

Evaluation of Economy and Compared Energy Efficiency on Grape in West Azerbaijan Province

Abdullah Hassanzadeh Gorttapeh¹, Farideh Faghenaby², Hania Mirsoltani³, Mahnaz Zahedmanesh⁴, Vahid Gasmian⁵ and Maryam Haji-Hasani¹

¹ Agricultural and Natural Sources Research Center of West Azerbaijan province, Uremia/Iran. E-Mail: Ahassanzadeh_g@yahoo.com

² University of Uremia, West Azerbaijan, Iran

³ Tabriz's Islamic Azad University, Tabriz, Iran.

⁴ Ata Plant Protection Clinic, Urmia, Iran.

⁵ Urmia Agricultural Managing Office

ABSTRACT

A way of estimation agriculture development and product stability agricultural location is using of energy flow method. In this consideration, energy flow at agricultural ecosystems of Grape in two cities from west Azerbaijan province was compared. The related data of inputs and outputs for evaluation of energy efficiency in these gardens are become equivalent value of input and output energy efficiency. Energy value of used factors and input in grape gardens of uremia and sardasht were respectively 6417773 and 862570 k cal/ha and output (production) energy value of the gardens were 25632600 and 10123800 k cal/ha respectively. Energy efficiency values (output: input ration) were 3.99 and 11.7 respectively. Data showed in grape gardens of uremia the most use of energy were nitrogen fertilized usage and irrigation. In grape gardens of sardasht the most use of energy was nitrogen fertilized. In general, because of the climate conditions, topography, society culture in these regions, difference in energy efficiency of these gardens almost was reasonable. The number of inputs increases; effect increases any one of input decrease. Grape garden system of sardasht hasn't any contamination and agricultural systems because of much Annual rainfall in this region are dry farming. There for, costs of irrigation and poisoning are deleted but inordinately poisoning of uremia gardens result in contamination and transformed these ecosystems.

Keywords: Energy efficiency, output, input, and grape.

INTRODUCTION

Agricultural ecosystems are related to economical and society condition widely, that there are in the world. The major of agricultural ecosystems management are maximum energy flow and human service materials. (Energy cycle is a subject of agricultural ecology and in different locations of word, input and output energy is calculated in different agricultural ecosystems (Heydar golynejad and Hassanzadeh-Gorttapeh, 2003).

Agricultural ecosystems depend on ecological energy and cultivation energy (Kuchaki, 1994), ecological energy source is sun energy that using for photosynthesis, environmental temperature control, atmosphere currents and creating rain (Hassanzadeh Gorttapeh et al, 2006). Cultivate energy is divisible in two groups biological and industrial. Amount of using energy in agriculture depends on

changing degree in natural ecosystem (Kuchaki and Hoseini, 1989). Apprehension distribution energy method is very important in development agricultural design (Hassanzadeh Gorttapeh et al, 2005). Sun is greater ecological energy source . Biological analyzes and energy in agricultural ecosystem necessary to efficient yield (Tripartitie et al, 2001).

Agricultural ecosystems haven't desirable condition. Because at the time of yield harvesting, all mineral elements go out of soil and rest provisions are used to feed domesticated animals, therefore coefficient return of materials is very low.(Hassanzadeh-Gorttapeh et al., 2001.; Kuchaki et al, 1995). In this case, these ecosystems must be are reclaimed by using chemical and organic fertilizers. On the other hand using of chemical materials such as fertilizers, fungicides, herbicides, and Make new ecological and economical problems of environmental. These problems particularly in Iran have more importance (Dehghanian, 1996 and Vlek et al, 2004). Iran country as one of the developing commercial countries the most of energy is used for agricultural productions for example insecticide, fertilizers and machinery. While human force is main energy source and machine power is used less (Vlek et al, 2004). The increase of industrial technological application in agriculture caused to increase in energy efficiency basically. Because in this condition fewer lands are released rotation, and shortage of nutrients and water is reparable mostly.

Nowadays the use of fossil fuels as energy in agriculture has specific rolls. Agriculture is depending on fossil fuels energy. Energy efficiency is increased with consumption of fossil fuels although; most energy is used in fossil fuels production. Fossil fuels energy increases amount of yields in land unit (Hassanzadeh-Gorttapeh et al, 2001, Kuchaki, 1994; Pimental et al, 1987).

Valadyani et al, (2003) express that amount of addition energy efficiency in using nitrogen depends on kind of previous yield, primary amount of nitrogen in the soil and type of weather.

