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Research article

COMPARISON OF ESTIMATING THE RATE OF NET PRODUCTION OF BIOMASS (Bn) AND YIELD POTENTIAL (Y) FOR RICE IN MAMASANI, KOOSHKAK AND KAMFIROOZ REGION, FARS PROVINCE, IRAN.

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ABSTRACT: Nowadays consider the importance of natural resources, especially soil for food security, management and planning so as to proper use of this valuable resource, is Necessary. One of the most important and useful tools for optimum use of soil resources is ways to evaluate and determine the capability and capacity of land. One way is to estimate and optimize yield potential of the product in perfect condition. During the procedure, yield, regardless of any limitation, including limitation of water, soil and management are calculated. In this study, comparison of net production of biomass (Bn) and yield potential (Y) for rice in Mamasani, Kooshkak and Kamfirooz have been done. About mamasani we can say Noor Abad the center of mamasani is located at 51 degrees, 31 minutes east longitude and 30 degrees and 7 minutes north latitude and for Kamfirooz we can say Kamfirooz is located in 120 kilometer of Shiraz City. Its main products are rice and side products such as wheat, barley and other grains are grown in the region. For rice in Mamasani some of the required information was extracted from synoptic station of noorabad mamasani which located 51 degrees and 32 degrees east longitude and 30 degrees and 04 minutes north latitude. The results showed that the yield for rice in the Kooshkak, mamasani and Kamfirooz without soil, management and climate limitation respectively is Equal to 4965, 5170 and 6375kilograms DM in hectare ; In some areas of Kamfirooz, Kooshkak and Mamasani the amount of harvested crop in the region are even less than the half in the study area.

Keywords: Land Suitability Evaluation, Net production of bio-mass, potential radiation – heat, rice

INTRODUCTION

Land evaluation may be defined as “the process of evaluating the role of land when it is used for a specific purpose." and it includes all methods that predict the potential ability of using lands. Land Evaluation determines the ground reaction toward specific productivity. With Land Evaluation, the relationship between land and its productivity is determined. Then, based on this relationship, its suitable usage can be found and the estimate of the amount necessary input sand resulting outputs can be achieved. In today's world, due to the increasing population growth and urban development the possible expansion of the cultivated area is reduced and therefore a strong need for efficient use of available and will be felt. The main objective of land evaluation is that each land is used efficiently with the study of physical, social and economic aspects [5]. The classification of land suitability is a review of natural resources such as water, air, soil, water and human, economic, social and agricultural resources [10]. The term “land suitability evaluation” was introduced for the first time in 1950 at the first International Congress of Soil Science, Amsterdaminan article entitled “Assessment of future land development” [11]. The years between 1950 - 1976, two important fundamental in the context of land evaluation took place in the world. The first was to divide the lands of America and the Soil Conservation Office, providing land within FAO's publication in 1976, which was introduced in the context of assessment for the purpose. Second, the land capability classification method provided by the office of Soil Conservation America and second, Provide the basis for the publication of the FAO in 1976, which is actually the basis for evaluating different objective introduced. The method until the 1975 aims to classify the various methods of assessment land, was being well covered in the world, but was unable to interpret the information in land development. So, FAO in 1976, edited and published foundation of land evaluation in the form Publication No. 32, Land evaluation studies in Iran, the first time in 1954, by an independent Board of Irrigation and Mahlr and other expert's collaboration with FAO was established. These studies generally classified assessment and evaluation of resources and capabilities to irrigate the land.Evaluation, officially was conducted by the Institute of Soil and Water Iran in 1968.

