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## **Valuation of forage production function of rangeland ecosystems in north of Iran – East Alborz Mountains**

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### **Introduction**

Rangeland ecosystem has 11-17 goods and services that most of them are public and non-market in nature; meaning they are non-rival and non-exclusive and are typically not sold in a traditional; such as climate regulation, soil conservation, biodiversity, *etc.* (Croitoru, 2007; Wu *et al.*, 2010). Forage is the main product of rangelands. According to the heterogeneity of range forages in terms of economic and lacking organized market for transaction, despite of imagine of ecological economists, it's a public good. So, determining its economic value as one of the main important nonmonetary functions of rangelands ecosystems can help managers to improve planning and optimal utilization management of it. (FAO, 2004) reported, annual value of each hectare of rangelands is 232\$ that 24.5% (equal to 57\$) of its total economic value belongs to forage production. Valuation of forage as non-monetary good requires a non-monetary valuation method. Replacement Cost Method (RCM) is one of pricing approaches technique that produce estimates equivalent to non- monetary prices (Karimzadegan *et al.*, 2007). So, the main purpose of this study is introducing a new approach in theme of “non-monetary ecosystem services valuation of rangelands in Iran”. This study is the first effort by Iranian scientists to provide insight to the many benefits and services that rangelands offer to society, and the extent to which the human race is vitally dependent on them. Without a firm understanding of the value of forage as main product of rangelands, we are unlikely to make many of other value added products other goods and services of range plants vegetation be consider for exact valuation of it.

### **Materials and Methods**

This research was conducted in Hezar-Jarib summer rangelands in the north of Iran in summer 2014 (Lat: 55° 00' - 54° 09' E, Long: 36° 26' - 36° 31' N). The area is mainly covered with loamy-loess formation, with a mean annual precipitation of 350 mm and average temperature of 11 °C. By overlaying primary maps like digital elevation model (Dem), geology and aspect, unit work map prepared. The necessary data related to the plant type, percentage of canopy cover of each plant, and different "Total Digestible Nutrients" (TDN) of species in vegetative regions was collected from each unit work. Palatability index of each multipurpose plant species were measured for estimating plant production afterward. In order to homogenize the value of all forage plants, (TDN) of each plant multiplied to its forage product to calculate the nutrition value of forage per rangeland unit work. Forage valued by a strategic replacement good "barely" with a "Cost Insurance and Freight" (CIF) price for valuation (McComb *et al.*, 2006). According to the specified T.D.N of barely, the equivalent weight of barely, identified for rangeland/ha. In this way total value of forage production calculated based on CIF price of barely 450\$ in summer 2014 (Wu *et al.*, 2010).

### **Results and Discussion**

Results showed that, from 12 unit work identified in the region, 6 plant types identified. *Astragalus gossypinus* Fisch. P.- *Onobrychis cornuta* (L.) Desv. Subsp. *Cornuta*; , *Bromus tomentellus* Boiss. p.- *Astragalus gossypinus* Fisch. P.; *Astragalus gossypinus* Fisch.p. - *Prongus ferulacea* (L.) Lindl.; *Astragalus gossypinus* Fisch.p. - *Bromus tomentellus* Boiss.p.; *Bromus tomentellus* Boiss.p. - *Festuca ovina* L.; *Artemisia sieberi*- *Astragalus gossypinus* Fisch. P.. Forage yield equivalent to barely was estimated 350.5 kg per 40660 ha of usable summer rangelands. According to the specified T.D.N of barely (2.65) its economic value was equivalent to 713280 Rials /hectare/year (\* around 2353 million US \$) in summer 2014. Also, its average annual economic value estimated, 84.6 milliard Rials (around 277200 milliard US\$). This amount of economic value was equal to 718900 Rials per hectare (around 2372 million US\$) of Hezar-Jarib rangelands. The estimated forage value is only 25 percentage of total economic value of rangeland ecosystem that has been exploited as natural bequest without any investment by the stakeholders.

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\*Conversions in this article use the average annual exchange for 2014, US \$1 =3300 Rial.

### **Conclusion**

As nonmarket services of rangelands will become rarer in future, it is expected that their value increases. We should emphasize again that the current study is just the starting point. It implies that we need more researches, and also point to some particular aspects which require more study. Furthermore, according to the fact that forge by converting to the other products like milk, wool, *etc.* has value added that suggested valued added of other goods and services of range plants vegetation be consider for exact valuation of it.

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