

Economic analysis of vegetable family farms

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Abstract

The main material of this study consists of primary data obtained through surveying 92 family farms in a chosen area. In the study area, it was found out that the cultivated land is 3.70 ha with average population of 7.49 people/ha, literacy rate is 84.78% and that 57.84% of family labour is unemployed. Each enterprise has an active capital of 82141.05\$ on average and the rate of foreign debts in the passive capital is less than 1%. Average agricultural income per person (1254. 87 \$) is 1/3 times less than the gross national income (3377 \$) in the country. The net profit of studied crops in the planted areas was 375.75, 367.94, 143.90, 98.42 and -12.08\$ for eggplant, squash, tomatoes, beans and watermelon, respectively. This result indicates that profitability does not had a significant effect on the pattern. Sensitivity analyses on enterprise net profit for eggplant, squash, tomato, bean and watermelon revealed that for eggplant and squash, net profits were more sensitive to yield and price changes than for tomatoes, beans and watermelons.

Key words: Vegetable family farms, economic analysis, profitability, cost analysis, sensitivity analysis

Introduction

Turkey is a country with a high vegetable production potential due to its ecological richness. In the country's 27 million ha cultivable land area, vegetables have a 3.7% share with 1007200 ha cultivated land area. This rate consists of about 1/3 of the more than 4 million ha irrigated land in the country. 35.1% of the country's population lives in rural areas and Agriculture sector has a 48.2% share in employment, 5.62 % in exports and 11.8% in Gross National Income (GNI) (Anonymous, 2003). The present situation proves that in the determination of patterns of enterprises, it is important to incline towards more profitable areas. For this reason, studies including financial, economic and profit analysis are needed.

With this consideration in mind, the economic structure of enterprises has been determined and their financial analyses are included in this study. Moreover, the profit analysis of vegetables grown have been carried out, and the results obtained are aimed to enlighten the producers in their decision making process.

Materials and methods

The main material of this study consists of primary data obtained by surveying the vegetable producer enterprises in the district of Çarsamba; the province of Samsun.

In the study area, 21 villages were included. Among these villages, the numbers of villages to be studied were determined purposefully. The amount of cultivated lands, the enterprises to be used as examples were taken into consideration and their coefficient of variation was calculated.

Henceforth, by using stratification (layer by layer) random exemplification method, the volume of the example was determined using the following formula:

$$n = \frac{(\sum N_h \times S_h)^2}{(\sum N_h)^2 \times D^2 + (\sum N_h \times S_h)^2} \quad (\text{Cicek and Erkan, 1996})$$

In the formula; n = the volume of the example, N_h = number of units in the h (frequency), S_h = standard deviation of the h layer, N = total number of units, D = d/t, d = deviation from the average, t = 1.65 layer

The number of enterprises to be surveyed is determined to be 92. During the distribution of surveys to villages, the number of vegetable growing enterprises in each village was taken into consideration.

In the stratification of total example volume, the formula below was used.

$$n_i = \frac{N_h \times n}{(\sum N_h \times S_h)}$$

In the formula: n_i = number of examples in each layer, n = total number of examples, N_h = number of enterprises in each layer, and S_h = standard deviation of each layer.

In Table 1, the stratification data and the distribution of the example volume in each stratum (layer) has been given. In the studied enterprises, in the introduction of the amount of capital and its components, the method of classifying capital by its functions has been the basis (Inan, 2001). As the result of annual activity report, GNI (gross national income), enterprises' expenses, real expenses, net revenue, agricultural income (net farm income) and gross family income (Erkus *et al.*, 1995; Akcay and Akay, 1999) were calculated and interpreted. In the financial analysis of the enterprises (Blokland, 2002); liquidity, solvency, profitability and efficiency criteria were used.

Liquidity studies were conducted to see how liquid the business is and it is the ability to meet liabilities when they become due.