In 1970, recipe resource assessment and land capability (FAO Publication, 212) in the 766 Journal of Soil and Water Institute of Iran were released. Iran does not have a long history of land suitability for particular products. Some of these studies by Movahedi Naini and Roozitalalb [6] for crops in Iran, Sepahvand and Zarrin kafsh [8] Khavh plain Lorestan, Ziayean and Abtahi [13] in Dagenham - Fars, Ghasemi Dehkordi and Mahmoodi [3] in Barkhar-Esfahan, Ayoobi and jalalian [1] in barkhan-esfahan, Zareian and Baghernejad [12] in beiza region, Fars province, Givi [4],[5] in Falavarjan-Esfahan, Zeinodiny [14] in Bard sir-Kerman, Sarvary and Mahmoodi [7] in Ghazvin plain, Bazgir [2] in Talandasht-Fars province and Sohrabi [9] in Silakhoor plain have been done. Important work that has been done in this area was to prepare guidelines for land evaluation and horticultural crops by Givi in the year 1975 -1976 and has been published by the Research Institute for Soil and Water Country.In this collection, research crops of vegetative needs of Iran's most important crops in terms of climate and land characteristics, in the tables is done. Before calculating the required parameters for rice, it is better to know rice. Rice is one of the most important food crops in the world and it is the staple food for over 2.7 billion people. In India, area under rice is 44.6 m ha with total output of 80 million tonnes (paddy) with an average productivity of 1855 kg/ha. It is grown in almost all the states. West Bengal, Uttar Pradesh, Madhya Pradesh, Bihar, Orissa, Andhra Pradesh, Assam, Tamilnadu, Kerala, Punjab, Maharashtra and Karnataka are major rice growing states and contribute to total 92% of area and production. Rice is a crop of tropical climate. However, it is also grown successfully in humid to sub-humid regions under subtropical and temperate climate. Rice is cultivated in almost all types of soils with varying productivity. Under high temperature, high humidity with sufficient rainfall and irrigation facilities, rice can be grown in any type of soil. The major soil groups where rice is grown are riverine alluvium, red-yellow, red loamy, hill and sub-montane, Terai, laterite, costal alluvium, red sandy, mixed red, black, medium and shallow black soils.

Research Objectives

The purpose of this study is to compare the estimated net production of biomass and the resulting potential for rice in three region of mamasani, Kamfirooz and Kooshkak, Fars Province, Iran regardless of the limitations of soil, water and management to be aware of the capabilities of the lands and planning efforts in order to achieve maximum yield of rice in the study area.

MATERIALS AND METHODS

This study has been done for kooshkak, Kamfirooz and mamasani region, Fars province, Iran. About mamasani we can say Noor Abad the center of mamasani is located at 51 degrees, 31 minutes east longitude and 30 degrees and 7 minutes north latitude and the altitude is 920 meters above sea level. Mamasani from North and West is limited to kohkiloye Boyer Ahmad, from east to Sepidan city, from south to kazeroon and from southwest is limited to boosher city. Kooshkak is one of the villages which the center of research projects in agricultural college, Shiraz University is there. Some of the required information was extracted from synoptic station of noorabad mamasani which located 51 degrees and 32 degrees east longitude and 30 degrees and 04 minutes north latitude, doroodzan (for Kamfirooz) which located 52 degrees and 17 degrees east longitude and 30 degrees and 11 minutes north latitude, Zarghan (for Kooshkak) which located 52 degrees and 43 degrees east longitude and 29 degrees and 47 minutes north latitude. In order to determine the potential production of rice in the study area, potential of heat - radiation was used. In This model, net produces of living plant and yield for the best varieties favorable conditions in terms of water, food and the control of pests and diseases will be estimated.

Equation 1 is used to calculate the net biomass production [10].

$$\text{Equation 1 - } Bn = (0.36 * bgm * KLAI) / ((1/L) + 0.25 * ct)$$

In equation 1 Bn is Net production of biomass (kilograms per hectare), ct is Respiratory rate, which is obtained from equation 2. Bgm is Maximum rate of impure biomass production (kg CH2O ha h^{-1}), KLAI correction factor for LAI □ 5m2/m2 and L is Number of days required for product.

$$\text{Equation 2- } Ct = C30\ (0.044 + 0.0019t + 0.001t^2)$$

C30 is respiratory rate for non-legume plants equal to 0.0108. And t is mean temperature by Celsius. Product is obtained from equation 3.

$$\text{Equation 3 - } Y = Bn * HI$$

In Equation 3, Y is crop production (kg per hectare) and HI is the harvest index.

RESULTS AND DISCUSSIONS

The results of calculations performed to estimate the amount of net production and biomass production potential are given Tables 1 to 3.

