INTERNATIONAL JOURNAL OF PLANT, ANIMAL AND ENVIRONMENTAL SCIENCES

IJPAES

Volume-4, Issue-2, April-June-2014

ISSN 2231-4490

Coden : IJPAES www.ijpaes.com

Received: 15th Feb-2014 *Revised: 18th March-2014* *Accepted: 24th March-2014*

Research article

COMPARISON OF ESTIMATING THE RATE OF NET PRODUCTION OF BIOMASS (BN) AND YIELD POTENTIAL (Y) FOR WHEAT AND CORN IN MAMASANI AND MARVDASHT CITY, FARS PROVINCE, IRAN.

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ABSTRACT: Nowadays consider the importance of natural resources, especially soil for food security, management and planningso 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 wheat and corn in Marvdasht and Mamasani have been done. Marvdasht City is located in the north of the Shiraz in mountainous areas. It has a cold weather and in other areas is moderate. And 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. In addition, synoptic station of Persepolis which located at 52 degrees and 54 minutes east longitude and 29 degrees and 56 minutes north latitude and synoptic station of noorabad mamasani which located 51 degrees and 32 degrees east longitude and 30 degrees and 04 minutes north latitude, some of the required information was extracted. The results showed that the yield for wheat and maize in the mamasani city, without soil, management and climate limitation is Equal to 6021 and 7329 kg DM in hectare ; In some areas of Marvdasht and Mmasani city, the amount of harvested crop in the region are up to 2 times.

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

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 allmethods that predict the potential ability of using lands. LandEvaluation determines the ground reaction to ward 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 inputs and 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 land will be felt. The main objective ofland evaluationis that each land is used efficiently with the study of physical, social and economic aspects [5].The classification of land suitability is are view 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 and development” [11]. The year’s between1950-1976, 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 Zarrinkafsh [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 wheat and corn, it is better to know wheat and corn. Wheat is the second-most produced crop on Earth, lagging behind only corn. Wheat provides a large fraction of the dietary protein and total food supply, and is grown all throughout the world, in a wide variety of climates. Wheat is a staple crop, grown as a primary food product and for other uses as well. Wheat is perhaps the oldest domesticated plant. According to paleobotanists and archaeologists, the modern domesticated form of this cereal grain originated in Southeastern Anatolia, around the region of Diyarbakir Province in present-day Turkey, around 8500 BC. Many cultures in the region had developed a semi-dependence on wild grains that are the forebears of modern wheat plants, and as cultures grew more adapted to using this handy wild plant, some unnamed geniuses developed methods to permanently cultivate suitable varieties. Over a period of hundreds, and later thousands of years, farmers and proto-agronomists developed more and more fruitful and reliable specimens and bred them selectively. Thanks to those efforts, there are now over 20 different species of wheat cultivated throughout the world. Like other cereal grains such as barley, millet and rice, wheat is a member of the *poaceae* family, and is related to lawn and prairie grasses. Due to wheat's thorough domestication over the past 10,000 years, wheat has lost its natural seed dispersal mechanism and can no longer propagate itself naturally. 220 million hectares of agricultural land in the world is growing to produce grain for making bread, human food, animal feed and industrial applications. Acreage of wheat, in Iran is about 6.2 million hectares; about 2 million hectares use water and about 4.2 million hectares is rained. The winter wheat cereals are such that there is an important role in nutrition. The composition of wheat grain is about 10-14% protein, 2% oil, 75-70 % carbohydrates, 2% fiber and 0.4 % K + concentration there. Among the important characteristics of wheat in cereals as human nutrition, it is the staple food. And the corn can be said: it has been considered a unique plant since the time that the indigenous peoples of the Americas developed it to be their staple food. It is central to many sacred mythologies and creation stories which are still honored today. Today, the United States, China, the European Union, Brazil and Mexico are the world's largest producers of maize. Together, the US and China produce approximately 60% of the world maize. 68% of the land devoted to maize is located in the developing world, however only 46% of maize production occurs there, indicating the need for improving yields in developing countries where it is a major source of direct human consumption for many of the poor. The United States is the world's largest producer and exporter of maize. Maize is the most important feed grain in the US because of its efficient conversion of dry substance to meat, milk and eggs, compared to other grains. In fact, the US devotes ~60% of its maize crop to animal feed. Approximately 20% is exported and the remaining crop is used for food and industry. There are 5 main endosperm types grown in the US: pop (<1% of commercial production), flint (14%), flour (12%), dent (73%), and sweet (<1%). Clearly, dent is the most important type, supplying livestock feed, starch, syrup, oil. The Corn Belt Dents of the US are only ~100-150 years old but they are the most productive races of maize in the world, providing the basic genetic foundation for virtually all of the corn produced in the US as well in most other temperate regions of the world. The maize plant is truly unique among the cereals. Maize is thought to be derived from teosinte, an ancient wild grass from Mexico and Guatemala. Unlike the other major cereal crops, there is physical separation of maize's male and female flowers. This allows for cross pollination and the large scale production of hybrid corn which is based on the exploitation of heterosis or hybrid vigor , broad morphological variation and genetic plasticity and diversity Maize is able to take advantage of sunlight better than most other major cereal crops and grows more rapidly because of the size and distribution of its foliage.