In this study most of using energy related to nitrogen fertilizer, and machinery respectively. Using of nitrogen with increasing humidity or precipitation is increased.

Punti et al. (1988) in the wheat and sunflower energy efficiency and ecological evaluation comparison showed that in the modern culture available energy from straw is lower than traditional culture.

The main objective of this paper is to analyze the energy efficiencies and economic aspect of the grape in two city of west Azerbaijan province, Iran

MATERIALS and METHODS

The grape (*Vitis vinifera*) is from Vitaceae family. This plant almost are cultured in total Iran regions, Urmia by existence cold high winter is one of the grape plantation important region in Iran country(Aslany and Hagygat, 1989 and Shahrestany, 1998).

Grape is one of exportable important productions in this province (Aslany et al, 1989 and Shahrestany et al, 1998); on this basis the study conduct during 2006-2007 in Urmia and Sardasht areas of the west Azerbaijan province in the North West of Iran.

In this consideration the energy flow in the agricultural ecosystem of grape was evaluated by five years statistics and information derived from the local's agriculture government organization (preparation of questionnaire raises from 25 farmers of any local). Detail inventory of average different inputs (labor, fertilizer, pesticide, nitrogen, phosphorus, potassium, fungicide, irrigation water) and output (grape yield) was prepared following scrolls, 1994. Various inputs and output data's were converted as output input ratio. So calculated amount of energy efficiency (input and output ratio) (Hassanzadeh- Gorttapeh et al, 2001 and 2005 ; Riller and Upadhyay, 1994).

Energy efficiency = Input energy/ Output energy

Inputs of Urmia area include labor (to dig of under tree, winter and spring pruning, collecting of lops, repair of streamlets, irrigation, moving of chemical fertilizers, moving of manure, fertilization, poisoning, moving, to pluck, collecting, putting box, to degree, wrapping, loading and moving, chemical fertilizers, poisoning (pesticide, fungicide) and irrigation (Table 1). The inputs of Sardasht area include labor (to plough under tree in winter and spring, collecting of lops, moving of chemical fertilizers, fertilization, pruning, to pluck, collecting, putting box, sorting, wrapping, loading and moving), chemical fertilizers (N2, P2o5 and K2o).

Yield average of Urmia and Sadrasht grape gardens in 2001-2006 agricultural years were 11.900 and 4.700 tons/ha, respectively. The fix price of each kilo grape in Urmia and Sardasht were 24.8 and 13.3 cents (1 \$=9000 Rails).

Table 1: Inputs energy in grape cultivation in Urmia and Sardasht areas (Iran).

Input	Urmia			Sardasht		
	Amount/ ha	energy/unit (kcal)	Kcal/ha	Amount/ ha	energy/unit (kcal)	Kcal/ha
Labor	873 hour	500	436500	320hour	500	160000
Nitrogen	180.5 kg	17600	3176800	37.2 kg	17600	654720
P2O5	62.5 kg	3190	199357	15 kg	3190	47850
K2O	250 kg	1600	4000000	-	-	-
Poisoning	13 kg	27170	353210	-	-	-
Irrigation	1600 m3	1157.43	1851888	-	-	-
Total			6417773			862570

Table 2: Grape compounds and energy produce per hectare in Urmia area.

Urmia					
Component	Component (%)	Energy/gram(kcal)	Aount / ha (kg)	Product energy (kg/ha)	Input /output (energy)
Hydrocarbon	20	4	2380	9520000	1.48
Protein	3.1	4	368.9	14756000	2.29
Oil	1.9	6	226.1	1356600	0.21
Total				25632600	3.99

Table 3: Grape compounds and energy produce per hectare in Sardasht area.

Sardasht					
Component	Component (%)	Energy/gram(kcal)	Amount/ha (kg)	Product energy (kg/ha)	Input/ output (energy)
Hydrocarbon	20	4	940	376000	2.67
Protein	3.1	4	145.7	582800	4.14
Oil	1.9	6	89.3	535800	0.38
Total				10123800	7.19

Table 4: Total costs, net revenue values and income/cost per hectare of grape cultivation (9000 Rials =1\$)

	Urmia (1000 Rials)	Sardasht (1000 Rials)
Avrage cost (2001-2006)	1977.94	216.66
Gross income	2961.77	626.66
Net income	983.83	410
Net income /cost	0.5	1.9

Table 5: Input energy rate and cost per hectare in grape garden.