Table 1-The estimated coefficients of yield potential of rice, Kamfirooz, FAO method

Amount	Calculate the maximum amount of impure biomass production (bgm)
39	Pm:Maximum leaf photosynthesis rate (kg CH2O ha^{-1} h^{-1})
460.26	bc:Maximum gross production of biomass in clear weather (kilograms per hectare per day)
216.3	Bo: Maximum gross production of biomass in cloudy weather (kilograms per hectare per day)
0.19	Ratio of days which the weather is not clear (1-n/N) f:
0.81	1-f: Ratio of days which the weather is clear (n/N)
604.08	**Bgm = Maximum rate of impure biomass production (kg CH2O ha^{-1} h^{-1})**
	Calculation of net production of biomass (Bn)
0.0108	C30 : respiratory rate for non-legume plants
0.0143	Ct:Respiratory rate
135	L : Number of days required for product
0.92	KLAI:Correction factor
18215	Bn :net production of biomass (kg ha^{-1})
0.35	HN: Harvest index
6375	**Y: Production potential of rice (kg ha^{-1} D.M)**

Table 2-The estimated coefficients of yield potential of rice, Kooshkak, FAO method

Amount	Calculate the maximum amount of impure biomass production (bgm)
38.5	Pm:Maximum leaf photosynthesis rate (kg CH2O ha^{-1} h^{-1})
423.75	bc:Maximum gross production of biomass in clear weather (kilograms per hectare per day)
223.25	Bo: Maximum gross production of biomass in cloudy weather (kilograms per hectare per day)
0.17	f:Ratio of days which the weather is not clear (1-n/N)
0.83	1-f: Ratio of days which the weather is clear (n/N)
557.43	**Bgm : Maximum rate of impure biomass production (kg CH2O ha^{-1} h^{-1})**
	Calculation of net production of biomass (Bn)
0.0108	C30 : respiratory rate for non-legume plants
0.0120	Ct:Respiratory rate
100	L : Number of days required for product
0.92	KLAI:Correction factor
14188	Bn :net production of biomass (kg ha^{-1})
0.35	HI: Harvest index
4965	**Y: Production potential of rice (kg ha^{-1} D.M)**

Table 3-The estimated coefficients of yield potential of rice, mamasani, FAO method

Amount	Calculate the maximum amount of impure biomass production (bgm)
39.3	Pm:Maximum leaf photosynthesis rate (kg CH2O ha^{-1} h^{-1})
400.612	bc:Maximum gross production of biomass in clear weather (kilograms per hectare per day)
205.4	Bo: Maximum gross production of biomass in cloudy weather (kilograms per hectare per day)
0.18	f:Ratio of days which the weather is not clear (1-n/N)
0.82	1-f: Ratio of days which the weather is clear (n/N)
529.072	**Bgm = Maximum rate of impure biomass production (kg CH2O ha^{-1} h^{-1})**
	Calculation of net production of biomass (Bn)
0.0108	C30 : respiratory rate for non-legume plants
0.0141	Ct:Respiratory rate
120	L : Number of days required for product
0.92	KLAI:Correction factor
14771	Bn: net production of biomass (kg ha^{-1})
0.35	HI: Harvest index
5170	**Y: Production potential of rice (kg ha^{-1} D.M)**

CONCLUSIONS AND SUGGESTIONS

As shown in Table 1, 2 and 3, the yield for rice in the Kamfirooz ,Kooshkak and Mamasaniregion without any limitations of soil, water and management, respectively is 6375, 4960 and 5170kg DM in ha. And as shown in The amount of harvested rice are even less than the half in some area with the count of rice grain humidity. The results show that yield potential of rice in Kamfiroozregion is more than the mamasani and Kooshkak region. In the reality the results are the same. And the rice of Kamfirooz not only is very famous in Fars province but also have an impressive quantity and quality in Iran. Climate factors appear to be the most important factor. Climate has an important role so as to cause Kamfirooz as a pole of rice in Iran. Management is undoubtedly one of the key strategies to achieve this yield. Overcome the limitations of soil and water is the keys to achieve the required potential yield. The calculated yield gives a good insight to resolve the limitations and to adopt appropriate policies to improve and increase further yield. It is recommended to use better sufficiency of resources, assess the potential land us in all areas should be done. And important policies of Agricultural branch with regard to this ability so as to increase the yield of important and Strategic products to achieve self-sufficiency in the production of various crops to avoid excessive imports and the outflow of currency to be adopted.

The relation between three vertices of the triangle so as to achieve sustainable development in the agriculture, soil, Agricultural Extension and farmers are very necessary. It is very essential because if we use efficiency water and a proper management, not only we have a fertile soil in near future, but also we have better products both in quality and quantity.

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