AGRISOCIONOMICS
Jurnal Sosial Ekonomi dan Kebijakan Pertanian

ISSN 2580-0566 EISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
4(2): 238-246, November 2020

THE UTILIZATION OF INFORMATION TECHNOLOGY IN IMPROVING MARKETING PERFORMANCE OF AGRICULTURAL PRODUCTS

Condro Puspo Nugroho*, Rini Mutisari, and Anisa Aprilia
Department of Agricultural Socio-Economics, Faculty of Agriculture, Brawijaya University, Malang, Indonesia
Correspondence email: condro@ub.ac.id

Submitted 05 December 2019; Accepted 04 July 2020

ABSTRAK

Excess supply dari produk pertanian cenderung akan terjadi jika jumlah produksinya tidak termanfaatkan sepenuhnya oleh pasar. Diharapkan petani bisa memanfaatkan teknologi dalam pemasaran hasil pertaniannya (*e-marketing*). Semakin tinggi tingkat pengetahuan terhadap IT semakin besar peluang dalam pengunaan *e-marketing*. Penelitian ini mempunyai tujuan mengkaji tingkatan pengetahuan dan keterampilan penggunaan teknologi informasi oleh petani, serta dampak pemanfaatannya terhadap pemasaran hasil pertanian, harga jual hasil pertanian dan tingkat pendapatan usahatani dibandingkan pemasaran dengan metode konvensional. Penentuan lokasi penelitian dilakukan menggunakan metode purposive pada Kabupaten Malang dan Kota Batu sebagai sentra tanaman hortikultura di Provinsi Jawa Timur. Pada kabupaten sentra dipilih kecamatan sentra komoditas yang selanjutnya dipilih desa sebagai tempat penelitian. Metode yang digunakan untuk menguji tujuan tersebut adalah uji beda rata-rata Independent sample t-test. Metode ini digunakan karena sampel yang akan diuji adalah dari dua kelompok yang berbeda yaitu petani yang menggunakan metode konvensional dan petani yang menggunakan *e-commerce* dalam proses pemasaran produk pertaniannya. Hasil analisis menunjukkan bahwa terdapat perbedaan yang signiifikan pada variabel harga, volume penjualan, dan pendapatan usahatani antara kedua kelompok. Dimana rata-rata harga yang diterima, volume penjualan, dan tingkat pendapatan milik petani pengguna *e-marketing* lebih besar daripada petani konvensional.

Kata Kunci*: e-marketing*, harga, konvensional, pendapatan, volume penjualan

ABSTRACT

Excess supply on agricultural products tends to occur when the market does not fully utilize their products. In that condition, technology plays an essential role in helping farmers promote and sell their products (e-marketing). In the other hand, applying e-marketing requires specific knowledge and skill by the farmers as the users. Higher knowledge and skill about IT mean a higher chance for farmers to apply e-marketing for their business. This research aimed to identify the level of farmers' knowledge and skill on using IT and to analyze its impact on the level their income, revenue, and selling price. Location of research was chosen purposively at Malang Regency and Batu City as production areas of horticultural products in Province of East Java. The samples were categorized into two; those were farmers who use e-commerce and those who do not (conventional farmers). The data was analyzed and tested used independent t-test to compare those categories. The results indicated that the level of income, revenue, and selling price were different significantly between those categories of the farmer, in which farmers who used e-commerce received higher income, higher revenue, and higher selling price than the conventional ones.

