RESEARCH ARTICLE **(Open Access)**

Comparison of Apple Cultivars "Golden" and "Starking" Profit Rate with Average Market Rate in Retail Trade of Dibra, Albania

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Abstract

The apple market plays a very important role in the economic development of Albania. The purpose of our study was measuring the risk by comparing the gross profit rates in the retail trade of "Golden" and "Starking" cultivars in relation to the market of Dibra Municipality. In order to measure this risk, it was used dispersions, standard deviations and variation coefficients. Monthly apple prices in retail trade for the period January to December 2016 were received by the Statistic Office, Dibra Agriculture Directory. Data processing was carried out using Excel software. Referring to the analysis of data it came out that in retail trade the "Starking" cultivar has a greater risk than the "Golden" cultivar. These findings are useful not only for retail traders but also for wholesalers, farmers, policymakers and for the final consumer itself.

Keywords: Retail trade, gross profit rate, dispersion, standard deviation, variation coefficient.

1. Introduction

The apple has its origin in the northwestern part of the Himalayan mountains and today cultivates about 7,000 varieties around the world, international annual output reaches 50 million tons of apples of various varieties [6]. In Albania it turns out that apples provide about 35% of income from orchards [7]. Dibra County has favorable climate conditions, the tradition of apple cultivation and the ever-growing interest of Dibra farmers, especially in the last 10 years. Dibra County occupies second place after Korça County for apple production [3]. The apple market as well as any other market is exposed by risk. The meaning of the risk is related to the possibility of an unwanted / unfavorable event [1]. In an environment where exist a risk, decisions are taken using some averages or "expected value" for yield, cost and pricing. Risk sources in agriculture affect all three areas of management: production, marketing and finance. Therefore, we have three types of risk: production risk, market risk and financial risk [1]. In this study our focus was market risk and especially the price of products (apple prices) in retail trade and by recognizing the apple prices from retail trade we also find their gross profit rates. Measuring the risk of the gross profit rate in the retail trade of "Golden" and "Starking" cultivars in relation to the market, it was used dispersions, standard deviations and variation coefficients.

2. Material and Methods

The data

In order to measure the risk of the gross profit rate of ''Starking'' and ''Golden'' cultivars and their impact on the market gross profit rate, we used and analyzed the following statistical data: apple retail prices for the 12 months of 2016 of Dibra Municipality (Dibra County [4] has 4 Municipalities: Bulqiza Municipality, Dibra Municipality, Klos Municipality, Mat Municipality, and in this study we received Dibra Municipality). In five days, each month, on different dates, daily retail prices are evidenced and recorded (here in the Annex). There are altogether 60 retail price observations (Source: Statistic Office, Dibra Agriculture Directory, 2016). [7]. To measure the risk, it was used dispersions, standard deviations and variation coefficients and then compare the results between the two cultivars.

2.1. The apple retail prices

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We used 60 observations (densities) for the whole period of 2016.

2.2 Measuring risk of gross profit in apple retail trade through dispersion (distribution)

In order to find out the dispersion of gross profits of "Golden" and "Starking" cultivars in apple retail trade, it was used the dispersion analysis about the average market profit rate. Based on IAS 2 [5], gross profit is the difference of the sale price at the purchase price. Thus, it will not include: sales costs; administrative costs; expenditures from financial activity and other expenses. In our case it will calculate the average gross profit of the market, the "Golden" and "Starking" cultivars in retail trade.

2.3 Measuring risk of gross profit in apple retail trade through standard deviation

Dispersion (distribution) around the average profit rate is measured by standard deviation. Since standard deviation measures the tendency for different rates of profit, which focus on the average profit rate, it can be used as a risk measure. The larger the dispersion, the greater the standard deviation, and the greater the risk associated with the profit from a commodity or product. A standard deviation of high value indicates a high variability of possible values. It is determined based on current values for a particular event. The standard deviation is calculated by the formula [2]:

$$\sigma = \sqrt{\frac{\Sigma(\bar{x} - x_i)^2}{n-1}}$$

where:

x_i - any possible value

$\bar{x}$ - average expected value

n - number of observed cases

To calculate the standard deviation, these procedures are followed: a) The average profit rate difference with the possible profit rate (this for each observation) is made; b) The difference is raised in square; c) Gather the squares raised in square; d) This amount is divided by the number of observations minus 1; and e) The square root is removed.

