PREDICTIVE MODEL FOR THE ADDED VALUE OF SULTANA SEEDLESS GRAPE PRODUCTION

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Abstract

Turkey after USA is the second important raisin grape producer by cv "Sultana" in the world (Kara, 2014). The Manisa district alone accounts for 31% of total grape production and 80% of the whole sultana seedless raisin grape production in Turkey. 95% of total grape output generated in Manisa is made up of Sultana seedless grape (TUIK, 2012). In this study, the added value of grape production in Manisa has been calculated and according to the findings, the per capita added value of grape production has been computed. In order to calculate the added value of grape production in Manisa, costs of labor, fuel, fertilizer, disinfection, hormone, repair and maintenance of the businesses around have been investigated. After calculated costs had been deducted from total business income, the total added value of grape production in Manisa and the per capita added value of grape production in Manisa were attained The efficiency per hectare in the sample production units, which was investigated during the field research, measures up to 26.470 kg. The percentile distributions of cost items at this efficiency level are; 27,8% fuel costs, 23,2% fertilizing costs, 19,9% irrigation costs, 11,4% disinfection costs, 7,5% hormone usage costs, 4,6% harvesting and transporting costs and the rest consists of maintenance costs. When the costs are deducted from

income per hectare (11.646 USD), the added value per hectare turns out to be 8843 USD.

Keywords: *Grape; Agricultural Production; Agricultural Added Value; Agricultural Input Output*
JEL Code: Q14, Q19

1. Introduction

Viticulture is one of the most important agricultural activities in the whole world. Therefore, in our country, grapery, which is a part of cultivated plants, constitutes the second largest area of cultivation following the grains. During the past decades some changes have been observed as to the plantation of grape. For example, in the year 1940, vineyards took up 397.000 ha or area; in the year 1960, it accounted for 781.870 ha; in the year 1980, it was 820.000 ha. However, in the year 1999, it shrank to 535.000 ha and in the year 2012, down to 462.296 ha (TUIK, 2013). Today, the area of agricultural fields in Turkey amount to 237.949.636 ha and after all these changes, plantation of grape now takes up 1,91% of this coverage and this amount equals to the 17% of horticulture areas. According to Food and Agricultural Organization of the United Nations (FAO, 2013) Turkey owns the 5th largest viticultural area and ranks as 6th in fresh grape production in the world. Aktaş (2002) reports that Turkey is recognized; first of all, as a producer of both seeded and seedless grapes and secondly as a producer of table grapes.

In Turkey, 23% of the total viticultural areas and 44% of total grape plantation is located in the Aegean region (Altindisli, 2003). Manisa, as a district, constitutes the 31% portion of the total grape production and 80% of the seedles raisin grape production in Turkey. Manisa is also the top producer of “sultani grapes” in Turkey and according to Turkish Statistical Institute (TurkStat, 2013), 95% of the grapes planted and produced in Manisa are seedless sultani grapes.

2. Material and Method

This study has been executed and applied in the district of Manisa. Data used in the study has been obtained from Farmer Registration System, established by TurkStat 2005, and the Ministry of Food, Agriculture and Livestock of Turkey, 2004. The data set of 2014 coming from 15 counties and 572 villages of the

Manisa district, has been generated from a sample size as determined by way of the below mentioned method. Data taken from Manisa Viticulture Research Institute, Provincial Directorate of Agriculture and TurkStat was also taken into account but the main data set comes from the field survey. In the analysis, original sets of data of 2014, collected through the procedure of double sampling for stratification, conducted in the center of Manisa, in the counties and the villages around Manisa, have been used.

Accounting records of grape producers are very important in calculating the costs of viticulture. However, these records are mostly inadequate and this causes deficiencies in calculations. To eliminate these problems, face-to-face interviews have been conducted and input and output values have been converted into usable data. On the other hand, it's also important to determine which data is appropriate in calculating costs and arranging input-output cost tables and which method is suitable to collect the usable data as well as how consistency could be achieved by way of cross interrogation. In literature, surveys emerged as an efficient way to collect cost values. The scale used in this study has been derived from early research streams conducted by Manisa Viticulture Research Institute, Manisa Agriculture Office, TurkStat, and PhD dissertations about related topics. The finalized forms were first of all tested at pilot surveys; some items were removed and some new or missed items were added and the final version of survey form has been formulated. The surveys conducted cover grape producers in Manisa, in 2014.

In the study, databases of Turkish Statistical Institute and Ministry of Agriculture were utilized. The universe of this study encompasses an expansive area of grape producers in the district of Manisa, which consists of 15 counties and 572 villages. In this wide area, so asto eliminate the time and cost limits of a proper field search, the optimum sample size representing the population has been figured out. To start with, the basic random sampling method was used (Çiçek, Erkan, 1996).

$$n = \frac{N.\sigma^2.z^2}{(N-1).d^2+\sigma^2.z^2} \qquad (1)$$

In the calculation of sample size, the error margin was at 10% and the reliability limit was 95%.

$$n = \frac{26824\ x\ (30.984)^2\ x\ (1.96)^2}{(26824-1)\ x\ (4.95)^2 + (30.984)^2\ x\ (1.96)^2},\quad n = 149{,}678 = 150 \quad (2)$$

Calculations show that the sample size should be 150.