Keywords: *conventional, e-marketing, income, price, sales volume*

INTRODUCTION

Science and technology play a basic role in the establishment of sustainable agribusiness (Adenle et al., 2017). Information and communication technology can accelerate the development of agriculture by facilitating knowledge management and becoming the primary intervention for more efficient agriculture (Rao, 2007; Salampasis and Theodoridis, 2013). Technological development influences the economic level of a country and determines the competitive position of the country. The growth of information technology should be utilized in the marketing sector for agricultural products, given that agricultural commodities that have a short shelf life and are easily damaged need special marketing methods to be marketed to consumers. Therefore, we need an empowerment model for farmers with a cooperative farming model to shorten marketing distribution to consumers. Cooperatives as one of the preferred governance structures for realizing alternative food systems are recommended both in agriculture and downstream at the consumer level and thus, government support and regulations are crucial to revive the cooperative movement as an association of voluntary farmers for mutual benefit (Milovanovic and Smutka, 2018; Gonzalez, 2017; Shen and Shen, 2018). Meanwhile, to improve agricultural yields, farmers are expected to get advantages from current technological advances.

Advances in technology and science in all fields have improved annually, but not all groups in society can benefit from it. An example is the utilization of the internet by farmers. Internet development has advanced and almost everyone utilizes it to make their work easier. With the sustainable development of internet-related technology and its application in the production, transportation, inventory, sales, and management of product information, the internet has become an essential model and development trend in agricultural production, sales, and consumption. The Internet of Things (IoT) has the potential to become a key to realize the vision of smart agriculture, even in the past few years, one of the most recognized aspects for benchmarking is IoT (Sinha et al., 2019; Shen et al., 2018; Khanna and Kaur, 2019). Meanwhile, in many remote villages, the majority of farmers have low education levels and are even illiterate, so that technological advances cannot be utilized by them. Therefore, the use of the internet by farmers is passive because of a lack of knowledge and skills (Janc et al., 2019).Based on the description above, this study will examine the level of knowledge and skills in using information technology by farmers, as well as the impact of its utilization on the marketing of agricultural products, the selling price of agricultural products, and the level of farm income compared to marketing with conventional methods. Therefore, the results of this study are expected to become a policy for the government and e-commerce entrepreneurs who can adjust the characteristics of the pattern in utilizing information technology by farmers.

RESEARCH METHODS

This study was conducted using a purposive method in the city/regency of horticultural plant centers in East Java Province. Malang Regency and Batu City have the greatest horticultural potential in East Java Province. Subsequently, commodity center districts were determined, followed by selecting villages as the research sites. There are two types of respondents selected as the objects under study, thereby the method of determining the sample used was different. First, for respondents of farmers who carried out conventional marketing (13 respondents), the Multi-stage cluster sampling method was used. Second, respondents of farmers who utilized the internet (7 respondents), the purposive sampling method was used by interviewing farmers who were partnering with one of the developing e-commerce in Indonesia.

Measurement of the knowledge level of information technology in farmers was carried out by using a list of 13 items with various types of questions and right and wrong assessments. The formula used to measure the percentage of the results obtained from the interview process according to Arikunto, 2013 was as follows:

$$Percentage = \frac{the\ number\ of\ correct\ values}{the\ number\ of\ questions} x\ 100\ \%$$

The category of farmer knowledge level was divided into three levels based on the percentage value as follows:

1. The knowledge level is high if the value ≥ 76-100%
2. The knowledge level is moderate if the value ≥ 60-75%
3. The knowledge level is low if the value ≤ 60%

To answer the objectives in this study, the analysis technique of the mean difference test of the price level, sales volume, and farm income between farmers who used IT and conventional farmers were carried out using the mean difference test method of Independent sample t-test. This method is used when two groups are compared independently, not in pairs, indicating that the variables to test for differences come from two different groups. In this case, the two groups of farmers who used IT and farmers who used conventional methods in the marketing process of their products.

The following is the formula for the Independent sample t-test method:

$$t = \frac{X - \mu}{s/\sqrt{n}}$$

Notes:

t = the value of t_{count}
X = sample mean
μ = population mean
S = sample standard deviation
n = the number of observations in the sample

The data used were primary data obtained through interview techniques. The main variables analyzed include selling price at the farm level (IDR/kg), sales volume (kg/week), and farm income (IDR/year). The research was conducted in Malang and Batu areas where the horticultural farmers used IT and conventional methods in the marketing process.

