Risk Production of Semi Organic and Conventional Vegetables Farming in Semarang Regency, Central Java, Indonesia

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Abstract- This research aims to analyze characteristics of semiorganic and conventional vegetable farmers, types of crops and cropping patterns, the cost structure of farming, and risk productivity semiorganic and conventional vegetable. The research location is determined by purposively, in four villages in Semarang Regency. The number of samples 132 farmers, consisting of 30 semiorganic vegetable farmers and 92 conventional vegetable farmers randomly selected. Data were collected by survey method through interviewing by using structured questionnaires and observation. The data were analyzed descriptively and risk analysis with used calculation of standard deviation and coefficient variation. The results show characteristics semiorganic vegetable farmers such as age, education, number of family members in farming, farming experience are higher than conventional vegetable farmers, except farm size. The types of crops semiorganic and conventional vegetables farmers are the same, but the semiorganic vegetable farmers more choose cabbage, tomatoes and chinese cabbage. Conventional vegetable farmers choose cabbage, chili, tomatoes and tobacco. The highest cost structure for semiorganic and conventional vegetable farming is for labor costs. The highest cost of vegetable production was in labor costs. Total production cost of semiorganic vegetables was 31 percents higher than conventional ones. The risk analysis of productivity used by deviation standard showed that the risk productivity of semiorganic vegetables 59 percents higher than the conventional one. The risk analysis of productivity used by the coefficient of variation showed that the risk productivity of organic vegetable 13 percents lower than the conventional ones.

Keywords*: conventional vegetable, farmers' risk, production risks, organic vegetable*

I. INTRODUCTION

Vegetables are one of the horticultural commodities which have a strategic role in the Indonesian economy. GDP horticulture vegetables increased from the year 2009 amounting to IDR 56.82 trillion to IDR 73.78 trillion in 2012 with a rate increase of 9.86 percents. Central Java is one of the largest vegetable producer in Indonesia, with six featured vegetable commodities, namely: onion, cabbage, potatoes, carrots, red chili and scallions. One of the regency of 35 regencies / cities in Central Java Province which is a producer of vegetable is Semarang Regency (Biro Pusat Statistik/BPS Kabupaten Semarang, 2016). Four main types of vegetables are cultivated farmers and is a typical highland vegetables are cabbage, chinese cabbage / lettuce, tomatoes, and carrot. The planting area for the four types of vegetables from the year 2012-2014 is likely to fluctuate as shown in Figure 1(Biro Pusat Statistik Provinsi Jawa Tengah, 2016). .

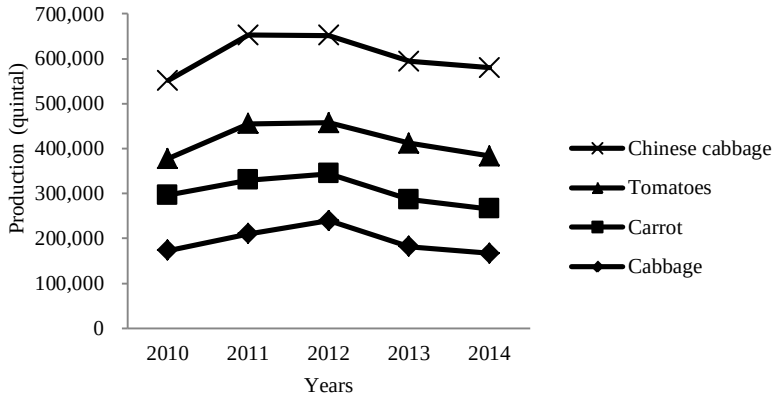

Figure 1: Production of Four Main Vegetables Types in Semarang Regency, 2010-2014

Fluctuations in production are an indication of production risks. Risks in agricultural activities is unique because in its activities by natural conditions such as climate, pests and diseases, drought and others. Some sources of risk that may be faced by farmers include

production risk, market risk or price risk, institutional risk, policy risk and financial risk (Ellis, 1988; Harwood et al., 1999; Moschini and Hennessy, 1999). From several sources of risk, it appeared that the main risks faced by farmers include the risk of production and the price of the product (Patrick et al., 1985; Wik et al., 1998). Indications of risk in farming activities are variations, fluctuations, or volatility of the results expected by the farmers.