2.4 Measuring change of the profit rate in apple retail trade through the variation coefficient

The formula of variation coefficient is [2]:

$$C_v = \frac{\sigma}{\bar{x}} 100$$

Thus, recognizing the standard deviation from the above for both cultivars and the average expected value, it was found this coefficient and it turns out which cultivar has the highest variation coefficient it is most risky and the opposite is less risky.

2.5 Measuring risk in retail trade of two cultivars and comparison of results

To measure the risk of retail trade between two cultivars, we have to compare which cultivar is more risky than the other to help the results from the calculations of the above formulas of dispersion, standard deviation and variation coefficient of two cultivars.

3. Results and Discussion

3.1. Calculation of the apple retail prices

Table 1shows that the minimum retail price is 55 All/kg and the maximum price is 150 All/kg. In this study we have a total of 60 observations or densities. The most frequent denser is 15 at the price of 130 All/kg. [7]

Table 1. Calculation of retail prices by densities (All/kg)

No.	Price (x)	Density (f)
1	***2***	***3***
1	55	1
2	60	1
3	70	14
4	75	1
5	80	6
6	90	1
7	100	8
8	110	1
9	120	6
10	130	15
11	135	2
12	150	4
Amount (Σ)		**f=60**

3.2 The results of dispersion (distribution)

Specifically, average gross profit rates of market and apple cultivars (these datas and formulas would be given here in Table A1. in the Annex as an appendix) in retail trade are shown below in Table 2, indicating that although the average gross profit rate is the same (28.81) for the two cultivars, there is a significant change to the available rates of profit. The cultivar

"Golden" profit rates are closer to the average gross profit rate of the market, while the cultivar "Starking" profit rates exceed the highest possible values (from 41.18% to 52.68%) and the lowest possible values (19.38 % to 7.88%) of the market profit rate. Possible gross profit rates for "Golden" cultivar are more focused on the average profit rate of 28.81% and vice versa with "Starking" cultivar. Since the "Golden" cultivar fluctuations are smaller, the profit rates are less risky, while for "Starking" cultivar the fluctuations are greater, and consequently the profit rates are more risky.

Table 2. The results of average gross profit rates (data in %)

No.	Average gross profit rates			
	Market	**Average**	**Golden**	**Starking**
1	**19.38**	28.81	**14.18**	**7.88**
2	20.00	28.81	14.80	8.50
3	21.54	28.81	16.34	10.04
4	22.22	28.81	17.02	10.72
5	22.37	28.81	17.17	10.87
6	22.62	28.81	17.42	11.12
7	22.73	28.81	27.93	34.23
8	34.29	28.81	39.49	45.79
9	39.73	28.81	44.93	51.23
10	39.81	28.81	45.01	51.31
11	39.86	28.81	45.06	51.36
12	**41.18**	28.81	**46.38**	**52.68**
Amounts	**345.71**	**345.71**	**345.71**	**345.71**
Averages	**28.81**	**28.81**	**28.81**	**28.81**

These risk changes are graphically shown in Figure 1. This figure shows the different gross profit rates on the horizontal axis and the frequency of their occurrence on the vertical axis. This is the same information as described above for "Golden" and "Starking" cultivars. Most of cultivar "Golden" rates are close to the average profit rate, so the distribution of the frequency for the cultivar "Starking" rate is lower and wider, which shows a dispersion more greater of the profit rates of this cultivar.