RESULTS AND DISCUSSION

Respondent Characteristics

Respondent characteristics in this study were presented in Table, in which the characteristics are described based on gender, area of land cultivation, age, last education, and farming experience. Table 1 shows that based on gender, male respondents dominated than female respondents. In the group of conventional farmers, male respondents were 84.61% and the rest were female respondents. Meanwhile, 100% of the respondents who used IT were male farmers. Furthermore, based on the area of land cultivation, the two groups of farmers were dominated by farmers who cultivated 1-3 ha of land, in which the conventional farmers were 53.85%, while the farmers who used IT were 42.86%.

There was a significant difference in the age variable, where conventional farmers were dominated by farmers aged 35-50 years, while farmers who used IT were 71.43 years old. In other words, farmers who used IT were dominated by young people, even the youngest respondent was only 17 years old. This is in accordance with existing conditions that younger people are better able to absorb new information and technology such as the use of e-commerce in their marketing methods.

Meanwhile, for the variable of last education, the group of farmers who used the conventional method had the lowest education level of elementary school, while those who used IT had the lowest education level of senior high school. Although it was not significantly different, if it is seen from the dominating level of education, farmers who used IT had a higher level of education than those who used conventional methods.

Table 1. Characteristics of Research Respondents

Information		Farmers Who Don't Use IT		Farmers Using IT	
		Total	Percentage	Total	Percentage
1	Sex				
	a Male	11	84.61	7	100
	b Female	2	15.39	0	0
	Total	13	100	7	100
2	Area of Land Concession				
	a < 1 ha	4	30.76	2	28.57
	b 1 - 3 ha	7	53.85	3	42.86
	c > 3 ha	2	15.39	2	28.57
	Total	13	100	7	100
3	Age (Years)				
	a 15 – 35 years	1	7.7	5	71.43
	b >35 – 50 years	7	53.85	2	28.57
	c >50 – 65 years	3	23.07	0	0
	d > 65 years	2	15.38	0	0
	Total	13	100	7	100
4	Lastest Formal Education				
	a Not completed in primary school	0	0	0	0
	b SD/equivalent	4	30.77	0	0
	c SMP/equivalent	2	15.38	1	14.28
	d SMA/equivalent	5	38.46	5	71.44
	e D1/D3	0	0	0	0
	f S1/S2	2	15.38	1	14.28
	Total	13	100	7	100
5	Farming Experiences				
	a < 5 years	3	23.08	4	57.15
	b 5 - 10 years	5	38.46	1	14.28
	c > 10 years	5	38.46	2	28.57
	Total	13	100	7	100

Source: Primary Data, 2019 (Processed)

Similar to the age, the higher the level of education, the faster a person can absorb information and new technology. Regarding the length of farming experience, farmers who used conventional methods had longer experience than those who used IT because farmers who used conventional methods tended to be older.

Knowledge Level and Operating Ability of Information Technology

Advances in information technology and science in all fields have improved from time to time but people cannot benefit from it, as experienced by farmers in using the internet. The advances of the internet are rapid and are used by all people in completing work. The majority of the education level of the farmers remains low and many farmers in

Indonesia are illiterate. Therefore, the improvement of technological advances does not have a beneficial impact on farmers.

On the contrary, technological advances are implemented to farmers, such as increasing access to price information by using communication tools in marketing oranges in Malang Regency and Batu City. The indicators used in measuring the knowledge level and abilities related to information technology are as follows:

Table 2 above describes many kinds of indicators in measuring the knowledge level and operating ability of information technology. There are 13 indicators used in measuring the knowledge level of farmers related to information technology, where 5 indicators are used to measuring the knowledge level and 8 indicators are used to measuring the level of ability.