The measures to calculate the risk is variance, standard deviation, and coefficient of variation (Elton and Gruber, 1995). These three measurements are related to each other. Random sizes that are used most of the standard deviation is a measure that describes the average deviation difference. The more varied results or returns then the risk will be even greater. Coefficient of variation is the result of the ratio of standard deviation to the expected return or expected returns can be very appropriate size for decision makers, especially in choosing an alternative from some business activities.

Vegetable farmers in Semarang Regency is aware of production risk and price risk, so in most cases farmers diversify farming with intercropping systems. The average farmer to plant more than three kinds of vegetables, with the aim to address the risk and optimize land use. Cultivation of vegetables cultivated in semiorganic and conventional.

Cavigelli et al. (2009) compared the long-term economic performance between the methods of organic farming and conventional farming in the Middle Atlantic region. Comparisons were made for organic grain and forage. From their research, Cavigelli et al. (2009) concluded that the premium price level then the net result (net return) organic farm is 2.4 times higher than conventional agricultural products; otherwise the risk of organic farming is 1.7 lower than conventional farming. The advantages of organic farming methods that others are, in the long term results of production increased and conversely, decreased production costs.

In general farming system called organic agriculture when food production process (and other agricultural products) are natural (, do not rely on chemical fertilizers and pesticides, artificial hormones, antibiotics such as frequently used in animal husbandry and does not use Genetically Modified Organisms (GMOs) (United Nations Conference on Trade and Development (UNCTAD), 2009).

Conventional farming is usually contrasted to organic farming. The United State Department of Agricultural (USDA) describes conventional farming systems as "conventional farming systems vary from farm to farm and from country to country. However, they share many characteristics: rapid technological innovation; large capital investments in order to apply production and management technology; large-scale farms; single crops/row crops grown continuously over many seasons; uniform high-yield hybrid crops; extensive use of pesticides, fertilizers, and external energy inputs; high labor efficiency; and dependency on agribusiness." (Organic and Conventional Agriculture, 2016).

Agricultural conditions in Indonesia is still in the process of transition between conventional farming systems toward sustainable agricultural systems. Sustainable agricultural systems still can not be applied evenly across Indonesia. This is because farmers do not want to risk reduction in production on their land. The decline in production is due, soil conditions accustomed to the intake of the chemical to be down quality, so when will implement sustainable agricultural soil quality must be restored first be of good quality. Returns soil quality requires a long time, resulting in nutrient intake obtained by the plant to be reduced and result in decreased production yield. This is what makes farmers reluctant to implement sustainable agricultural systems.

Organic farming is one part of a sustainable agricultural system, in which farming systems include various techniques, such as inter-cropping, mulching, crop and post-harvest handling. Organic farming has a characteristic in law and certification, a ban on the use of synthetic materials, as well as the maintenance of soil productivity.

In this study used the term semiorganic because farmers do not fully apply the principles of organic farming as defined above. The purpose of this study were to analyze characteristics of semi organic and conventional vegetable farmers, to identify types of crops and cropping patterns semiorganic and conventional vegetable farming, to analyze the cost structure of farming semi organic and conventional vegetables, and to compare risk productivity semi organic and conventional vegetable.

II. RESEARCH ELABORATIONS

Location Sample

Research location was purposively determined such as in Semarang Regency by considering as follow: (1) Semarang Regency is as one of the biggest vegetables production center in Central Java, (2) vegetables comodity was sought by farmers in semi organic and conventional way. Then this research selected Getasan District as the biggest contributor of vegetables, variety of vegetables, sought in semiorganic and conventional way. From 13 villages in Getasan Subdistrict, four villages was chosen. The semiorganic vegetables only existed in Batur Village, so the semi organic vegetables' location was only Batur Village. Conventional vegetables' location were Wates Village, Tolokan Village, and Tajuk Village.