Table 1. Stratification data of the enterprises that constitutes the population and the distribution of the example volume in each stratum

Layer No	Layer max. and min. limit	Layer average	Example average	No. of enterprises in each layer(Nh)	Standard deviation(Sh)	Nh x Sh	Nh x (Sh) ²	Number of examples
1	1-15	8	8.87	582	4.01	2333.82	9358.62	35
2	16-30	23	22.82	376	4.45	1673.20	7445.74	25
3	31+	—	47.29	134	15.84	2122.56	33621.35	32
Total	—	—	78.98	1092	—	6129.58	50425.71	92

Working capital, one of the major tools in the liquidity toolbox, was calculated by subtracting current liabilities from current assets. Current ratio was considered as the ratio of the firm's working capital to short term debts. Most firms will find it preferable to keep the ratio greater than 1. Liquidity ratio was calculated to evaluate the power of the liquid to pay off the short-term debts. Most firms will find it preferable to keep the ratio greater than 1. Current debt ratio was calculated by dividing current liabilities by total liabilities. It shows what proportion of the entire firm's debt. Equity was obtained by subtracting the foreign capital from the firm's passive capital. This is the single best measurement of solvency. Also, it can be said that the most useful indicator of a firm's progress is a good equity trend. Leverage ratio was calculated by dividing total debt by equity. Most firms will find it preferable to keep the ratio to a maximum of 1. Return on Equity (ROE) considered as the income of the fundamental investment (beginning assets) on the firm was calculated. This ratio has importance in the analysis and comparison of the results of especially big firms. Return on Asset (ROA) was calculated by $(\text{net income} + \text{interest paid} - \text{owner's salary}) \times 100 / (\text{beginning assets})$.

Asset turnover was considered as the amount of sales generated for every dollar's worth of assets. It was calculated by dividing sales in dollars by assets in dollars. Labour productivity was calculated by dividing the firm's gross output by the labor cost of the firm. Financial ratability was calculated by subtracting debt interests from the net revenue and taking the ratio of the result (net profit) to the beginning assets. Economic ratability was calculated by the ratio of active capital to the net revenue.

Ratability factor was calculated by the ratio of net revenue to the gross revenue. (Erkus *et al.*, 1995; Erkus and Demirci, 1985; Inan, 2001). Knowing all the inputs of the in response to what the earnings are in a branch is connected to a branch's total cost analysis.

Amortization and interest costs were taken into consideration for the fixed capital elements used in vegetable costs as a part of fixed costs. To these fixed capital elements, paid taxes, insurance and rent costs were added (Kiral and Kasnakoglu, 1999). When rent paid for rent was determined, rent of 1 decare (a thousand square meters, 0.247 acres) of land on average in the studied enterprises was used. Capital interest was calculated, half of the annual interest rates given in the year of the study by T.C. Ziraat Bankasi (Turkish Republic's Bank of Agriculture) to enterprises as credit for vegetable production was taken into consideration. As management expenses (Akçay *et al.*, 1999), 3% of gross national income was considered. Fixed capital interest was considered as 5%. Sensitivity analysis (Tshering, 2002) was made in the study.

Results and discussion

The socio-demographic structure of the enterprises: Some indicators related to the population, education level and labour of the enterprises are given in Table 2.

Table 2. Population, education and labour situation in the studied area

Social structure features	Unit	Enterprise average(92)
Male population	Person	3.50
Female population	Person	3.99
Total population	Person	7.49
Industrious population average	%	79.04
Enterprise manager's average age	Age	53.05
Enterprise manager's literacy rate	%	84.78
Family labour potential	MLD	1222.01
Family labour used in the enterprise	%	94.71
Inactive family labour	%	57.84
Foreign labour used in the enterprise	%	5.29
Total labour used in the enterprise	MLD	530.02

MLD (Man Labour Day)

As it can be observed from the table, the male population in the enterprises is 3.50 per enterprise whereas the female population per enterprise is 3.99 and the total population is 7.49. Industrious population is 79.04%. The average age of the enterprise manager is 53.05 and the literacy rate is 84.78%.