Input energy	Urmia		Sardasht	
	energy use/ ha (%)	cost/ha (%)	energy use/ha (%)	cost /ha (%)
Labor	6.7	26.7	18.5	99
Nitrogen	49.5	0.5	75.9	0.46
P2O5	3.1	0.27	5.5	0.46
K2o	6.2	0.27	-	-
Poisoning	5.5	42.9	-	-
Irrigation	28.8	29.2	-	-
Total	100	100	100	100

RESULT and DISCUSSION

Data showed that energy efficiency (output and input energy ratio) for grape yield in Urmia and Sardasht areas were 3.99 and 11.7 respectively (table 1). It means that for each unit of using energy 3.99 or 11.7 kcal energy is produced. When the amount of energy for each input was calculated, this result showed that, the most consumption of energy in Urmia gardens was related to nitrogen fertilizer (79.5) and irrigation (28.8) respectively. The most consumption of energy in Sardasht gardens was related to nitrogen fertilizer (75.9) and labor (18.5) respectively. Although nitrogen fertilizers have low percentage of total input cost but amount of energy use very much (table 1 and 4). N fertilizer is the most important fertilizer among other fertilizers both in consumption amount in plant and energy making N fertilizer requires a lot of energy. As for making, wrapping and moving, of each kilo N almost 77.5 MJ energy is needed (Vlek et al, 2004). Hassanzadeh-Gorttapeh et al, 2006, showed that in sugar beet culture the most consumption of energy was related to irrigation (31.6%) and machinery (23.8%) respectively. The reason is high requirement to water and the growth period is long time.

In Urmia area the most labor consumption of energy was related to plough under tree, sorting, wrapping, loading and moving, respectively (table 2), but in Sardasht it was related to plough of under tree, picking, collecting, sorting, wrapping, and fertilization respectively (table 3). Because when these are performed number of labor is determinate, so the costs that are used for these inputs are a lot (table 4), also, the number of labors in this case is more than other cases (table 5).

In Sardasht area aren't used of poisoning, potassium fertilizer and irrigation. The reason is *Ribes nigrum* is Native tree of Sardasht, also is resistant and adapted against undesirable conditions. This tree wildy grows in mountains slope, because in this area a lot of rainfall grape garden aren't irrigated than Using of N fertilizers should be according required amount. As humidity or precipitation increases, using of fertilizers especially N fertilizer are increased. (Rillor and Upadhyay, 1992;

Shahrestany et al, 1998). So, amount of N fertilizer that is used in Urmia garden is more than Sardasht gardens(table 1).

Sardasht gardens energy efficiency is three times as much as Urmia gardens (table 2 and 3). Using the input per hectare grape garden is very low in Sardasht area. If it can be made like this condition for Urmia gardens, energy efficiency will increase.

Although Urmia has high production but because of more fertilizer consumption, its energy efficiency is low also more using of N fertilizer will caused increase the N aggregation damaging in grape fruit. Also using it caused environment contamination (Blamy and Chapman, 1981). Hassanzadeh-Gorttapeh et al, 2005, suggested that amount using energy in potato is a lot The reason is lots of use of using potato seed that healthy seed is adequate and non-uniform dimension seeds and using much human energy.

Consumption of fossil fuels, chemical fertilizers, insecticides and... Induce to release a lot of CO₂ in the atmosphere. In the mean while, chemical fertilizer (Specially N fertilizer), fossil fuels, irrigation pumps, and insecticides have the most of CO₂ release respectively (Vlek et al, 2004). In Urmia there is high yield but energy efficiency is low (table 2). In Sardasht region there is low yield but energy efficiency is high (table 3), The reason is consumption of lower inputs. Agriculture in this region have performed in low yield and isn't commercial. If using the inputs is desirable, yield will be increased, on the other hand whatever using of energy increases, increasing effect of each input is lessening in yield (Kuchaki et al, 1995; Meimandy Nejad, 1974).

Among costs calculated for each area, these results obtained that net income and total cost ratio in Urmia and Sardasht grape production is 0.5 and 1.9 respectively (table 4), this means that for each Rails of input cost, the farmer benefits 0.5 or 1.9 rails. Whatever this rate is more, net income is increased. So farmers for more grape production and more benefit should use the modern and mechanization methods. Also, the chemical fertilizers should be used exactly (by testing soil).

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