Farmer Samples

Total population vegetable farmers at four (4) villages is 198 . With Slovin's formula (Slovin's formula sampling techniques, 2015):

n = N / (1 + Ne^2)
= 198 / (1+ 198.$(0,05)^2$)
= 132

n = number of samples
N = total population
e = error tolerance (5%)

The conventional vegetables sampling used random sampling method, except in Batur Village, because there was only 30 farmers of semiorganic vegetables. Sample distribution of farmer according to the village was able to be observed in Table 1.

Table 1: Distribution of Vegetables Farmers Amount

Details	Semi Organic	Conventional			Total
	Batur Village	Wates Village	Tolokan Village	Tajuk Village	
Number of Population	30	55	54	59	198
Number of samples	30	33	33	36	132

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Type and Method of Data Collection

Basic method that used in this research was analytic descriptive method. Type of data that used was pooled data, consisted of time series data of planting season for one year (2014/2015) to get production risks and cross section data, as many as 132 persons of farmer in Getasan District that did semiorganic and conventional way of vegetable farming.

Source of data that used were primary and secondary data. Primary data was done by interviewing farmer as a sample based on questionnaire that has been designed specifically for research and direct observation in the field. The captured data was vegetables farm information that was sought by respondent farmers in Planting Season 2014/2015, those were characteristic of vegetable farmers (age, education, farm experience, amount of family members, farm size), types of crops, cropping patterns, farm input and output per planting season, the price of input and output. Secondary data was collected from report data Department of Agriculture Semarang Regency and Province of Central Java, BPS Semarang Regency and other relevant agencies.

Method of Data Analysis

Data processing was used Microsoft Excel 2007. Data processing used descriptive analysis and risk analysis with used calculation of Standard Deviation, and Coefficient Variation.

III. RESULTS

Characteristics Semi Organic and Conventional Vegetable Farmers

Description characteristics of semi-organic vegetable farmers and conventional are presented in Table 2.

Table 2: Characteristics Semi Organic and Conventional Vegetable Farmers

Characteristic	Semi Organic Farmers	Conventional Farmers
Age (years)	46	43
Education (years)	7	6
Number of family members in farming (person)	2	1
Farming experience (years)	22.5	20.3
Farm size (m^2)	1,767	2,100

Table 2 shows that characteristics semi organic vegetable farmers such as age, education, number of family members in farming, farming experience are higher than conventional vegetable farmers, except farm size. Semiorganic farmers and conventional farmers cultivate less than 0.5 hectares of land, but with intensive exploitation.

Types of Crops and Cropping Patterns Semiorganic and Conventional Vegetable Farming

Semiorganic and conventional vegetables farmers seek more than one crop in a year, with planting patterns: vegetables - vegetables - vegetables / tobacco. Types of vegetables grown by farmers are cabbage, tomatoes, chili, cabbage and carrots. Farmers grow vegetables intercropping and or relay cropping. The average age of the plant 70-125 days. Land preparation starts before the rainy season (September). Planting vegetables do for the state of water sufficient (October to March). In the dry season, there are some farmers who grow tobacco. Table 3 shows the performance of the type of crops grown semi-organic and conventional farmers in one year.

Based on Table 3, although the types of crops semi-organic and conventional vegetables farmers are the same, but the semi-organic vegetable farmers more choose cabbage, tomatoes and Chinese cabbage. Conventional vegetable farmers choose cabbage, chili, tomatoes and tobacco.

Table 3: Types of Vegetable Plants Semiorganic and Conventional Farmers

Types of Vegetable Plants	Semi Organic (%)	Conventional (%)
Cabbage	100.0	100.0
Tomatoes	86.7	43.1
Chilis	20.0	57.8
Chinese cabbage	80.0	21.6
Carrot	13.3	15.7
Tobacco	23.3	40.2

The Cost Structure of Farming Semiorganic and Conventional Vegetables

The cost of farming is the production cost incurred by the semiorganic and conventional vegetable farmer during one year. Cost Structure farming illustrates how a farm managed by observing in detail the costs incurred for farming activities. Table 4 shows the cost structure of semiorganic and conventional vegetables farming.