It has high productivity due to its large leaf area and has one of the highest photosynthetic rates of all food crops. The high yield of maize compared to other cereal crops is possible because of the low position of the ear, where it is able to capture a greater proportion of the nutrients. This is unlike the other cereals whose seeds are found high up on the plant stalk. The ear is covered with a husk leaf, shielding the kernels from pests and accidental dispersal, unlike other cereals where individual grains are covered with bractea. Because of the husk leaves preventing the maize plant from dispersing its seed, some consider maize a human invention because it cannot reproduce without the aid of humans

Research Objectives

The purpose of this study is to compare the estimated net production of biomass and the resulting potential for wheat and maize in the city of mamasani and marvfasht, 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 wheat and maize in the study area.

MATERIALS AND METHODS

This study has been done for marvdasht and mamasani city, Fars province, Iran. Marvdasht city is located in Fars province, Iran. Marvdasht City is located in the north of the Shiraz in mountainous areas it has cold weather and in other areas is moderate. And 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. In addition, synoptic station of Persepolis which located at 52 degrees and 54 minutes east longitude and 29 degrees and 56 minutes north latitude and synoptic station of noorabad mamasani which located 51 degrees and 32 degrees east longitude and 30 degrees and 04 minutes north latitude, some of the required information was extracted. In order to determine the potential production of wheat and maize 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].

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.

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.

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 4.

Table 1-The estimated coefficients of yield potential of wheat, mamasani, FAO method

Amount	Calculate the maximum amount of impure biomass production (bgm)
20	Pm:Maximum leaf photosynthesis rate (kg CH2O ha^{-1} h^{-1})
379.58	bc:Maximum gross production of biomass in clear weather (kilograms per hectare per day)
196.7	Bo: Maximum gross production of biomass in cloudy weather (kilograms per hectare per day)
0.25	Ratio of days which the weather is not clear (1-n/N) f:
0.75	1-f: Ratio of days which the weather is clear (n/N)
332.12	**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
0.0083	Ct:Respiratory rate
240	L : Number of days required for product
0.90	KLAI:Correction factor
17204	Bn :net production of biomass (kg ha^{-1})
0.35	HN: Harvest index
6021	**Y: Production potential of Wheat (kg ha^{-1} D.M)**

Table 2-The estimated coefficients of yield potential of maize, mamasani, FAO method