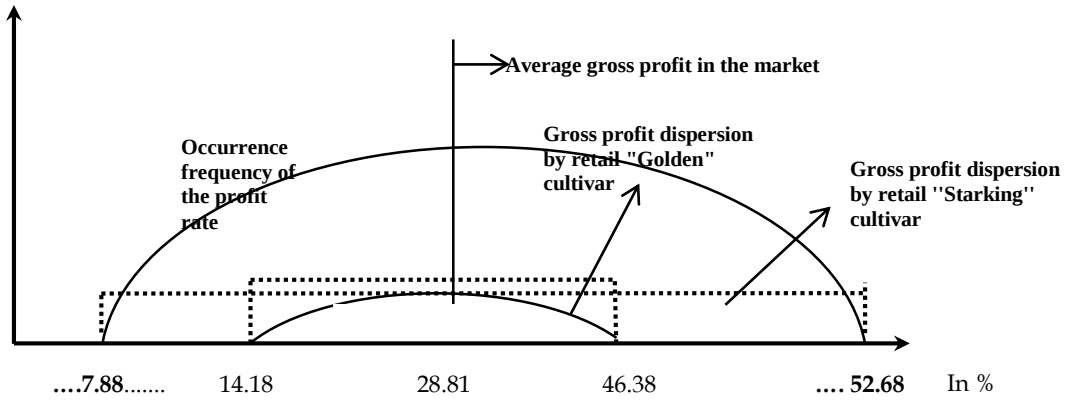

Figure 1. Distribution of the gross profit rate of the market on gross profit for "Golden" and "Starking" cultivars in retail trade

3.3 The results of Standard deviation

For "Golden" cultivar, standard deviation is calculated as follows:

$$\sigma_g = \sqrt{\frac{\Sigma(28.81-14.18)^2 + ... + (28.81-46.38)^2}{12-1}} = \sqrt{198.16} = 14.07$$

The standard deviation around the average gross profit rate of 28.81% for the "Golden" cultivar is ± 14.07%.

The arithmetic actions of the above formula are reflected in the table below.

Table 3. Calculation of standard deviation for "Golden" cultivar

Gross profit rates in %		Difference	(Difference)2
Average	**Golden**		
28.81	14.18	14.63	214.04
28.81	14.80	14.01	196.28
28.81	16.34	12.47	155.52
28.81	17.02	11.79	138.98
28.81	17.17	11.64	135.51
28.81	17.42	11.39	129.74
28.81	27.93	0.88	0.78
28.81	39.49	-10.68	114.02
28.81	44.93	-16.12	259.79
28.81	45.01	-16.20	262.52
28.81	45.06	-16.25	263.98
28.81	46.38	-17.57	308.64
	Amount		**2179.80**

For the "Starking" cultivar, the standard deviation is calculated as follows:

$$\sigma = \sqrt{\frac{\Sigma(28.81-7.88)^2 + ... + (28.81-52.68)^2}{12-1}} = \sqrt{285.14} = 16.88$$

The standard deviation around the average gross profit rate of 28.81% for the "Starking" cultivar is ±16.88%. The arithmetic actions of the above formula are reflected in the table below. In tables 5 and 6 below are given the standard deviation interpretations for "Golden" and "Starking" cultivars, although in absolute terms the standard deviation is greater, ± 16.88 for the "Starking" cultivar and ± 14.07 for the "Golden" cultivar, while the opposite occurs with profit rates falling within or between 14.74 - 42.88 (28,81-14,07=14,74; 28,81+14,07=42,88) for the first cultivar, are in large percentages and 11.93 - 45.69 (28,81-16,88=11,93; 28,81+16,88=45,69) for the second cultivar, are in small percentages.

Table 4. Calculation of standard deviation for "*Starking*" cultivar

Gross profit rates in %		Difference	(Difference)2
Average	**Starking**		
28.81	7.88	20.93	306.21
28.81	8.50	20.31	284.54
28.81	10.04	18.77	234.08
28.81	10.72	18.09	213.25
28.81	10.87	17.94	208.84
28.81	11.12	17.69	201.50
28.81	34.23	-5.42	-4.77
28.81	45.79	-16.98	181.30
28.81	51.23	-22.42	361.35
28.81	51.31	-22.50	364.58
28.81	51.36	-22.55	366.36
28.81	52.68	-23.87	419.33
	Amount		**3136.58**

Standard deviation ± 14.07, around the average profit rate of 28.81%, shows an approximation of about 58.33% of all observations (in this case, it represents 58.33% of profit rates).