Then, double stratified sampling method was used. As the estimation was aimed at predicting results for the district of Manisa, as a whole; 15 villages were chosen out of this sample size of 150 grape producers, in the light of cost and labor differences. The survey was planned to be applied to 10 different households in each of these 15 villages. These villages were labelled as the first strata sample units. Taking into account the fact that area-size variation has a more meaningful impact on calculations in this selection, (MOS) measure of size was used. Samples were derived with the approach of Probability Proportional to Size(PPS), considering the MOS values in the table.

In this calculation, the probability (P_i) of a sample unit (n) taken into the sample, depends on the size (S_i) of the residential area.
P_i = $n.S_i / S$
S = $\sum S_i$
This formula can be transformed for this study as;
S = Total MOS values related to residence area
I = Residence area index
Si = I. Size of residence area
Under these circumstances, the inverse of probability of chosen residence area gives the weight of residence area (f1) (first strata). In the second stage of sampling procedure, 10 grape producers were chosen in each village (determined in the first stage of sampling) by using systematic sampling method. Each viticulture manufacturer was classified by their area size and 10 of them were chosen with a systematic method, being ranked according to the size of the land they owned.

When choosing n number of units from an N mass, with equal probability,
1. The range coefficiency was calculated from A = N/n
2. A random number between 1 and the range coefficent was generatedon computer. This number would indicate the starting number and the queue number of the first sample

3. The queue number of the second sample was determined by adding the range coefficient to the starting number. This was conducted for all of the following samples.
4. Probability of villagesfalling under the second phase sampling, was calculated by n/N. The reverse of this calculation gives the weights of the sample villages in Table1.

Table 1. Sample Villages and Their Weights

County	Village	Area Size (ha)	Number of Producers	Weight
ALAŞEHİR	Caberfakılı	3771,5	1652	**165,2**
ALAŞEHİR	Kavaklıdere	882,9	256	104,97
ALAŞEHİR	Center	758,4	456	217,68
ALAŞEHİR	Şahyar	268,8	60	80,83
ALAŞEHİR	Tepeköy	216,8	135	225,49
MANİSA	Center	2761,2	1480	194,06
MANİSA	Yeniköy	53,5	43	290,99
SALİHLİ	Taytan	640,3	239	135,14
SARIGÖL	Bahadırlar	488,2	155	114,95
SARIGÖL	Çavuşlar	440	190	156,34
SARIGÖL	Sığırtmaç	157,5	80	183,86
SARUHANLI	Center	1428,4	665	168,55
SARUHANLI	Kumkuyucak	366,5	96	94,84
TURGUTLU	Center	2216,8	1223	199,74
TURGUTLU	Örenköy	100,4	97	349,74
TOTAL		14551,2	6827	

3. Findings and Discussion

Producing high value-added products is of critical importance for firms and manufacturers to contribute to country's GDP and to the wealth of society (Müftüoğlu, et al., 2005).

In this study, TurkStat's method for input-output cost tables were utilized for the formulation of a predictive model to estimate the added value of grape production in Manisa district. According to TurkStat (2014), in order to predict the added value in agricultural activities, 7 types of production costs should be deducted from the output costs. These include the costs of; seed, disinfection manure, compost, fuel, maintenance, disinfection and irrigation. TurkStat doesn't factoring

labor costs as an input cost in measuring added value of agricultural activities. The explanations as to the calculation of these costs can be seen below.

The number of seasons, the amount of usage in every season and the total costs were taken into account while calculating the costs of hormone usage. The labor costs incurred by hormone usage were not included, as they aren't part of TurkStat's method which was employed in this study.

Table 2. Hormone Usage Values and Amounts

County	Village	Value (USD)	Hormone per hectare (ppm)	Cost of hormone per hectare (USD/ha)
ALAŞEHİR	Caberfakılı	1.137.369	127	39,64
ALAŞEHİR	Kavaklıdere	545.527	44	13,77
ALAŞEHİR	Center	2.195.550	151	47,13
ALAŞEHİR	Şahyar	708.346	65	20,14
ALAŞEHİR	Tepeköy	840.045	65	20,16
MANİSA	Center	1.359.288	57	17,83
MANİSA	Yeniköy	450.483	17	5,16
SALİHLİ	Taytan	827.730	56	17,50
SARIGÖL	Bahadırlar	1.894.977	157	48,88
SARIGÖL	Çavuşlar	1.436.642	147	45,95
SARIGÖL	Sığırtmaç	1.674.053	112	34,89
SARUHANLI	Center	362.256	30	9,48
SARUHANLI	Kumkuyucak	355.390	21	6,41
TURGUTLU	Center	1.163.028	51	15,89
TURGUTLU	Örenköy	0	0	0,00
TOTAL		14.950.684	68	21,05

In Table 2. total expenditures on hormone usage in the related year is shown as 14.950.684USD. It has been observed that hormone usage is more common where irrigation facilities are better. While calculating the hormone costs, the period when hormone is being used; the amount of usage and the total expenses used for application were taken into account. In the Örenköy village of Turgutlu county, no hormone was used due to the rugged structure of the land and lack of irrigation facilities. Hormone usage is calculated as ppm per hectare. 1 hormone tablet equals to 10 ppm and contains 1 gr Active GA3 (Gibberrellic Acid). On the other hand, 500 cc of liquid hormone contains 0,5 gr GA3 and it equals to 5 ppm.