Amount	Calculate the maximum amount of impure biomass production (bgm)
65	Pm:Maximum leaf photosynthesis rate (kg CH_2O ha^{-1} h^{-1})
378.6	bc:Maximum gross production of biomass in clear weather (kilograms per hectare per day)
192.8	Bo: Maximum gross production of biomass in cloudy weather (kilograms per hectare per day)
0.20	f:Ratio of days which the weather is not clear (1-n/N)
0.80	1-f: Ratio of days which the weather is clear (n/N)
697.33	**Bgm : Maximum rate of impure biomass production (kg CH_2O ha^{-1} h^{-1})**
	Calculation of net production of biomass (Bn)
0.0108	C30 : respiratory rate for non-legume plants
0.0094	Ct:Respiratory rate
122	L : Number of days required for product
0.88	KLAI:Correction factor
20938	Bn :net production of biomass (kg ha^{-1})
0.35	HI: Harvest index
7329	**Y: Production potential of maize (kg ha^{-1} D.M)**

Table 3-The estimated coefficients of yield potential of wheat, marvdasht, FAO method

Amount	Calculate the maximum amount of impure biomass production (bgm)
38	Pm:Maximum leaf photosynthesis rate (kg CH_2O ha^{-1} h^{-1})
234.44	bc:Maximum gross production of biomass in clear weather (kilograms per hectare per day)
189.89	Bo: Maximum gross production of biomass in cloudy weather (kilograms per hectare per day)
0.25	f:Ratio of days which the weather is not clear (1-n/N)
0.75	1-f: Ratio of days which the weather is clear (n/N)
407.52	**Bgm = Maximum rate of impure biomass production (kg CH_2O ha^{-1} h^{-1})**
	Calculation of net production of biomass (Bn)
0.0108	C30 : respiratory rate for non-legume plants
0.0054	Ct:Respiratory rate
205	L : Number of days required for product
0.9	KLAI:Correction factor
2183	Bn: net production of biomass (kg ha^{-1})
0.35	HI: Harvest index
7839	**Y: Production potential of Wheat (kg ha^{-1} D.M)**

Table 4-The estimated coefficients of yield potential of maize, Marvdasht, FAO method

Amount	Calculate the maximum amount of impure biomass production (bgm)
65.5	Pm:Maximum leaf photosynthesis rate (kg CH2O ha^{-1} h^{-1})
426.75	bc:Maximum gross production of biomass in clear weather (kilograms per hectare per day)
224.75	Bo: Maximum gross production of biomass in cloudy weather (kilograms per hectare per day)
0.15	f:Ratio of days which the weather is not clear (1-n/N)
0.85	1-f: Ratio of days which the weather is clear (n/N)
827.04	**Bgm = Maximum rate of impure biomass production (kg CH2O ha^{-1} h^{-1})**
0.0108	Calculation of net production of biomass (Bn)
0.0128	C30 : respiratory rate for non-legume plants
110	Ct: Respiratory rate
0.90	L: Number of days required for product
21773	KLAI:Correction factor
0.35	Bn :net production of biomass (kg ha^{-1})
7620	HI: Harvest index
	Y: Production potential of maize (kg ha^{-1} D.M)

CONCLUSIONS AND SUGGESTIONS

As shown in Table 1 and 2, the yield for wheat and maize in the mamasani city without any limitations of soil, water and management, respectively is 6021 and 7329 kg DM in ha. And As shown in Table 3 and 4, the yield for wheat and maize in the Marvdasht city without any limitations of soil, water and management, respectively is 7839 and 7620 kg DM in ha. The amount of harvested corn and wheat yieldare even up to 2 times more, with an average humidity of 15% for wheat and 17% for corn seed. The results shows that yield potential of both corn and wheat in Marvdasht city is more than the mamasani city. Climate factors appear to be the most important factor. Climate has an important role so as to cause Marvdasht as a pole of wheat in Iran.Management is undoubtedly one of the key strategies to achieve this yield. Overcome the limitations of soil and water are the keys to achieve the required potential yield. The calculated yield give 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 andStrategic 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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