Family labour potential is 1222.01 MLD, The ratio of family labour used in the enterprise is 94.71 %; the foreign labour ratio is 5.29. Inactive family labour has a high value of 57.84%. Total labour used in the enterprise is 530.02 MLD.

Financial analysis of the enterprises: The financial analysis of vegetable farms whose capital structure was studied is included under this sub-heading. The capital of each enterprise is given in Table 3. The enterprises on average have a share of 85.77% land and a share of 14.23% enterprise capital in the total active capital. The ratio of fixed enterprise capital is 12.64%, and the ratio of working capital is 1.59. 0.70% of the passive capital consists of foreign capital and paid-in-capital is 99.30%. Most of the foreign capital consists of nominal debts (50%). In the studied enterprises, working capital is 1138.30\$. This means that the enterprises do not encounter any problems paying the short-term debts.

The average liquidity ratio is 5.39 among the enterprises. If the fact that liquidity ratio is desired to be greater than 1 is taken into consideration; it can be concluded that the enterprises can easily pay their short-term debts. Current debt ratio turned out to be 0.28. Among the enterprises, the ratio of paid-in-capital to passive capital was 99.30%. This ratio indicates that the enterprises avoid going into debts.

The leverage ratio, which indicates the ratio of foreign capital to paid-in-capital was 0.07%. This can be explained by the low ability of producers to go into debts and the high current interest rates.

Under present investigation, the Return on Equity (ROE) is 9.72%. This ratio has a higher value when compared to the opportunity cost of paid-in-capital and the real interest.

Among the studied enterprises, their Return on Assets (ROA) is 9.75%. Among the studied enterprises, due to the very low level of going into debts, it is observed that the values of ROA and ROE are close to each other.

In the studied enterprises, asset turnover is 18.75 %, productivity of labour is 3.78%. Financial rantability is 6.2% with a positive value. Economic rantability with its 6.87% value is greater than the real interest in Turkey. The fact that financial and economic rantabilities are close to each other can be explained by the enterprises' low rate of going into debts. 36.64% rantability factor indicates that the annual results of activity reports of enterprises are rantable.

Because of the low rate of going into debts in the studied enterprises; coverage ratio, capital and debt margin, and debt to income ratio has not been calculated.

The agricultural and economic structure of the enterprises: The data regarding the economic structure of the research area is

given in Table 4. While total enterprise field is 37.98 decare (da) per enterprise, owned field ratio is 99.29 %. Average lot number is 5.41 and average lot width is 7.07.

The most important share belongs to vegetables with 65.83% in the pattern of the area. Nevertheless, cereals (13.36%), fruits (13.80%), leguminous plants (3.54%) are intesneively produced.

Raising livestock has a 6.55% share while vegetable production has a 93.45% share in the total gross product value of enterprises. Gross product per enterprise field decare is 402.73\$/da, enterprise's expenditure is 255.16\$/da, real expenses are 157.01 \$/da, net product is 147.57\$/da, agricultural income is 245.73 \$/da, agricultural income per person is 1254.87\$.

Yield levels of some of the crops are as follows: wheat (374.59kg/da), rice (519.49 kg/da), tomato (4088.27 kg/da), eggplant (4047.77 kg/da), beans (1661.36 kg/da), squash (3262.35 kg/da), watermelons (4530.90 kg/da), peach (1530.54 kg/da), potato (1994.83 kg/da).

The profitability of vegetables grown in the enterprises: Under this, full cost analysis and proportional profitability of some vegetables have been determined and their sensitivity analyses was done.

Profitability Analysis

Various measures of costs, returns and profitabilities are reported in the Table 5.