Five indicators related to the measurement of knowledge level include Knowledge of Social Media which has Business Features, IT knowledge can expand the market, IT knowledge shows price information, Knowing that IT developments

Table 2. Percentage of Knowledge Levels and Information Technology Operational Ability Based on Each Indicator

No.	Indicator	Criteria	Percentage (%)
1	The intensity of using cellphones or gadgets	a. Every day	100
		b. Every week	0
		c. Never use	0
2	Internet Use Intensity	a. Every day	85
		b. Every week	0
		c. Never use	15
3	Ownership of social media accounts	a. Have a Social Media Account	70
		b Don't Have Social Media Accounts	30
4	Knowledge about social media as a feature for business	a. Knowing	55
		b. Do Not Know	45
5	IT knowledge can expand the market	a. Knowing	70
		b. Do Not Know	30
6	IT knowledge shows pricing information	a. Knowing	65
		b. Do Not Know	35
7	Knowing the development of IT quite rapidly	a. Knowing	75
		b. Do Not Know	25
8	Knowledge of the benefits of IT in agriculture	a. Knowing	65
		b. Do Not Know	35
9	Gadget application capabilities	a. Able to use the application	80
		b. Not able to use the application	20
10	Business IT application capabilities	a. Able to use the application	60
		b. Not able to use the application	40
11	The ability to utilize IT for market networks	a. Able to take the advantage	55
		b. Not able to take the advantage	45
12	The ability to use IT for price access	a. Able to take the advantage	60
		b. Not able to take the advantage	40
13	IT usage customization capability	a. Able to adjust	50
		b. Not able to adjust	50

Source: Primary Data, 2019 (Processed)

Tabel 3. Knowledge Level Categorization Based on Farmers Using IT and Conventional Farmers

No.	Knowledge Level Category	Score	Percentage (%)	
			Conventional Farmers (Don't Use IT)	**Farmers Who Use IT**
1	Low	1-5	46.15	0.00
2	Moderate	6-10	30.77	57.14
3	High	11-14	23.08	42.86
Total			100.00	100.00

Source: Primary Data, 2019 (Processed)

are quite rapid, and Knowledge of the Benefits of IT in the Agriculture Sector. Meanwhile, the eight indicators related to the measurement of the level of ability are represented by the ability to use gadget applications, the ability to use business IT applications, the ability to use IT for market networks, the ability to use IT for price access, the ability of adjustment of using IT, and the intensity of using the internet and social media.

As seen from the results, all farmers utilized gadgets in their daily lives and most of them used the internet. However, only less than 40% of farmers used this information technology in marketing their agricultural products. This is similar to the results of a study in Curut Village, Penawangan District, Grobogan Regency, Central Java, which stated that the knowledge level of farmers about the selling system using the internet was 100%, but only 9.26% could use the internet for everyday use and even only 5.6 % of farmers who used the internet for trading (Yuantari et al., 2016). Besides, according to Rao (2007), when seen from the institutional network in agriculture with the use of information technology, India could overcome obstacles and effectively integrate farmer capacity development into the agricultural development process. Therefore, with information technology, farmers could improve their ability to access markets and eventually received an impact on the development of the agricultural economy in general.

Table 3 above shows the relationship between the knowledge level of farmers on IT knowledge and the ability to operate technology. The level of IT knowledge was divided based on 3 categories, which were low, medium, and high based on the Guttman score for each indicator. The table above shows that the higher the level of IT knowledge, the greater the opportunity to utilize information technology in marketing agricultural products. When seen from the group of farmers who used IT, 42.86% were in the high knowledge level category and 0% of the farmers were in a low category. Meanwhile, in the group of farmers who used conventional methods in marketing their agricultural products, the majority of 46.15% were in the low category in the level of IT knowledge and only 23.08 percent were in the high category. It causes the knowledge level of the farmers related to information technology to greatly affect the methods to be used in marketing their harvest results.

The Difference in Sales Performance

The following are the results of the analysis of the mean difference test for the variables of the selling price, sales volume, and farm income as presented in Table 4.