The standard deviation ± 16.88, around the average profit rate of 28.81%, shows an approximation of about 16.7% of all observations (in this case, this represents 16.7% of the profit rates).

Profits for "Golden" cultivar move ± 14.07 around the average gross profit rate of 28.81%. At an interval of 14.74 - 42.88 included or included a case or observation or 58.33% from 100% of observations / cases. (out of: 7/12*100 = 58.33% where 7 boxes are yellow from 12/observations).

Profits for the "Starking" cultivar move ± 16.88 around the average gross profit rates of 28.81%. At an interval of 11.93 - 45.69 are included a case or observation or 16.7% from 100% of observations / cases. (out of: 2/12*100 = 16.70% where 2 boxes are red with 12/observations).

where: G.P- Gross Profit, A.G.P- Average of Gross Profit.

Table 5. Interpretation of standard deviation for "Golden" cultivar

No.	**…..**	1	2	3	4	5	6	7	8	9	10	11	12	….
G.P	**…..**	**14.18**	**14.80**	**16.34**	**17.02**	**17.17**	**17.42**	**27.93**	**39.49**	44.93	45.01	45.06	46.38	**….**
A.G.P.	**28.81**													
Standard deviation for "Golden" is ±14.07								**14.74**	**42.88**					
								58.33%						

Table 6. Interpretation of standard deviation for "Starking" cultivar

No.		1	2	3	4	5	6	7	8	9	10	11	12	
G.P.	**…..**	**7.88**	**8.5**	**10.04**	**10.72**	**10.87**	**11.12**	**34.23**	**45.79**	**51.23**	**51.31**	**51.36**	**52.68**	**….**
A.G.P.	**28.81**													
Standard deviation for "Starking" is ±16.88						**11.93**	**16.70%**		**45.69**					

3.4 The results of variation coefficient

The variation coefficient for the "Golden" cultivar is:

$$C_v = \frac{\sigma}{\bar{x}} 100 = \frac{14.07}{28.81} 100 = 0.488$$

The variation coefficient for the "Starking" cultivar is:

$$C_v = \frac{\sigma}{\bar{x}} 100 = \frac{16.88}{28.81} 100 = 0.568$$

From the calculations it turned out that "Starking" cultivar has a variation coefficient greater than "Golden" cultivar and consequently is more risky in this trade.

3.5 Comparison of results between "Starking" and "Golden cultivars

Measuring risk of apple retail prices between the two cultivars has been done by comparing dispersions, standard deviations and variation coefficients. Their results are shown below in the Table 7.

Table 7. Measuring risk of gross profit in the retail trade of two cultivars

Cultivars	**Dispersion**	**Deviation**	**% of Observations**	**C_v**
Golden	14.18-46.38	14.07	58.33	48,8
Starking	7.88-52.68	16.88	16.7	56,8

The largest dispersion around the average profit rate implies that the product (production) has greater risk because the investor may be less certain about the future rate of profit. The bigger the dispersion, the greater the possibility of a huge loss of investment, and at the same time the greater the chance of a big profit. However, this opportunity for greater profit is associated with maintaining a greater risk. "Golden"

cultivar has the lowest risk, it has less dispersion. But also, there is less chance for a big profit. A reduction in risk implies a reduction in the potential rate of investment profit.

The "Starking" cultivar has a larger standard deviation (± 16.88) compared to the "Golden" cultivar (± 14.07). Then, the risk is greater in the marketing of "Starking" cultivar, always comparing it with "Golden" cultivar.