Table 4: Cost Structure of Semiorganic and Conventional Vegetable Farming per hectare

Type of production costs	Semiorganic vegetables		Conventional vegetables	
	IDR	%	IDR	%
Seeds/seedlings (IDR)	1,378,783	3.93	1,277,529	4.78
Organic fertilizer (IDR)	7,614,250	21.72	4,841,462	18.10
Urea (IDR)	800,651	2.28	396,005	1.48
SP36, KCl (IDR)	1,488,076	4.25	908,181	3.40
NPK (IDR)	871,788	2.49	617,548	2.31
Chemistry pesticide (IDR)	292,932	0.84	818,076	3.06
Organic pesticide (IDR)	830,538	2.37	-	-
Mulching (IDR)	3,627,555	10.35	2,513,629	9.40
Bamboo & rope (for tomatoes) (IDR)	1,805,512	5.15	1,435,757	5.37
Labor cost (IDR)	16,338,783	46,62	13,933,867	52.10
Total Costs (IDR)	35,048,868	100.00	26,742,052	100.00

Based on the descriptive analysis in Table 4, there showed that total cost of production of semiorganic vegetables, 31 percents higher than conventional ones. The difference of those costs were in using of organic pesticide. The highest cost of vegetable production was in labor costs, that many as 46.62 percents of the total cost of semiorganic vegetables and 52.10 percents to the total cost of conventional vegetables. Table 4 showed that the semiorganic vegetables still used urea, SP36 and KCl fertilizer. Otherwise the conventional vegetable used organic fertilizer, although the utilization was lower than semiorganic vegetables

Risk Productivity Semi Organic and Conventional Vegetable

Table 5 presented the results of productivity risk analysis by using Standard Deviation, and Coefficient Variation.

Tabel 5: Comparison between Risk Productivity Semiorganic and Conventional Vegetables per hectare

	Semiorganic Vegetable	Conventional Vegetable
Average productivity per hectare (IDR)	58,962,931.52	32,259,874.11
Standard deviation	71,667,050.01	44,976,554.53
Coefficient Variation	1.22	1.39

Based on Table 5, the average productivity per hectare of semiorganic vegetables, 83 percents higher than the average productivity per hectare of conventional vegetables. The risk analysis of productivity used by deviation standard showed that the producitivity risk of semiorganic vegetables 59 percents higher than the conventional one.

From the risk appraisal with coefficient variation measurement, semiorganic vegetable had productivity risk as 1.22 that interpreted as every one unit of productivity that had been got by semiorganic vegetables farmer, the risk (disadvantage) would be as many as 1.22 unit or 12.2 percents. Whereas the productivity risk of conventional vegetables as many as 1.39 that interpreted as every one unit of producitvity that had been got by conventional farmers, the risk (disadvantage) would be as many as 1.39 units or 13.9 percents. That is, the risk productivity of organic vegetables 13% lower than conventional vegetables.

IV. CONCLUSION

Based on the results as above, it was concluded as follow:

1. Characteristics semi organic vegetable farmers such as age, education, number of family members in farming, farming experience are higher than conventional vegetable farmers, except farm size. Semiorganic farmers and conventional farmers cultivate less than 0.5 hectares of land, but with intensive exploitation.
2. Type of crops that were grown by semiorganic and conventional vegetables farmers were same, but semiorganic vegetables farmers picked more in cabbage, tomatoes and chinese cabbage. Conventional vegetable farmers picked more in cabbage, chilis, tomatoes and tobacco. Vegetables planting was used intercropping or relay cropping method.
3. The cost structure of vegetable farming shows the greatest production costs of vegetable farming is labor costs amount of 46.62 percents to the total cost of semiorganic vegetables and 52.10 percents of the total cost of conventional vegetables. Total semiorganic vegetables production costs, 31 percents higher of the total cost of conventional vegetables. The different types of semiorganic vegetable production costs and conventional vegetables is on the use of organic pesticides
4. Risk productivity as measured by the standard deviation indicates the risk productivity of semiorganic vegetables 59 percents higher than the risk of productivity of conventional vegetables. Risk productivity as measured by the coefficient of variation showed that the risk productivity of semiorganic vegetables 13 percents lower than risk productivity of conventional vegetables

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