Table 2 shows that all variables of the selling price, sales volume, and farm income had significant differences between the two groups of respondents. Among the three variables tested, the variable of selling price had the most significant difference between the two groups, which was significant at the level of $\alpha = 0.01$. The average price received by farmers using conventional methods of marketing was IDR 7,291.67/kg, while that received by farmers who used IT was IDR

Table 4. Results of the Difference Test for the Variable Average Selling Price, Sales Volume, and Income Level between Farmers Using Conventional Methods and Farmers Using IT in the Marketing Process

No.	Variable	Average Score		Sig t-test
		Conventional	**IT User**	
1	Price (IDR/kg)	7,291.67	10,309.43	0.000
2	Sales volume (kg/week)	787.77	6071.43	0.089
3	Income (IDR/year)	148,938.62	296,388.86	0.045

Source: Primary Data, 2019 (Processed)

10,309.43/kg. The difference was quite large of IDR 3,017.76/kg. It was because of differences in the marketing methods adopted by the two groups of respondents which gave an impact on the marketing chain. In the conventional method, before reaching the final consumer, the products marketed from farmers pass through several marketing agencies. Therefore, the selling price received by farmers tends to be lower. Meanwhile, farmers who used IT in selling their products only involve the institutions of farmers - partner companies - end consumers. Even some farmers sell the products directly to end consumers by utilizing their social media, so it is likely that the price received will be higher.

Meanwhile, the variable of sales volume between conventional farmers and farmers who used IT had a significant difference at the 1% significance level. The weekly sales volume for conventional farmers was 787,77 kg while that for farmers who used IT was 6071.43 kg. This significant difference can result from several aspects. First, the market reach of the farmers who used IT is wider than conventional farmers. Second, it is because of the discounts that are often given by partner companies (marketplace) to consumers where the products are sold. Therefore, this has encouraged more and more consumers to buy these products. Besides, because of the existence of IT, consumers also quite easy to find the desired item because they only need to choose to pay and wait for the goods to be delivered to their house.

The last variable was income which also had a significant difference at the level of $\alpha = 0.05$. The average income of conventional farmers was IDR 148,938.62/ha/year, while the income of farmers who used IT was IDR 296,388.86/ha/year. This difference is highly reasonable because the impact of the price and sales volume received by farmers who used IT was greater than conventional farmers.

This is in line with the results of a study conducted by Yuantari et al. (2016) which stated that the utilization of the internet can help farmers in simplifying the marketing of agricultural products and improving the selling value so that it also increased the income of farmers in Curut Village, Penawangan District, Grobogan Regency, Central Java.

Based on the descriptions presented earlier, it can actually be seen that farmers who used IT for the marketing process of their agricultural products earn more profit than those who dis not use IT. It can mainly be seen from the difference in selling prices and market reach, which is why many young farmers shift their conventional sales to IT-based sales. Besides selling prices and market reach, another reason is that the use of IT can also expand communications and networks.

As for farmers who did not use IT, the results of the interview show that there is actually a desire from the farmers to participate. However, because of limited information, the ability to access information media and applications, and particularly the concern that they could not meet the target when needed, then they did not use IT. The concern for not being able to meet the target is also because their average land ownership is narrower when compared to farmers who used IT.

CONCLUSIONS

Farmers who used conventional methods and those who used IT in their marketing were both dominated by farmers who cultivated 1-3 ha of land, in which 53.85% were conventional farmers, and 42.86% were farmers who used IT. The cultivation of the land was quite wide (the area of cultivation of land >1 ha in Java is categorized as wide) because the farmers selected as the samples were horticultural farmers. Meanwhile, food crop farmers who tended to have narrow land remained using conventional methods for marketing.

The level of IT knowledge in the group of farmers who used IT was 42.86% in the high category and 0% of the farmers were in a low category. Meanwhile, in the group of farmers who used conventional methods in the marketing of agricultural products, the majority of 46.15% had a low category in the level of IT knowledge and only 23.08 percent were in the high category. It causes the knowledge level of the farmers related to information technology to greatly affect the methods to be used in marketing their harvest results. Therefore, the higher the level of IT knowledge, the greater the opportunity to utilize information technology in marketing agricultural products.

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