Table 3. The capital of each enterprise (\$) and its proportional distribution (%)

	Enterprise growers							
	Group (35)		Group (25)		Group (32)		Avrgerage (92)	
	\$	%	\$	%	\$	%	\$	%
Assets								
Field capital	36276.88	85.11	67017.30	86.20	110526.28	85.81	70455.76	85.77
Tools and machinery assets	2379.91	5.58	6166.33	7.93	12807.05	9.94	7035.93	8.56
Capital animal assets	2985.36	7.01	3392.55	4.36	3731.24	2.89	3348.64	4.08
Material and tools Capital	320.69	0.75	375.25	0.48	578.84	0.45	425.15	0.52
Capital money	660.68	1.55	792.42	1.02	1175.65	0.91	875.58	1.07
Enterprise capital	6346.64	14.89	10726.55	13.80	18272.79	14.19	11685.30	14.23
Total of active revenues	42623.42	100.00	77743.85	100.00	128799.07	100.00	82141.05	100.00
Passive								
Short term debts	129.08	0.30	166.33	0.22	196.27	0.15	162.34	0.20
Mid-term debts	---	---	---	---	---	---	---	---
Long-term debts	---	---	---	---	---	---	---	---
Total	129.08	0.30	166.33	0.22	196.27	0.15	162.34	0.20
Value of shared and rented land	---	---	864.94	1.11	499.00	0.39	408.52	0.50
Total	---	---	864.94	1.11	499.00	0.39	408.52	0.50
Total of foreign capital	129.08	0.30	1031.27	1.33	695.28	0.54	570.86	0.70
Paid-in-capital	42494.34	99.70	76712.58	98.67	128103.79	99.46	81570.19	99.30
Total of passive capital	42623.42	100.00	77743.85	100.00	128799.07	100.00	128799.07	100.00

1. LIQUIDITY

- Working capital (\$)	1138.39
- Current ratio	8.01
- Liquidy ratio	5.39
- Current debt ratio	0.28

2. SOLVENCY

- Equity (%)	99.30
- Leverage ratio	0.07

3. PROFITABILITY

- Return on equity (%)	9.72
- Return on asset (%)	9.75

4. EFFICIENCY

- Asset turnover (%)	18.75
- Labor productivity	3.78
- Financial rantability (%)	6.82
- Economic rantability (%)	6.87
- Rantability factor (%)	36.64

Table 4. Data regarding the economic structure of the research area

Agricultural structure characteristics	Average of the enterprises(92)
Total of the enterprises' land (da)	37.98
Owned land ratio (%)	99.29
Rented land ratio (%)	0.71
Number of lots	5.41
Average lot area (da)	7.07
Pattern (share in the total enterprise land)	
Cereal plants (%)	13.36
Industrial plants (%)	0.31
Vegetables (%)	65.83
Leguminous plants (%)	3.54
Fodder plants (%)	0.55
Tuber plants(%)	0.86
Total of field crops (%)	84.45
Fruits (%)	13.80
Grove (%)	1.75
GPV per enterprise (share in total GPV*)	
Vegetable(%)	93.45
Raising livestock (%)	6.55
Gross per enterprise field decare (\$/da)	402.73
Enterprise expenses per enterprise field decare(\$/da)	255.16
Real expenditure per enterprise field decare(\$/da)	157.01
Net product per enterprise field decare (\$/da)	147.57
Agricultural income per enterprise field decare (\$/da)	245.73
Agricultural income per person (\$)	1254.87
Yields of the important crops	
- Wheat (kg/da)	374.59
- Rice (kg/da)	519.49
- Tomato (kg/da)	4088.27
- Eggplant (kg/da)	4047.77
- Beans (kg/da)	1661.36
- Squash (kg/da)	3262.35
- Watermelon (kg/da)	4530.90
- Peach (kg/da)	1530.54
- Potato (kg/da)	1994.83

(*) GPV: Gross Product Value

Revenue: It is clear from Table 5 that the highest gross values belong to squash (652.47 \$/da) followed by eggplant (631.45 \$/da), tomato (392.47 \$/da), beans (383.77 \$/da) and watermelon (199.36 \$/da).

