = 4
X_2	6 ranks from preference to aversion: complete risk preference = 1, strong risk preference = 2, ordinary risk preference = 3, medium risk preference = 4, risk aversion = 5, complete risk aversion = 6 6 kategorii: pełna skłonność do ryzyka = 1, silna skłonność do ryzyka = 2, zwykła skłonność do ryzyka = 3, średnia skłonność do ryzyka = 4, awersja do ryzyka = 5, pełna awersja do ryzyka = 6
X_3	yes =1， no = 0 tak = 1， nie = 0
X_4	yes = 1， no = 0 tak = 1， nie = 0
X_5	yes = 1， no = 0 tak = 1， nie = 0
X_6	yes = 1， no = 0 tak = 1， nie = 0
X_7	yes = 1， no = 0 tak = 1， nie = 0

Source: own elaboration.
Źródło: opracowanie własne.

categories. The first category denotes farmers' characteristics, including age of the householder (X_1) and risk preferences (X_2); the second category concerns expected obstacles in organic production, including the availability of sufficient funds for the transition to organic production (X_3), and the adequacy of labour (X_4); the third category involves farmers' expected benefits from organic production, including the opinion whether organic production can increase revenue (X_5) and improve the environment (X_6), as well as whether organic products are more safety and beneficial to health (X_7).

The analysis and interpretation of the results of regression

After the identification of the dependent variable and independent variables, the binary regression analysis with SPSS 17.0 was conducted adopting forced entry method for the introduction of independent variables. The estimated results are shown in Table 4.

The overall effect of the model fits in good condition. The χ^2 value of 79.320 and its significance level of 0.000 in chi-squared test suggest good fitting. The small –2 Log 1ikelihood value of 112.928 from the likelihood ratio test manifest the satisfactory fitness. Both the high Cox & Snell R square value of 0.433 and the high Nagelkerke R Square value of 0.579 indicate the soundness of the model. The χ^2 value of 10.760 and its significance level of 0.216, well beyond the 0.05 threshold, in the Hosmer-Lemeshow test lead to the acceptance of the null hypothesis that no significant differences exist between the observed data and forecasted data. The overall predictability of the model was 84.3%, showing the reliability of the regression model for accurately describing the reality. Therefore, the authors use this as the final model.

According to the results of the model, the following conclusions were drawn. Firstly, age has a positive effect on farmers' willingness to engage in organic farming at 5% significance level. When the other conditions remain unchanged, farmers are more likely to conduct organic farming when they get elder. The possible reason is that elder farmers in China pay more attention to health issues.

Secondly, risk preference demonstrates a positive influence at 1% significance level. This shows that risky farmers prefer organic farming more than risk-averse ones, probably because they can bear higher input costs and greater market price fluctuations in contrast to conventional farmers.

Thirdly, labour has a positive effect at 5% significance level, indicating that the more abundant labour is, the stronger farmers' willingness to conduct organic production is. This is because organic farming prohibits chemical fertilisers and pesticides and requires manual weeding, and therefore it demands more labour than conventional farming. Hence labour-abundant family enjoy greater advantage.

Fourthly, expected income exhibits positive influence at 1% significance level, suggesting that the higher farmers' income from organic production is expected, the more willing farmers are to turn to organic production. This conclusion is consistent with the assumption that in business it is a rational choice to maximise one's own economic interests. Farmers will likewise pursue maximum profits when deciding on production methods and techniques.

Table 4. Estimation result of logistic model
Tabela 4. Estymacja parametrów modelu regresji logistycznej

Specification Wyszczególnienie	B Współczynnik	Std. Err. Błąd standardowy	Wald Statystyka Walda	df Liczba stopni swobody	Sig. Istotność	Exp(B) Iloraz szans
X_1	0.588**	0.264	4.957	1	0.026	1.800
X_2	0.645***	0.160	16.282	1	0.000	1.906
X_3	0.263	0.527	0.249	1	0.618	1.301
X_4	1.272**	0.547	5.405	1	0.020	3.569
X_5	2.769***	0.527	27.649	1	0.000	15.950
X_6	2.118*	1.205	3.089	1	0.079	8.314
X_7	–3.118	2.378	1.719	1	0.190	0.044
Constant Stała	–3.753	2.313	2.633	1	0.105	0.023
Model as whole Razem	Chi-square (χ^2) = 79.320.126, Sig = 0.000, -2 Log likelihood = 112.928, Cox & Snell R Square = 0.433, Nagelkerke R Square = 0.579, Hosmer-Lemeshow-square = 10.760, Sig = 0.216 Chi-kwadrat (χ^2) = 79.320.126, p = 0.000, -2 logarytm wiarygodności = 112.928, Coxa i Snella R kwadrat = 0.433, Nagelkerke'a R-kwadrat = 0.579, Chi-kwadrat Hosmera-Lemeshowa = 10.760, p = 0.216					