Irrigation costs calculated by these variables; frequency of irrigation, price of using state owned irrigation channels, electricity costs, rental price of the irrigation facility of another manufacturer, other overall expenses (except labor costs) are shown in Table 3.

Table 3. Irrigation Costs per Hectare

County	Village	Value (USD)	Cost of irrigation per hectare (USD/ha)
ALAŞEHİR	Caberfakılı	4.315.849	1502,56
ALAŞEHİR	Kavaklıdere	3.181.535	805,13
ALAŞEHİR	Center	1.646.341	353,85
ALAŞEHİR	Şahyar	2.042.777	579,49
ALAŞEHİR	Tepeköy	1.010.771	241,03
MANİSA	Center	2.782.562	364,10
MANİSA	Yeniköy	1.435.829	164,10
SALİHLİ	Taytan	1.334.818	282,05
SARIGÖL	Bahadırlar	4.145.795	1071,79
SARIGÖL	Çavuşlar	1.608.315	512,82
SARIGÖL	Sığırtmaç	7.144.211	1487,18
SARUHANLI	Center	4.132.670	1082,05
SARUHANLI	Kumkuyucak	3.497.798	630,77
TURGUTLU	Center	1.254.887	169,23
TURGUTLU	Örenköy	163.569	71,79
TOTAL		39.697.728	558,97

Total irrigation costs in the related year is 39.697.728 USD. Irrigation appeared to have taken up a significant slice out of all the cost items.

Labor costs were calculated for different labor activities such as ploughing, pruning, collecting the prune dreg, fastening, green pruning, fertilizing, hormone usage, disinfection, irrigation, and harvesting. Total cost of labor for these tasks has been calculated for both male and female wage labor and unpaid family labor. However, unpaid family labor hasn't been taken into account, as in line with TurkStat's approach.

Table 4. Labor Costs of Per Hectare

County	Village	Weeding cost (USD/ha)	Prunning cost (USD/ha)	Collecting the prune dreg cost (USD/ha)	Fastening cost (USD/ha)	Green prunning cost (USD/ha)	Excrement Cost (USD/ha)	Fertiliser cost (USD/ha)	Disinfection cost (USD/ha)	Irrigation cost (USD/ha)	Harvesting cost (USD/ha)	Total (USD/ha)
ALAŞEHİR	Caberfakılı	2,7	244,0	0,0	222,3	16,7	0,0	0,0	45,1	0,0	647	**1.182**
ALAŞEHİR	Kavaklıdere	403,0	373,7	37,1	204,4	91,8	9,8	711,2	1.499	387	586	**4.304**
ALAŞEHİR	Center	216,2	518,7	12,9	299,1	199,2	75,8	169,1	525,0	649	476	**3.141**
ALAŞEHİR	Şahyar	88,9	330,0	17,1	190,6	55,8	0,0	0,0	0,9	37	571	**1.276**
ALAŞEHİR	Tepeköy	0,0	44,8	0,0	198,6	37,2	0,0	0,0	0,0	0,0	392	**672**
MANİSA	Center	24,4	193,9	18,8	213,0	51,9	2,7	0,9	7,8	10	399	**924**
MANİSA	Yeniköy	46,0	329,7	2,4	187,0	119,9	73,5	28,4	49,5	41	559	**1.437**
SALİHLİ	Taytan	82,6	289,3	9,0	220,3	184,4	76,2	37,2	125,1	19	509	**1.553**
SARIGÖL	Bahadırlar	15,8	435,9	4,8	242,2	193,0	1,7	13,6	47,8	57	521	**1.533**
SARIGÖL	Çavuşlar	89,7	42,7	2,6	129,6	93,2	0,0	13,9	90,6	40	418	**948**
SARIGÖL	Sığırtmaç	8,2	295,5	8,2	182,3	69,9	2,7	16,3	68,1	84	568	**1.304**
SARUHANLI	Center	126,1	506,0	16,2	321,6	47,3	0,0	21,5	47,9	52	699	**1.841**
SARUHANLI	Kumkuyucak	4,3	392,9	8,6	222,6	133,2	0,0	12,6	24,8	103	609	**1.512**
TURGUTLU	Center	0,0	148,1	0,0	123,6	1,3	2,3	0,0	3,9	1,9	354	**635**
TURGUTLU	Örenköy	138,5	38,3	0,0	0,0	0,0	0,0	16,4	76,6	0,0	193	**463**

Labor costs per hectare were calculated for each labor activity in vineyards in Table 4. The primary activity in cultivation is pruning; then it's followed by weeding, clearing of the waste from pruning, fastening, green pruning, fertilizing, disinfection, and harvesting in an order.

As aforementioned, labor costs cover solely direct costs of wage labor; this item doesn't include unpaid family labor.

Harvesting proved to be the largest item among labor costs. Depending on the condition of grapes, one hectare of vineyard can be harvested by 2-3 people. The second largest labor cost item is pruning. Ten people can prune one hectare of vineyard in one day. Pruning depends on the maturity of the vineyards, the yield and the number of grape branches. The third largest labor cost item is fastening.

Roping process is handled after trimming, in order to prevent new shoots from emerging immediately and help them hold on to the bollard and the wires.