Costs: The higher costs belong to beans (285.35 \$/da), squash (284.53 \$/da), eggplant (255.70 \$/da), tomato (248.57 \$/da) and watermelon (211.44 \$/da).

Return: The higher enterprise gross margin belongs to eggplant (497.43 \$/da), squash (492.86 \$/da), tomato (245.84 \$/da), beans (185.22 \$/da) and watermelon (47.72 \$/da). The highest net profit belongs to eggplant (375.75 \$/da) followed by squash (367.94 \$/da), tomato (143.90 \$/da), beans (98.42 \$/da) and watermelon (-12.08 \$/da).

Sensitivity Analysis

The results of the sensitivity analysis are reported for vegetables investigated with respect to + 50 per cent change of the vegetables

prices and yield holding operating cost constant.

For eggplants (Table 6), holding operating cost (134.02\$/da) and one of either yield (4047.77 kg/da) or price (0.156 \$/kg) constant, net profit remained minus with a 20% decrease in price or yield. Also, for squash (Table 7), holding operating cost (159.61 \$/da) and one of either yield (3262.35 kg/da) or price (0.200 \$/kg) constant, net profit remained minus with a 20% decrease in price or yields. For tomatoes (Table 8), holding operating cost (146.63 \$/da) and one of either yield (4088.27 kg/da) or price (0.096 \$/kg) constant, net profit remained minus with a 20% increase in price or yield.

Also, for watermelons (table 10), holding operating cost (151.64 \$/da) and one of either yield (4530.90 kg/da) or price (0.05 \$/kg) constant, net profit remained minus with a 50% increase in price or yields.

The enterprises studied are family enterprises (7.49 persons per enterprise on average). The average entrepreneur has a low educate level (67% of entrepreneurs are primary school graduates) and is relatively old (on average 53.06 years old) and the average enterprise has a relatively small field area (37.98da). It is found that livestock raising is not given an important place in these enterprises (6.55%).

The enterprises have 82141.05 \$ worth of assets on average and 85.77% of this belongs to the land assets. This indicates that the enterprises are weak, small and insufficient in terms of working capital (14.23%). The inclination towards going into debts in these enterprises is very low (0.70%) and all the debts are short-term. This can be result of current high interest rates and insufficient support to agriculture in the country.

In the research area, agricultural income per person is (1254\$) and it is 1/3 of average personal income (3377\$) in the country. All the studied yields (except for watermelon) have been found profitable. Although eggplant is the most profitable per decare (375.75\$) among the studied crops, it comes the second in the pattern (12.18%). Beans which have the forth place (98.42\$) among the most profitable crops comes the first in the pattern (19.79%). Squash, which has only a 4.03% share in the pattern, is the second among the crops.

Sensitivity analyses on the enterprise net profit showed that for eggplants and squash, net profits were more sensitive to yield and price changes than for tomatoes, beans and watermelons.

For the eggplant and squash, net profit is positive when a 10% decrease occurs whereas for the others net profit is negative when even at least 20% increase occurs. Since interest rates for debts are high, paid-in capital is insufficient and the government's support for agriculture weakens day by day in Turkey, family enterprises avoid taking risks. This explains why the family enterprises take upon the traditional way of rather than risk-taking, market based, specialized principles.

Producers produce vegetables for consumption within the country and the market of the country. However, in order to benefit the agricultural export of the country, the high vegetable potential in the area should be used.

