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Energy Input-Output Analysis in Wheat, Barley and Oat Production

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Abstract: The consumed energy, energy input-output relation of wheat, barley, and oat production in was analysed in Al-Qarneh al-Ghamayj (31° 1' 5.5956'' N and 47° 25' 23.4192'' E.). The irrigation consumed 32.99, 31.83 and 31.96% of the total energy inputs on wheat, barley and oat, respectively. Fuel is the second source of consumed energy in tractors, harvesting engines, pumps being. 8466.21 (27.84%), 9415.03 (28.45), and 8757.33 (28.41) for wheat, barley, and oats, respectively. The fertilizers consumed energy (Nitrogen especially) were 7291.94 (23.98%), 7658.35 (23.14%), and 7444.72 (24.15%) MJ ha^{-1} for wheat, barley, and oats respectively. The average energy output for grain wheat , barley and oat was 60469.63, 71960.66 and 70017.61 MJ ha^{-1}. Barley was the most energy-efficient crop (1.9 %) followed by wheat and oat (1.71 and 1.59 %). Barley yield was 4945.75 Kg ha^{-1} with input energy of 37776.46 MJ ha^{-1} while wheat yield was 4113.58 Kg ha^{-1} with input energy of 38095.52 MJ ha^{-1}.

Keywords**:** Input and output energy, Energy efficiency, Wheat, Barley, Oats

Reduced energy consumption in cereal production leads to lower production costs. The use of traditional means of agricultural production increases the cost of agricultural production particularly in developing countries. Most developing countries rely mainly on fossil fuels to produce energy for agricultural production. These countries still use a modest percentage of renewable energy in production compared to the developed world. The agricultural production cannot increase except if sufficient fertilizers and water for irrigation are available in an appropriate time and utilized with scientifically methods. With increasing the world population, the energy consumption required efficient planning. This means the input components need to be specified to prescribe the methods most efficient for dominating them. Crop food and yields provisions to consumers are straight linked to energy and adequate energy is needed in the appropriate form at the suitable time to increase productivity. One method for improving the consumption of energy in agricultural production is to determine the competence of manners and techniques used (Safa and Tabatabaeefar 2002). The energy input had an influence directly on crop yield. Fossil fuel and fertilizers (N and P) account for the greatest share (>75%) of overall energy spent in a mixed cropping system (Safa et al 2010). Agricultural practices contain all crops processes that happen after its land reclamation such as plowing, seeding, fertilizing, weed control, combating insects, irrigation, harvest, and transportation. The energy needed for agricultural production was roughly 3% of the total in the developed countries national consumption. The percentage of energy consumption in developing countries increased to 6% of the total national consumption. There must be a plan for energy consumption, on the other hand, with the existing population increasing the current lifestyle will be unsustainable (Sahabi et al 2013). The energy used in agricultural production can be classified into direct and indirect energy. The essential means of direct energy used on the farm include fossil fuel consumption such as diesel, gasoline, furnace oil, electro power and coal. The energy consumed as indirect for transportation agricultural input, like pesticides, fodder, equipment, cereals, and the organic and chemical fertilizers. Indirect energy consumption is 70 percent in dairy farms and around 49.97 percent in arable fields (Saunders et al 2006). This investigation aimed to determine the energy consumption in wheat, barley and oat development based on farm operations and semi-arid farmland energy sources.

MATERIAL AND METHODS

Study site: A field experiment was conducted during seasons 2017 and 2018. The field experiments were carried out in the district of Al-Qarneh al-Ghamayj (65 km north of the city center of Basrah, 31° 1' 5.5956'' N and 47° 25' 23.4192'' E.). Average annual rainfall in spring of 2017 and 2018 was 100 mm and 180 mm respectively, with average temperatures of 21 ° C and 23 ° C for the same period's. Soil