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Interactive comment on "Morphological plasticity of root growth under mild water stress increases water use efficiency without reducing yield in maize" *by* Qian Cai et al.

Qian Cai et al.

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The manuscript focused on yield and water use of rain-fed maize in semi-arid region where the summer drought frequently occurs. For high yielding of maize, the government or farmers are hard to make a decision on whether the irrigation systems is economically necessary, especially under climate change. The paper has a good experimental design by a mobile rain shelter. The results are interesting and valid. Suggestions: (1) provide more informative discussion on the economic analysis of the necessity of irrigation systems. What is current situation, how much area of maize can

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Discussion paper

be irrigated at the time of drought occurrence in rain-fed agriculture, for example at study region, how often was this system used, and how much is the cost.

Response: In studied region (Liaoning province), almost all maize grow in rain-fed condition (2.4 million ha), covering 73% of total area of grain crops. To reduce the effect of drought stress on maize production, the wells system piping up underground water to irrigate crop is planned recently. The wells need to be 60 to 70 m deep with an average cost of 12,000 Yuan for each. Each well can irrigate 9 to 10 ha of maize. According to our results, only severe drought stress significantly reduced maize yield (up to 50%), which happened less than 5% during 1965 to 2015. Mild drought stress occurs much frequently (28% of years), however, it does not affect maize yield much. Our study suggested that the well system in this rain-fed agriculture might not be economically and ecologically necessary. Other agronomy practices such as intercropping maize with crops requiring less water (e.g. peanut), cultivar selection, adjusting sowing windows (Liu et al., 2013; Lu et al., 2017) and ridge-furrow with plastic film (Dong et al., 2017) are applicable for optimising crop yield and regional sustainability. We added this in the discussion (L312-325).

(2) Add the long-term rainfall data and the trend under climate change senarios. This results would help readers to understand the severity of summer drought.

Response: We added a new figure (Fig. 2) in results for rainfall variations and cumulative frequency from 1965 to 2015 (L199-205).

Detail comments: L78, delete 'Interestingly'.

Response: Done.

L101-104, give information on the data is averaged from which years.

Response: We clarified in the revised text.

L106-107, since the experiments were conducted under a rain shelter, the detail rainfall in experimental years is not useful, delete.

Response: Done.

L236, delete ‘for’.

Response: Done.

L295, change ‘would increase’ to ‘increases’.

Response: Done.

L301, replace ‘interesting evidences’ by ‘more evidences’

Response: Done.

L442, Table 2, ears plant-1; Kernels ear-1.

Response: Done.

L445, Figure 1, Capitalize M in legends as ‘Maximum air temperature’.

Response: Done.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/bg-2017-103/bg-2017-103-AC1-supplement.pdf

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