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***Research Article***

# ESTIMATING THE RATE OF NET PRODUCTION OF BIOMASS (BN) AND YIELD POTENTIAL (Y) FOR COWPEA IN MAMASSANI CITY, FARS PROVINCE, IRAN

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## ABSTRACT
Due to the importance of land potential for special use and considering the importance of natural resources, especially soil for food security, management and planning of the 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 at perfect conditions. During the procedure, yield is calculated, regardless of any limitation, including limitation of water, soil and management. In this study, net production of biomass (Bn) and yield potential (Y) of Cowpea (*Vigna unguiculata*) in Mammasani City, Fars province have been done. In addition, 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 yield for cowpea in the Mammasani city, without soil, management and climate limitation is Equal to 6385.684kg DM in hectare; in some areas of Mamasani city, the amount of harvested crop are even less than half in comparison of Yield Potential (Y) forcowpea(*Vigna unguiculata*)inMamassani city.

***Keywords****: Land Suitability Evaluation, Net Production of Bio-Mass, Potential Radiation – Heat, Cowpea*

## INTRODUCTION
In today's world, with the limitation land for Agriculture, and also the limitation of water it is very important to have the best crop production. Land evaluation is the simplest and easiest way to use. 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 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 of land evaluation is that each land is used efficiently with the study of physical, social and economic aspects (Givi, 1988). The classification of land suitability is a review of natural resources such as water, air, soil, water and human, economic, social and agricultural resources (Sys *et al.*, 1991). The term land suitability evaluation was introduced for the first time in 1950 at the first International Congress of Soil Science, Amsterdam in an article entitled Assessment of future land development (Visser *et al.*, 1991). 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 and Roozitalalb (1994) for crops in Iran, Sepahvand and Zarrinkafsh (1996) Khavh plain Lorestan, Ziayean and Abtahi (1996) in Dagenham-Fars, GhasemiDehkordi and Mahmoodi (1996) in Barkhar-Esfahan, in barkhan-esfahan, Zareian and Baghernejad (1997) in beiza region, Fars province, Givi (1977, 1988) in Falavarjan-Esfahan, Zeinodiny (1998) in Bard sir-Kerman, Bazgir (1998) in Talandasht-Fars province and Sohrabi (2003) 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 cowpea, it is better to know cowpea.

Cowpeas are one of the most important food legume crops in the semiarid tropics covering Asia, Africa, southern Europe and Central and South America. A drought-tolerant and warm-weather crop, cowpeas are well-adapted to the drier regions of the tropics, where other food legumes do not perform well. It also has the useful ability to fix atmospheric nitrogen through its root nodules, and it grows well in poor soils with more than 85% sand and with less than 0.2% organic matter and low levels of maize, millet, sorghum, sugarcane, and cotton. This makes cowpeas as an important component of traditional intercropping systems, especially in the complex and elegant subsistence farming systems of the dry savannas in sub-Saharan Africa. In these systems the haulm (dried stalks) of cowpea is a valuable by-product, used as animal feed.

The purpose of this study is to estimate net production of biomass and the resulting potential for cowpea(*Vigna unguiculata*) in the city of Mamasani, 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 cowpea in the study area.

## MATERIALS AND METHODS

This study has been carried outinMamasani city, Fars province, Iran. 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 Noorabad Mamasani which is 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 cowpea(*Vigna unguiculata*)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 DISCUSSION

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

**Table 1: The estimated coefficients of yield potential of cowpea, Mamasani, FAO method**

| **Calculate the maximum amount of impure biomass production (bgm)** | **Amount** |
|---|---|
| Pm: Maximum leaf photosynthesis rate (kg CH2O $ha^{-1}$ $h^{-1}$) | 38 |
| bc: Maximum gross production of biomass in clear weather (kilograms per hectare per day) | 458.66 |
| Bo: Maximum gross production of biomass in cloudy weather (kilograms per hectare per day) | 240.5 |
| f: Ratio of days which the weather is not clear (1-n/N) | 0.29 |
| 1-f: Ratio of days which the weather is clear (n/N) | 0.71 |
| **Bgm = Maximum rate of impure biomass production (kg CH2O $ha^{-1}$ $h^{-1}$)** | **554.84** |
| Calculation of net production of biomass (Bn) | |
| C30 : respiratory rate for non-legume plants | 0.0108 |
| Ct: Respiratory rate | 0.0141 |
| L: Number of days required for product | 153 |
| KLAI: Correction factor | 0.92 |
| Bn: net production of biomass (kg $ha^{-1}$) | 18244.81 |
| HN: Harvest index | 0.35 |
| **Y: Yield potential of cowpea (kg $ha^{-1}$ D.M)** | **6385** |
| **Yield (kg $ha^{-1}$)** | **7599** |

### *Conclusions*

It is urgent to have different evaluation for different crops to have the best alternative in the future research. Bu it is obvious as shown in Table 1, the yield for cowpea in the Mamasani city without any limitations of soil, water and management is 6385 kg DM in ha. The amount of harvested cowpea yieldare even less than half with an average humidity of 19% for cowpea. 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 too. 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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