The fourth largest labor cost item is labor force utilized in the course of disinfection. Since the disinfection process consists of injection of insectices, fungicides, and herbicide, four times or five times in a period, this item constitutes a significant portion in total labor costs. The fifth largest labor cost item is irrigation. Most of the sample production units in the field search use flooding method for irrigation. This method requires quite intensive work force. Besides these labor cost items, removing the prune waste and fertilizing are the other items factored in calculating the total labor costs. Labor costs are not included in the total costs in added value calculation which is to come out at the end of this study.

In calculating the fuel costs (bollard pull), expenditures for different agricultural activities (ploughing, hoeing, disk harrowing, hoeing with spring, disinfection, irrigation, manuring, harvesting, etc.) which require fuel consumption, were taken into account. In cases when the manufacturer didn't have equipment for these activities and if s/he rented them, rental fees for the equipments have also been counted in.

Table 5. Fuel Costs of Per Hectare

County	Village	Weeding cost (USD/ha)	Hoeing fuel cost (USD/ha)	Disk harrowing fuel cost (USD/ha)	Sweeping fuel cost (USD/ha)	Disinfection fuel cost (USD/ha)	Irrigation fuel cost (USD/ha)	Fertilising fuel cost (USD/ha)	Harvesting and transportation fuel cost (USD/ha)	Total (USD/ha)
ALAŞEHİR	Caberfakılı	87,3	52,0	32,2	9,9	313,3	0,0	21,8	102	**619**
ALAŞEHİR	Kavaklıdere	266	79,1	159,4	0,0	267,1	177,9	74,8	104	**1.129**
ALAŞEHİR	Center	127	40,6	101,1	4,1	129,4	28,6	54,5	103	**589**
ALAŞEHİR	Şahyar	190	77,4	91,4	0,0	249,3	120,3	85,1	133	**948**
ALAŞEHİR	Tepeköy	56,0	51,9	58,0	27,2	268,9	6,8	37,8	101	**608**
MANİSA	Center	137	65,5	83,1	26,8	210,1	46,5	31,4	75	**676**
MANİSA	Yeniköy	80,8	53,0	123,2	3,9	202,8	97,8	75,7	77	**714**
SALİHLİ	Taytan	141	125,5	91,7	92,9	208,4	62,3	64,0	146	**932**
SARIGÖL	Bahadırlar	297	88,5	7,6	140,3	595,5	11,4	177	214	**1.532**
SARIGÖL	Çavuşlar	183	125,9	137,5	35,4	338,1	16,8	47,0	165	**1.049**
SARIGÖL	Sığırtmaç	205	101,5	102,9	44,0	721,5	57,5	69,6	210	**1.512**
SARUHANLI	Center	226	139,2	80,6	65,2	238,6	75,6	51,1	282	**1.159**
SARUHANLI	Kumkuyucak	295	96,3	97,1	118,3	295,8	205,3	31,4	195	**1.335**
TURGUTLU	Center	224	123,6	27,5	12,8	82,5	135,2	47,0	89	**742**
TURGUTLU	Örenköy	8,6	11,5	0,0	0,0	2,9	0,0	0,0	5,2	**28**

In the calculation of fuel costs, all activities in agricultural production (from weeding to harvesting and transportation) were measured as seen in Table 5. Disinfection expenditures appeared to be the top spending item among all fuel costs. Use of tractors and agrimotor in disinfection increases the fuel costs. Other cost items which increase the fuel cost extensively, are weeding and harvesting.
It is seen in Table 6. that fertilizing costs were assessed in two different categories: artificial fertilizer and farm manure. Artificial fertilizer consists of ammonium sulphate, ammonium nitrate, urea, triple super phosphate, di ammonium phosphate, 15-15-15 composite, 20-20 composite, 18-46 composite and leaf manure. Questions about usage frequency and total costs of each of these ingredients were investigated during the field search.

Table 6. Fertilizing Costs per Hectare

County	Village	Farm manure total cost (USD/ha)	Ammonium sulphate total cost (USD/ha)	Ammonium nitrate total cost (USD/ha)	Urea total cost (USD/ha)	Triple super phosphate (USD/ha)	Di ammonium phospate total cost (USD/ha)	Composite (20-20) total cost (USD/ha)	Composite (15-15-15) total cost (USD/ha)	Composite (18-46) Total cost (USD/ha)	Leaf manure total cost (USD/ha)	Total (USD/ha)
ALAŞEHİR	Caberfakılı	128,6	61,4	32,0	61,4	76,1	13,9	30,7	1,5	0,0	230,4	**635,9**
ALAŞEHİR	Kavaklıdere	14,6	565,8	79,4	75,3	170,1	7,2	0,0	0,0	0,0	314,6	**1.226,9**
ALAŞEHİR	Center	230,8	221,0	89,8	215,8	18,5	88,0	0,0	15,5	7,0	286,0	**1.172,3**
ALAŞEHİR	Şahyar	0,0	168,5	72,0	120,2	60,3	0,0	3,4	131,3	0,0	108,3	**663,9**
ALAŞEHİR	Tepeköy	66,7	57,6	114,3	77,8	42,0	31,0	0,0	25,0	33,0	46,7	**494,1**
MANİSA	Center	95,9	40,5	13,9	21,5	15,6	0,0	0,0	26,2	0,0	47,8	**261,4**
MANİSA	Yeniköy	104,7	60,2	26,9	23,9	129,5	43,4	0,0	0,0	0,0	48,0	**436,7**
SALİHLİ	Taytan	17,0	142,5	31,1	30,5	1,1	0,0	115,8	100,6	0,0	353,7	**792,4**
SARIGÖL	Bahadırlar	442,8	148,0	155,7	116,3	174,5	0,0	36,9	22,8	17,6	487,4	**1.601,9**
SARIGÖL	Çavuşlar	51,1	134,7	1.085,2	36,6	0,0	10,0	14,4	53,8	0,0	96,3	**1.482,1**
SARIGÖL	Sığırtmaç	36,8	98,7	172,9	76,2	11,0	16,5	7,2	87,7	21,2	195,2	**723,3**
SARUHANLI	Center	83,8	89,9	10,6	20,5	2,0	9,1	0,0	59,5	63,8	117,4	**456,6**
SARUHANLI	Kumkuyucak	18,1	3,5	10,2	29,3	0,0	1,1	0,0	2,6	71,1	7,5	**143,4**
TURGUTLU	Center	169,7	55,1	67,8	6,2	0,0	5,6	0,0	61,5	0,0	0,0	**365,9**
TURGUTLU	Örenköy	0,0	0,0	46,4	0,0	0,0	26,5	0,0	162,9	0,0	0,0	**235,8**