Note: * indicates the 0.1 significance level, ** indicates the 0.05 significance level, *** indicates the 0.01 significance level; lack of * indicates the significance level higher than $p > 0.1$.
Source: own elaboration based on the questionnaire survey (n = 140).
Objaśnienie: * oznacza istotność parametru na poziomie 0,1; ** oznacza istotność parametru na poziomie 0,05; *** oznacza istotność parametru na poziomie 0,01; brak * oznacza, że ocena parametru jest statystycznie istotna na poziomie $p > 0,1$.
Źródło: opracowanie własne na podstawie wyników badań ankietowych (n = 140).

Fifthly, environment has a positive effect at 10% significance level, showing that organic farmers see considerable environmental benefits and are more willing to switch to organic production. The reason may be that frequent incidents of environmental pollution have raised farmers' awareness of environmental protection. The expected environmental benefits are one of the most important factors determining the selection of agricultural production methods.

CONCLUDING REMARKS AND SUGGESTIONS

The empirical results suggest that such factors as age, risk preferences, labour abundance, expected income and environment can significantly affect farmers' willingness to engage in organic agricultural production. The study showed the strong willingness of farmers to switch to organic agriculture, but restricted by limited government's support and inadequate understanding of organic farming by farmers. To promote the rapid progress of organic agriculture in China, the following policy suggestions are recommended:

1) Government should strengthen policy support in organic farming. Government subsidises to organic farmers at all levels, reductions in the organic agriculture tax and certification fees, and technical guidance for farmers will greatly improve farmers' willingness to switch to organic production and upscale organic agricultural production. Government propaganda on laws, certifications and production processes concerning organic agriculture can enhance farmers' awareness

of organic farming and provide assistance in their decision-making;

2) Government should encourage local transfer of surplus rural labour into organic agricultural production. Compared with conventional farming, organic farming is more labour-intensive, demanding higher quantity and quality of labour. Therefore, government can achieve the purpose of absorbing surplus rural labour, encouraging highly educated farmers to engage in organic farming, and creating more opportunities for organic farming development through improvement in farmers' welfare standards, strengthening in rural social security systems and financial services, and reinforcement in rural infrastructure constructions;

3) Government should support the establishment of organic agricultural cooperatives. Rural cooperatives are consistent with the realities in the Chinese countryside, therefore effectively overcoming the weakness of decentralized individual farming, strengthening farmers' negotiation power, reducing their transaction costs, raising their income, and facilitating their access to market information and technical services are vital to enable them to better react to market changes.

4) Government should expand cooperation with universities and research institutions in organic R&D. Due to the backwardness of organic farming techniques and research, organic farming centres can cooperate with universities to develop new technology and seeds, helping organic crops better resist various risks. Those centres can also introduce new management and marketing practices to provide professional guidance and services for the stable and sustained development of organic farming.

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ROZWÓJ ROLNICTWA EKOLOGICZNEGO W CHINACH I CZYNNIKI WPŁYWAJĄCE NA ROLNICTWO EKOLOGICZNE

Streszczenie. Cel artykułu. Celem artykułu jest zidentyfikowanie czynników determinujących podjęcie i rozwój produkcji ekologicznej w chińskich gospodarstwach rolnych oraz sformułowanie zaleceń dla polityki gospodarczej mającej na celu wsparcie tego systemu produkcji.
Materiał i metoda badań. Materiał źródłowy stanowiły wyniki badań ankietowych przeprowadzonych wśród rolników podejmujących produkcję metodami ekologicznymi w małych gospodarstwach rolnych prowincji Jiangsu. W badaniach wykorzystano model binarnej regresji logistycznej.
Wnioski. Dowiedziono, że istotny wpływ na podejmowanie produkcji ekologicznej miały: wiek rolników, skłonność do ryzyka, koszty pracy, spodziewane korzyści i względy środowiskowe. Dalszemu rozwojowi rolnictwa ekologicznego w Chinach mogłyby sprzyjać polityka wsparcia ze strony państwa adresowana do rolników podejmujących decyzję o konwersji na produkcję ekologiczną oraz promowanie współpracy spółdzielni rolniczych i instytucji badawczych w celu doskonalenia technik produkcji ekologicznej.

Słowa kluczowe: rolnictwo ekologiczne, czynniki determinujące podjęcie i rozwój produkcji ekologicznej, polityka gospodarcza

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