Table 5. The production cost and profitability of vegetables grown in the researched enterprises

	Eggplant		Squash		Tomato		Beans		Watermelon	
	\$	%	\$	%	\$	%	\$	%	\$	%
Cost of the seeds	14.83	5.80	17.82	6.26	17.29	6.96	41.65	14.60	28.46	13.46
Cost of soil preparation	20.62	8.06	19.09	6.71	22.77	9.16	23.09	8.09	21.03	9.95
Cost of pesticides	7.58	2.96	11.67	4.11	14.32	5.76	9.91	3.47	18.88	8.93
Cost of fertilizers	15.28	5.98	16.27	5.72	17.63	7.09	16.00	5.61	12.48	5.90
Cost of irrigation	17.78	6.94	17.22	6.05	12.85	5.16	16.77	5.88	16.33	7.72
Cost of upkeep	10.04	3.93	12.64	4.44	8.50	3.42	14.02	4.91	7.62	3.60
Cost of harvest	18.27	7.15	30.01	10.55	20.93	8.42	34.05	11.94	14.41	6.82
Other expenses	2.81	1.10	2.97	1.04	3.03	1.22	3.35	1.17	1.95	0.92
Total of expenses	107.21	41.93	127.69	44.88	117.31	47.19	158.84	55.67	121.16	57.31
Working capital interest	26.81	10.49	31.92	11.22	29.33	11.80	39.71	13.91	30.47	14.41
Total of changeable expenses (A)	134.02	52.41	159.61	56.10	146.63	58.99	198.55	69.58	151.64	71.72
Field rent	33.27	13.01	33.27	11.69	33.27	13.39	33.27	11.66	33.27	15.74
Other fixed expenses	23.87	9.34	24.74	8.70	18.87	7.59	14.45	5.06	7.13	3.37
Interests	44.66	17.47	46.30	16.27	36.53	14.69	27.03	9.47	13.35	6.31
Management expenses	19.88	7.77	20.61	7.24	13.27	5.34	12.05	4.23	6.05	2.86
Total of fixed expenses (B)	121.68	47.59	124.92	43.90	101.94	41.01	86.80	30.42	59.81	28.28
Total of expenses (C=A+B)	255.70	100	284.53	100	248.57	100	285.35	100	211.44	100
Gross value (\$/da) (D)	631.45	—	652.47	—	392.47	—	383.77	—	199.36	—
Gross profit (E=D-A)	497.43	—	492.86	—	245.84	—	185.22	—	47.72	—
Net profit (F=D-C) (\$/da)	375.75	—	367.94	—	143.90	—	98.42	—	-12.08	—
Cost (\$/kg)	0.063		0.087		0.061		0.172		0.047	
Selling price (\$/kg)	0.156		0.200		0.096		0.231		0.044	
Net profit (\$/kg)	406.95		402.32		193.87		116.37		9.66	
Ratio in the pattern (%)	12.18		4.03		9.49		19.79		7.92	
Proportional profit	1		2		3		4		5	

Table 6. Sensitivity analysis on enterprise net profit with changing eggplants yield and price

	Yield* Changed(%)	Eggplants price (\$/kg)										
		0.075	0.09	0.105	0.12	0.135	0.15	0.165	0.18	0.195	0.21	0.225
2023.9	-50	-103.9	-73.5	-43.2	-12.8	17.5	47.9	78.3	108.6	139.0	169.3	199.7
2428.7	-40	-73.5	-37.1	-0.7	35.8	72.2	108.6	145.1	181.5	217.9	254.4	290.8
2833.4	-30	-43.2	-0.7	41.8	84.3	126.8	169.3	211.8	254.4	296.9	339.4	381.9
3238.2	-20	-12.8	35.8	84.3	132.9	181.5	230.1	278.6	327.2	375.8	424.4	472.9
3643.0	-10	17.5	72.2	126.8	181.5	236.1	290.8	345.4	400.1	454.7	509.4	564.0
4047.8	0	47.9	108.6	169.3	230.1	290.8	351.5	412.2	472.9	533.7	594.4	655.1
4452.6	10	78.3	145.1	211.8	278.6	345.4	412.2	479.0	545.8	612.6	679.4	746.2
4857.3	20	108.6	181.5	254.4	327.2	400.1	472.9	545.8	618.7	691.5	764.4	837.3
5262.1	30	139.0	217.9	296.9	375.8	454.7	533.7	612.6	691.5	770.5	849.4	928.3
5666.9	40	169.3	254.4	339.4	424.4	509.4	594.4	679.4	764.4	849.4	934.4	1019.4
6071.7	50	199.7	290.8	381.9	472.9	564.0	655.1	746.2	837.3	928.3	1019.4	1110.5