Fertilizing costs appeared to be the second biggest cost item among the total costs. Ammonium sulphate usage seemed to be the largest expenditure among the fertilizing items. This was followed by leaf manure. Fertilizing is an important practice in terms of productivity.

Disinfection costs were calculated under three basic categories of disinfection usage; insectice, fungicides, and herbicide in Table 7. During the field search producers were asked about their usage periods of each disinfection and the total costs of disinfection usage.

Table 7. Disinfection Costs per Hectare

County	Village	İnsectice total cost (USD/ha)	Fungucide total cost (USD/ha)	Herbicide total cost (USD/ha)	Total (USD/ha)
ALAŞEHİR	Caberfakılı	107,4	71,5	75,1	**253,9**
ALAŞEHİR	Kavaklıdere	133,4	75,8	88,6	**297,8**
ALAŞEHİR	Center	126,0	125,3	63,2	**314,5**
ALAŞEHİR	Şahyar	306,6	203,1	86,0	**595,8**
ALAŞEHİR	Tepeköy	146,9	122,3	44,2	**313,4**
MANİSA	Center	216,0	177,0	49,4	**442,4**
MANİSA	Yeniköy	93,3	89,3	14,3	**196,8**
SALİHLİ	Taytan	45,9	29,3	25,1	**100,4**
SARIGÖL	Bahadırlar	147,7	259,1	0,0	**406,9**
SARIGÖL	Çavuşlar	230,2	196,7	18,8	**445,6**
SARIGÖL	Sığırtmaç	363,6	453,1	61,2	**877,9**
SARUHANLI	Center	183,8	184,9	34,7	**403,5**
SARUHANLI	Kumkuyucak	64,7	31,7	12,6	**109,0**
TURGUTLU	Center	78,0	0,0	21,7	**99,7**
TURGUTLU	Örenköy	5,2	144,5	0,0	**149,7**

It appeared that disinfection usage in Manisa district is excessive. Some producers declared that they use disinfections even 20 times in a period. Such excess usage of disinfections as well as disinfection efforts based on trial and error, cause producers to have to bear with some extra expenses. Insecticides appeared to be biggest cost item in disinfection usage. This is followed by fungicides and the last one was herbicides. Maintenance costs consist of spending on renewing the viticulture bollard, fixing the strings, and mending the tools and devices. Maintenance costs can be seen in Table 8.

Table 8. Maintenance Costs per Hectare

County	Village	Maintenance cost (USD/ha)
ALAŞEHİR	Caberfakılı	**935,4**
ALAŞEHİR	Kavaklıdere	**10,3**
ALAŞEHİR	Center	**229,4**
ALAŞEHİR	Şahyar	**224,9**
ALAŞEHİR	Tepeköy	**143,3**

MANİSA	Center	**45,6**
MANİSA	Yeniköy	**222,2**
SALİHLİ	Taytan	**143,5**
SARIGÖL	Bahadırlar	**0,0**
SARIGÖL	Çavuşlar	**59,0**
SARIGÖL	Sığırtmaç	**295,7**
SARUHANLI	Center	**29,0**
SARUHANLI	Kumkuyucak	**21,3**
TURGUTLU	Center	**127,6**
TURGUTLU	Örenköy	**0,0**

The added value of grape production in Manisa district and the load of each cost item per hectare, over total costs can be seen below in Table 9.

As can be inferred from Table 9, the largest cost item is fuel costs. The field research executed for this study showed that fertilizing costs and costs of disinfection usage can be decreased by raising awareness amongst producers. From this stand point, it can be argued that the efforts of state authorities, governmental establishments and all the other relevant institutions would have significant impact, not only on decreasing the costs on the side of the producers; but also on enhancing the nationwide added value creation.

