



## GIS-based modeling of potential yield distributions for different oat varieties in China

Daqian Liu<sup>a</sup>, Fan Wan<sup>a</sup>, Rui Guo<sup>a</sup>, Fengmin Li<sup>a</sup>, Huhua Cao<sup>b</sup>, Guojun Sun<sup>a,\*</sup>

<sup>a</sup> MOE Key Laboratory of Arid and Grassland Ecology, Lanzhou University, Lanzhou 730000, PR China

<sup>b</sup> Department of Geography, University of Ottawa, Ottawa, Ontario, Canada K1N 6N5

### ARTICLE INFO

#### Article history:

Received 11 August 2010

Accepted 4 November 2010

#### Keywords:

Oat  
Different variety  
Grain and fresh yield  
Stepwise regression

### ABSTRACT

Cultivation of the common oat (*Avena sativa* L.) and the naked oat (*Avena nuda* L.) can be highly productive in many types of environments because these species are tolerant to infertile, dry and salty environments. In this study, we modeled the distribution of potential yields for different varieties of oat in China based on GIS assessments. We analyzed the yield of three oat varieties under different environmental conditions and created a model of factors significantly correlated with yield. Stepwise regression models were constructed for each oat variety, and the potential yield distributions were calculated for each variety. Correlating oat variety yield with environmental factors showed that precipitation and soil nutrition content were the most important factors in oat production. Precipitation and soil nutrition during the month of April were positively correlated with yield, while temperature and wind speed in July were negatively correlated with yield. The common oat variety “Qingyj444” was capable of producing a fresh grass yield of 30,000 kg/hm<sup>2</sup> in western Sichuan, the southwest of Gansu, and certain parts of Qinghai and Heilongjiang province. The naked oat varieties “Bayou3” and “Pin5” produced high yields of 3000 kg/hm<sup>2</sup> in Heilongjiang, the regions north of Shanxi, east of Neimenggu and the southern Gansu province, areas with high quality rain and soil nutrition conditions. We constructed a “China Crop Mapping Decision System” based on our findings, and this system is accessible through the internet and will facilitate informed agricultural decision-making.

© 2010 Elsevier Ltd. All rights reserved.

### 1. Introduction

The common oat (*Avena sativa* L.) and the naked oat (*Avena nuda* L.) are important minor crops in western and semi-arid regions of China. Because of their tolerance to infertile soils and arid, salty environmental conditions, these oats can be cultivated in a variety of regions [1,2]. The common and naked oats have high nutritional values and can be used as both grain and forage crops [2,3]. The naked oat is planted primarily in the semi-arid regions of northern China and is mainly cultivated for grain. The common oat is planted in the high-elevation regions in the northwest and southwest regions and is generally used for forage [4]. Previous research used Geographic Information Systems (GIS) to assess areas suitable for cultivating common and naked oats in China at national, provincial and county levels [5].

In addition to evaluating the potential to expand farmlands, it is valuable to predict potential yields of different areas [6]. Forecasts of potential crop yield are essential in estimating production, assisting farmers, agribusiness firms, exporters and governments in making decisions for efficient resource allocation, price adjustment and export planning [7]. Climate and soil

\* Corresponding author. Tel.: +86 09318912841.

E-mail addresses: [sungj@lzu.edu.cn](mailto:sungj@lzu.edu.cn), [guoruisky@gmail.com](mailto:guoruisky@gmail.com) (G. Sun).