Table 7. Sensitivity analysis on enterprise net profit with changing squash yield and price

	Yield* Changed(%)	Squash price (\$/kg)										
		0.1	0.12	0.14	0.16	0.18	0.2	0.22	0.24	0.26	0.28	0.3
1631.175	-50	-121.4	-88.8	-56.2	-23.5	9.1	41.7	74.3	107.0	139.6	172.2	204.8
1957.41	-40	-88.8	-49.6	-10.5	28.7	67.8	107.0	146.1	185.3	224.4	263.5	302.7
2283.645	-30	-56.2	-10.5	35.2	80.9	126.5	172.2	217.9	263.5	309.2	354.9	400.6
2609.88	-20	-23.5	28.7	80.9	133.1	185.3	237.5	289.6	341.8	394.0	446.2	498.4
2936.115	-10	9.1	67.8	126.5	185.3	244.0	302.7	361.4	420.1	478.9	537.6	596.3
3262.35	0	41.7	107.0	172.2	237.5	302.7	367.9	433.2	498.4	563.7	628.9	694.2
3588.585	10	74.3	146.1	217.9	289.6	361.4	433.2	505.0	576.7	648.5	720.3	792.0
3914.82	20	107.0	185.3	263.5	341.8	420.1	498.5	576.7	655.0	733.3	811.6	889.9
4241.055	30	139.6	224.4	309.2	394.0	478.9	563.7	648.5	733.3	818.1	903.0	987.8
4567.29	40	172.2	263.5	354.9	446.2	537.6	628.9	720.3	811.6	903.0	994.3	1085.7
4893.525	50	204.8	302.7	400.6	498.4	596.3	694.2	792.1	889.9	987.8	1085.7	1183.5

*(kg/da)

Table 8. Sensitivity analysis on enterprise net profit with changing tomatoes yield and price

Yield (kg/da)	Changed %	Tomato price (\$/kg)										
		0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15
		-50	-40	-30	-20	-10	0	10	20	30	40	50
2044.2	-50	-146.4	-125.9	-105.5	-85.0	-64.6	-44.2	-23.7	-3.3	17.2	37.6	58.1
2453.0	-40	-125.9	-101.4	-76.9	-52.3	-27.8	-3.3	21.3	45.8	70.3	94.9	119.4
2861.8	-30	-105.5	-76.9	-48.2	-19.6	9.0	37.6	66.2	94.9	123.7	152.1	180.7
3270.6	-20	-85.0	-52.3	-19.6	13.1	45.8	78.5	111.2	143.9	176.6	209.3	242.0
3679.5	-10	-64.6	-27.8	9.0	45.8	82.6	119.4	156.2	193.0	229.8	266.6	303.4
4088.3	0	-44.2	-3.3	37.6	78.5	119.4	160.3	201.1	242.0	282.9	323.8	364.7
4497.1	10	-23.7	21.3	66.2	111.2	156.2	201.1	246.1	291.1	336.1	381.0	426.0
4906.0	20	-3.27	45.8	94.9	143.9	193.0	242.0	291.1	340.2	389.2	438.3	487.3
5314.8	30	17.2	70.3	123.5	176.6	229.8	282.9	336.1	389.2	442.4	495.5	548.7
5723.6	40	37.6	94.9	152.1	209.3	266.6	323.8	381.0	438.3	495.5	552.7	610.0
6132.5	50	58.1	119.4	180.7	242.0	303.4	364.7	426.0	487.3	548.7	610.0	671.3

Table 9. Sensitivity analysis on enterprise net profit with changing beans yield and price