Table 9. Added Value of Manisa Grape Production (USD/ha)

County	Village	Hormone (USD/ha)	İnsectice, Herbicide, Funguicide (USD/ha)	Irrigation (USD/ha)	Fertilizer (USD/ha)	Fuel (USD/ha)	Maintenance (USD/ha)	Total Cost (USD/ha)	İncome (USD/ha)	Value Added (USD/ha)
ALAŞEHİR	Caberfakılı	396,4	253,9	1.504	635,9	619,2	935,4	4.344,9	14.057,7	**9.712,9**
ALAŞEHİR	Kavaklıdere	137,7	297,8	803,1	1.226	1.129,5	10,3	3.605,3	10.725,4	**7.120,1**
ALAŞEHİR	Center	471,3	314,5	353,4	1.172	589,4	229,4	3.130,3	10.320,9	**7.190,6**
ALAŞEHİR	Şahyar	201,4	595,8	580,7	663,9	948,2	224,9	3.214,8	9.813,3	**6.598,5**
ALAŞEHİR	Tepeköy	201,6	313,4	242,5	494,1	608,6	143,3	2.003,5	11.307,1	**9.303,6**
MANİSA	Center	178,2	442,4	364,9	261,4	676,0	45,6	1.968,5	13.528,4	**11.559,9**
MANİSA	Yeniköy	51,6	196,8	164,5	436,7	714,8	222,2	1.786,6	12.272,3	**10.485,7**
SALİHLİ	Taytan	175,0	100,4	282,2	792,4	932,9	143,5	2.426,5	6.478,9	**4.052,4**
SARIGÖL	Bahadırlar	488,8	406,9	1.069	1.601	1.532,9	0,0	5.099,7	14.725,5	**9.625,9**
SARIGÖL	Çavuşlar	459,5	445,6	514,4	1.482	1.049,8	59,0	4.010,5	8.904,4	**4.893,9**
SARIGÖL	Sığırtmaç	348,9	877,9	1.488	723,3	1.512,9	295,7	5.247,4	17.157,5	**11.910,2**
SARUHANLI	Center	94,8	403,5	1.081	456,6	1.159,8	29,0	3.225,0	12.150,2	**8.925,2**
SARUHANLI	Kumkuyucak	64,1	109,0	630,8	143,4	1.335,4	21,3	2.304,0	10.478,0	**8.173,9**
TURGUTLU	Center	158,9	99,7	171,4	365,9	742,4	127,6	1.665,9	12.902,3	**11.236,4**
TURGUTLU	Örenköy	0,0	149,7	72,0	235,8	28,3	0,0	485,8	3.205,2	**2.719,4**

The "Predictive Model for Grape Production in Manisa District" was developed by calculating the percentage of each cost item shown in Table 10. Cost items used for calculating the added value can be seen in the first column. The predictive model exhibits values attained by subtracting the total costs from the revenue. According to the field research run for this study; total revenue was computed as 827.055.456 USD; total costs were calculated as 827.055.456 USD; and the added value was calculated as 628.083.317 USD.

Table 10. Estimated Added Value Model for Grape Production in Manisa

Costs	Value (USD)	Share in total costs (%)	Costs/Income ratio (%)	Costs/Value added ratio (%)
HORMONE	14.950.684	7,51	1,81	2,38
CHEMİCALS	22.742.777	11,43	2,75	3,62
IRRIGATION	39.697.726	19,95	4,80	6,32
FERTILIZER	46.165.761	23,20	5,58	7,35
FUEL	64.500.473	32,42	7,80	10,27
MAINTANANCE	10.914.717	5,49	1,32	1,74
TOTAL COST	198.972.139	100,0	24,06	31,68
INCOME	827.055.456		100,0	131,7
CREATED VALUE ADDED	**628.083.317**			**100,0**

This added value represents the Manisa district as a whole.

Table 11. Efficiency of Fresh Grape per Hectare (kg/ha)

County	Village	Total Vineyard (ha)	Total produced grape (kg)	Average yield per ha (kg/ha)
ALAŞEHİR	Caberfakılı	2.869	80.101.440	**27.920**
ALAŞEHİR	Kavaklıdere	3.962	121.249.932	**30.600**
ALAŞEHİR	Center	4.659	125.056.400	**26.840**
ALAŞEHİR	Şahyar	3.518	72.270.154	**20.540**
ALAŞEHİR	Tepeköy	4.168	101.827.302	**24.430**
MERKEZ	Center	7.627	230.348.745	**30.200**
MERKEZ	Yeniköy	8.730	253.458.910	**29.030**
SALİHLİ	Taytan	4.730	103.513.640	**21.890**
SARIGÖL	Bahadırlar	3.877	104.277.579	**26.900**
SARIGÖL	Çavuşlar	3.127	71.267.202	**22.790**
SARIGÖL	Sığırtmaç	4.799	169.884.053	**35.400**
SARUHANLI	Center	3.822	104.707.334	**27.390**

SARUHANLI	Kumkuyucak	5.545	141.244.565	**25.470**
TURGUTLU	Center	7.320	185.755.875	**25.380**
TURGUTLU	Örenköy	2.273	14.828.819	**6.520**
TOTAL		**71.025**	**1.879.791.950**	**26.470**

In the relevant year; the total grape production amounted to 1.879.791.950 kg. across 71.0245 hectares of land in Manisa district. The productivity of fresh grape production per hectare was calculated by dividing the total grape production by the total land as given in Table 11. The result turned out as 26.470 kg/ha. The details can found in Table 12.