The variation coefficient between two cultivars does not change very much. However, Starking cultivar has a greater variation coefficient and is therefore more risky in this trade. From the comparisons made above we come to the conclusion that in the retail trade "Starking" cultivar has a higher risk than "Golden" cultivar. These findings are useful not only for retail traders but also for wholesalers, farmers, policymakers and for the final consumer itself.

4. Conclusions

Our study is the first attempt to measure the risk of the gross profit rate in the retail trade of "Golden" and "Starking" cultivars and the market using the monthly data of January-December 2016 in Dibra Municipality. In this study to measure the risk, it was used dispersions, standard deviations and variation coefficients. From comparison of the study results that in the retail trade "Starking" cultivar has a higher risk than the "Golden" cultivar. Therefore, since this cultivar is more vulnerable to retail trade, it is necessary to minimize the undesirable impact on potential losses to have a less profitable gross profit. In future scientific research we can use the same statistical metrics that it was used in our study but also in the wholesale trade of any agricultural product. This would help to better understand the market risk of agricultural products because no previous research has been done in our country.

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ANNEX 1

Table A1. The results of average gross profit rate of market and apple cultivars in retail trade

January (dates)	**2**	**4**	**5**	**9**	**22**	**Amounts**	**AP**	**AGP**	**AGPR**
Wholesale price	60	60	60	60	60	300	60		
Retail price	100	100	100	100	110	510	102	42	**41,18**
February (dates)	**2**	**8**	**15**	**22**	**29**				
Wholesale price	50	55	55	50	50	260	52		
Retail price	55	60	70	70	70	325	65	13	**20,00**
March (dates)	**4**	**7**	**18**	**21**	**29**				
Wholesale price	60	60	120	85	90	415	83		
Retail price	130	130	150	150	130	690	138	55	**39,86**
April (dates)	**4**	**12**	**22**	**26**	**29**				
Wholesale price	95	110	100	100	105	510	102		
Retail price	130	135	130	130	135	660	132	30	**22,73**
May (dates)	**3**	**9**	**20**	**23**	**30**				
Wholesale price	100	100	95	95	100	490	98		
Retail price	130	130	120	120	130	630	126	28	**22,22**
June (dates)	**3**	**6**	**13**	**20**	**26**				
Wholesale price	100	100	100	100	110	510	102		
Retail price	130	130	130	130	130	650	130	28	**21,54**
July (dates)	**1**	**4**	**18**	**22**	**30**				
Wholesale price	110	100	110	100	100	520	104		
Retail price	130	120	150	120	125	645	129	25	**19,38**
August (dates)	**8**	**15**	**22**	**26**	**29**				
Wholesale price	70	65	65	65	60	325	65		
Retail price	100	120	120	100	100	540	108	43	**39,81**
Sptember (dates)	**5**	**13**	**16**	**19**	**26**				
Wholesale price	80	65	65	65	50	325	65		
Retail price	100	80	80	80	80	420	84	19	**22,62**
October (dates)	**3**	**9**	**14**	**24**	**31**				
Wholesale price	50	55	40	35	40	220	44		
Retail price	75	80	70	70	70	365	73	29	**39,73**
November (dates)	**7**	**18**	**14**	**21**	**30**				
Wholesale price	40	40	50	50	50	230	46		
Retail price	70	70	70	70	70	350	70	24	**34,29**
December (dates)	**2**	**5**	**9**	**20**	**30**				
Wholesale price	50	50	50	65	80	295	59		
Retail price	70	70	70	80	90	380	76	17	**22,37**
								Amount	**345,71**
								Average	**28,81**

Where:
AP = Amouns / n
AGP = AP(RP) – AP(WP)
AGPR = AGP / AP(RP)
Average Price - AP
Average Gross Profit - AGP
Average Gross Profit Rate – AGPR
Retail price - RP
Wholesale price - WP
n - number of the month dates

Notes: The formulas of average gross profit rates of market are the same for apple cultivars (Golden and Starking, we made a price difference among them). In Table 2 above, the ranking of results is made from the lowest value to the highest value.