Yield (kg/da)	Changed %	Beans price (\$/kg)										
		0.1	0.12	0.14	0.16	0.18	0.2	0.22	0.24	0.26	0.28	0.3
		-50	-40	-30	-20	-10	0	10	20	30	40	50
830.7	-50	-202.30	-185.7	-169.1	-152.4	-136.0	-119.2	-102.6	-86.0	-69.4	-52.8	-36.1
996.8	-40	-185.7	-165.7	-145.8	-125.9	-106.0	-86.0	-66.1	-46.1	-26.2	-6.3	13.7
1163	-30	-169.1	-145.8	-122.5	-99.3	-76.0	-52.8	-29.5	-6.2	17.0	40.3	63.6
1329.1	-20	-152.4	-125.9	-99.3	-72.7	-46.1	-19.5	7.1	33.6	60.2	86.8	113.4
1495.2	-10	-135.8	-105.9	-76.0	-46.1	-16.2	13.7	43.6	73.5	103.4	133.3	163.2
1661.4	0	-119.2	-86.0	-52.8	-19.5	13.7	46.9	80.2	113.4	146.6	179.8	213.1
1827.5	10	-102.6	-66.1	-29.5	7.1	43.6	80.2	116.7	153.3	189.8	226.4	262.9
1993.6	20	-86.0	-46.1	-6.3	33.6	73.5	113.4	153.2	193.1	233.0	272.9	312.7
2159.8	30	-69.4	-26.2	17.0	60.2	103.4	146.6	189.8	233.0	276.2	319.4	362.6
2325.9	40	-52.8	-6.2	40.3	86.8	133.3	179.8	226.4	272.9	319.4	365.9	412.4
2492	50	-36.2	13.7	63.5	113.4	163.2	213.1	262.9	312.7	362.6	412.4	462.3

For beans (table 9). holding operating cost (198.55 \$/da) and one of either yield (1661.36 kg/da) or price (0.231 \$/kg) constant. net profit remained minus with a 40% increase in price or yields.

Table 10. Sensitivity analysis on enterprise net profit with changing watermelons yield and price

Yield (kg/da)	Changed %	Watermelon price (\$/kg)										
		0.025	0.03	0.035	0.04	0.045	0.05	0.055	0.06	0.065	0.07	0.075
		-50	-40	-30	-20	-10	0	10	20	30	40	50
2265.45	-50	-154.8	-143.5	-132.2	-120.8	-109.5	-98.2	-86.8	-75.5	-64.2	-52.9	-41.5
2718.54	-40	-143.5	-129.9	-116.3	-102.7	-89.1	-75.5	-61.92	-48.3	-34.7	-21.1	-7.6
3171.63	-30	-132.2	-116.3	-100.4	-84.6	-68.7	-52.9	-37.0	-21.1	-5.3	10.6	26.4
3624.72	-20	-120.8	-102.7	-84.6	-66.5	-48.3	-30.2	-12.1	6.1	24.2	42.3	60.4
4077.81	-10	-109.5	-89.1	-68.7	-48.3	-27.9	-7.6	12.8	33.2	53.6	74.0	94.4
4530.9	0	-98.2	-75.5	-52.9	-30.2	-7.6	15.1	37.8	60.4	83.1	105.7	128.4
4983.99	10	-86.8	-61.9	-37.0	-12.1	12.8	37.8	62.7	87.6	112.5	137.4	162.4
5437.08	20	-75.5	-48.3	-21.1	6.1	33.2	60.4	87.6	114.8	142.0	169.2	196.3
5890.17	30	-64.2	-34.7	-5.30	24.2	53.6	83.1	112.5	142.0	171.4	200.9	230.3
6343.26	40	-52.9	-21.1	10.6	42.3	74.0	105.7	137.4	169.2	200.9	232.6	264.3
6796.35	50	-41.5	-7.6	26.4	60.4	94.4	128.4	162.4	196.3	230.3	264.3	

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