Table 12. Total Cost of Fresh Grape per Kg. (USD/kg)

County	Village	Total Costs (USD)	Total produced grape (kg)	Costs of per kg (USD/kg)
ALAŞEHİR	Caberfakılı	12.467.145	80.101.440	**0,156**
ALAŞEHİR	Kavaklıdere	14.283.430	121.249.932	**0,118**
ALAŞEHİR	Center	14.582.817	125.056.400	**0,117**
ALAŞEHİR	Şahyar	11.308.598	72.270.154	**0,156**
ALAŞEHİR	Tepeköy	8.349.778	101.827.302	**0,082**
MERKEZ	Center	15.012.820	230.348.745	**0,065**
MERKEZ	Yeniköy	15.596.493	253.458.910	**0,062**
SALİHLİ	Taytan	11.476.610	103.513.640	**0,111**
SARIGÖL	Bahadırlar	19.772.405	104.277.579	**0,190**
SARIGÖL	Çavuşlar	12.539.153	71.267.202	**0,176**
SARIGÖL	Sığırtmaç	25.180.556	169.884.053	**0,148**
SARUHANLI	Center	12.326.496	104.707.334	**0,118**
SARUHANLI	Kumkuyucak	12.776.600	141.244.565	**0,090**
TURGUTLU	Center	12.194.938	185.755.875	**0,066**
TURGUTLU	Örenköy	1.104.271	14.828.819	**0,074**
TOTAL		**198.972.116**	**1.879.791.950**	**0,106**

Total cost of grape production in Manisa district was calculated as 198.972.116 USD in this study. Production cost per kg was calculated by dividing this number by the total output of fresh grapes in the sample and the resultant expense totaled up to 0,106 USD. In other words, production cost of fresh grape in Manisa district in the year 2014 is; 0,106 USD/kg.

Table 13. Cost of Production per Hectare (USD/ha)

County	Village	Total	Total	Average	Production	Production

		Vineyard (ha)	produced grape (kg)	yield per ha (kg/ha)	costs of per kg (USD/kg)	cost of per ha (USD/ha)
ALAŞEHİR	Caberfakılı	2.869,4	80.101.440	27.920	**0,156**	**4.345,5**
ALAŞEHİR	Kavaklıdere	3.961,8	121.249.932	30.600	**0,118**	**3.604,7**
ALAŞEHİR	Center	4.658,6	125.056.400	26.840	**0,117**	**3.129,8**
ALAŞEHİR	Şahyar	3.517,7	72.270.154	20.540	**0,156**	**3.214,0**
ALAŞEHİR	Tepeköy	4.167,6	101.827.302	24.430	**0,082**	**2.003,2**
MERKEZ	Center	7.626,5	230.348.745	30.200	**0,065**	**1.968,3**
MERKEZ	Yeniköy	8.729,9	253.458.910	29.030	**0,062**	**1.786,3**
SALİHLİ	Taytan	4.729,7	103.513.640	21.890	**0,111**	**2.427,0**
SARIGÖL	Bahadırlar	3.877,2	104.277.579	26.900	**0,190**	**5.100,6**
SARIGÖL	Çavuşlar	3.126,6	71.267.202	22.790	**0,176**	**4.009,8**
SARIGÖL	Sığırtmaç	4.798,7	169.884.053	35.400	**0,148**	**5.247,1**
SARUHANLI	Center	3.822,2	104.707.334	27.390	**0,118**	**3.224,4**
SARUHANLI	Kumkuyucak	5.545,3	141.244.565	25.470	**0,090**	**2.303,9**
TURGUTLU	Center	7.320,4	185.755.875	25.380	**0,066**	**1.666,2**
TURGUTLU	Örenköy	2.273,3	14.828.819	6.520	**0,074**	**485,5**
TOTAL		**71.024,9**	**1.879.791.950**	**26.470**	**0,106**	**2.801,8**

As shown in Table 13, the production cost per hectare was calculated as 2801,8 USD. This result represents the average for Manisa district. Total costs that would be incurred to get 26.470 kg's of grape from a hectare can be seen in Table 14.

Table 14. Added Value of Fresh Grape per Kilogram (USD/kg)

County	Village	Total value added (USD)	Total produced grape (kg)	Value added of per kg (USD/kg)
ALAŞEHİR	Caberfakılı	27.870.083	80.101.440	**0,348**
ALAŞEHİR	Kavaklıdere	28.208.601	121.249.932	**0,233**
ALAŞEHİR	Center	33.498.261	125.056.400	**0,268**
ALAŞEHİR	Şahyar	23.211.713	72.270.154	**0,321**
ALAŞEHİR	Tepeköy	38.773.733	101.827.302	**0,381**
MERKEZ	Center	88.161.205	230.348.745	**0,383**
MERKEZ	Yeniköy	91.539.242	253.458.910	**0,361**
SALİHLİ	Taytan	19.166.504	103.513.640	**0,185**
SARIGÖL	Bahadırlar	37.321.454	104.277.579	**0,358**
SARIGÖL	Çavuşlar	15.301.264	71.267.202	**0,215**
SARIGÖL	Sığırtmaç	57.153.244	169.884.053	**0,336**
SARUHANLI	Center	34.113.891	104.707.334	**0,326**
SARUHANLI	Kumkuyucak	45.326.855	141.244.565	**0,321**

TURGUTLU	Center	82.255.209	185.755.875	**0,443**
TURGUTLU	Örenköy	6.182.081	14.828.819	**0,417**
TOTAL		**628.083.317**	**1.879.791.950**	**0,334**

The added value per kg is 0,334 USD. The efficiency per kg can change year by year, depending on the condition of vineyards and the methods used for maintaining the vineyards. According to the results of our predictive model, the added value of grape production is 0,334 USD per kg.

Table 15. Added Value of Fresh Grape per Hectare (USD/ha)

County	Village	Total value added (USD)	Total Vineyard (ha)	Value added of per ha (USD/ha)
ALAŞEHİR	Caberfakılı	27.870.083	2.869,4	**9.713**
ALAŞEHİR	Kavaklıdere	28.208.601	3.961,8	**7.120**
ALAŞEHİR	Center	33.498.261	4.658,6	**7.191**
ALAŞEHİR	Şahyar	23.211.713	3.517,7	**6.599**
ALAŞEHİR	Tepeköy	38.773.733	4.167,6	**9.304**
MERKEZ	Center	88.161.205	7.626,5	**11.560**
MERKEZ	Yeniköy	91.539.242	8.729,9	**10.486**
SALİHLİ	Taytan	19.166.504	4.729,7	**4.052**
SARIGÖL	Bahadırlar	37.321.454	3.877,2	**9.626**
SARIGÖL	Çavuşlar	15.301.264	3.126,6	**4.894**
SARIGÖL	Sığırtmaç	57.153.244	4.798,7	**11.910**
SARUHANLI	Center	34.113.891	3.822,2	**8.925**
SARUHANLI	Kumkuyucak	45.326.855	5.545,3	**8.174**
TURGUTLU	Center	82.255.209	7.320,4	**11.236**
TURGUTLU	Örenköy	6.182.081	2.273,3	**2.719**
TOTAL		**628.083.317**	**71.024,9**	**8.843**

The added value per hectare is 8843 USD as shown in Table 15. In other words, producers create an added value of 8843 USD from one hectare of their vineyard activities.

4. Conclusion

Based on the input cost table developed by Uysal (2007), Table 16 shows the inputs and outputs in the production process of 26.470 kg per hectare.

As can be seen in Table 16, the efficiency per hectare in the sample production units, which was investigated during the field research, measures up to 26.470 kg. The percentile distributions of cost items at this efficiency level are; 27,6% fuel costs, 23,1% fertilizing costs, 19,9% irrigation costs, 11,4% disinfection costs, 7,5% hormone usage costs, 4,6% harvesting and transporting costs and the rest consists of maintenance costs. When the costs are deducted from income per hectare (11.646 USD), the added value per hectare turns out to be 8843 USD.

Details can be seen below.

Table 16. Average Inputs of Efficiency per Hectare (for 26.470 kg/ha efficiency)

PROCESS	DATE AND NUMBER OF THE PROCESS	COST OF BOLLARD PULL (USD/ha)	MATERIAL USAGE (kg/ha)	UNIT	COST (USD/ha)	% RATIO
CULTIVATION PROCESS (ha)						
Ploughing (ha)	Dec-July (5)	375,00			375,00	13,3%
Prunning(ha)	Dec-Feb (1)					
Collecting the prune dreg(ha)	Dec-Feb (1)					
Fastening(ha)	Dec-Feb (1)					
Green prunning(ha)	May June (1)					
Fertilizing(ha)	Nov-March	58,60			58,60	2,1%
Disinfection(ha)	Feb-July	248,40			248,40	8,8%
Irrigation(ha)	May-July	78,60			78,60	2,8%
Hormone(ha)	May-July	17,30			17,30	0,6%
TOTAL		**777,90**			**777,90**	**27,6%**
HARVEST-TRANSPORT (ha)						
Harvest (ha)		129,90			129,90	4,6%
TOTAL		**129,90**			**129,90**	**4,6%**
Fertilizing Cost (ha)			2500,9	Kg	650,20	23,1%
Disinfection cost (ha)			41,1	Kg	320,20	11,4%
Hormone Cost (ha)			101,5	Kg	210,5	7,5%
Irrıgation (ha)					559	19,8%
Maintanence (ha)					153,6	5,4%

TOTAL	**907,80**	**264,35**	**Kg**	**1893,50**	**67,1%**
TOTAL COSTS(ha)				**2820,0**	**100,0%**
Yield (kg/ha)				26470	
Cost of per kg.				0,106	
İncome of per kg.				0,44	
Value added of per kg.				0,334	
İncome (ha)				11646	
Value Added (USD/ha)				**8843**	

As can be seen in Table 16, the efficiency per hectare in the sample production units, which was investigated during the field research, measures up to 26.470 kg. The percentile distributions of cost items at this efficiency level are; 27,6% fuel costs, 23,1% fertilizing costs, 19,9% irrigation costs, 11,4% disinfection costs, 7,5% hormone usage costs, 4,6% harvesting and transporting costs and the rest consists of maintenance costs. When the costs are deducted from income per hectare (11.646 USD), the added value per hectare turns out to be 8843 USD.

(TUIK, 2014) defines Gross Domestic Product (GDP) as a value which is equal to the sum of the values of all goods and services produced by resident institutional units engaged in domestic production activities in an economy in a given period of time, minus the total inputs which are used in the production of these goods and services. In accordance with this definition, in order to find out the GDP that grape producers might get, one should subtract the costs (except for labour costs) that the grape producers have to bear with, from their revenue.

According to the results of the census in 31.12.2013, the district of Manisa hosts a population of 1.359.463 people. When the resultant added value amounts are divided by the population, the added value of grape production in Manisa turns out to be 462 USD per capita.

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