



Comparison of Practice Factor Values of Soil and Water Conservation Measures Under the Condition of Snowmelt and Rainfall Erosion

Xiu Quan Xu, Hao Ming Fan, Juan Tan, Yanfeng Jia, Min Wu

Shenyang Agricultural University

2020.5



CONTENTS

1

Introduction

2

Materials and methods

3

Results and discussion

4

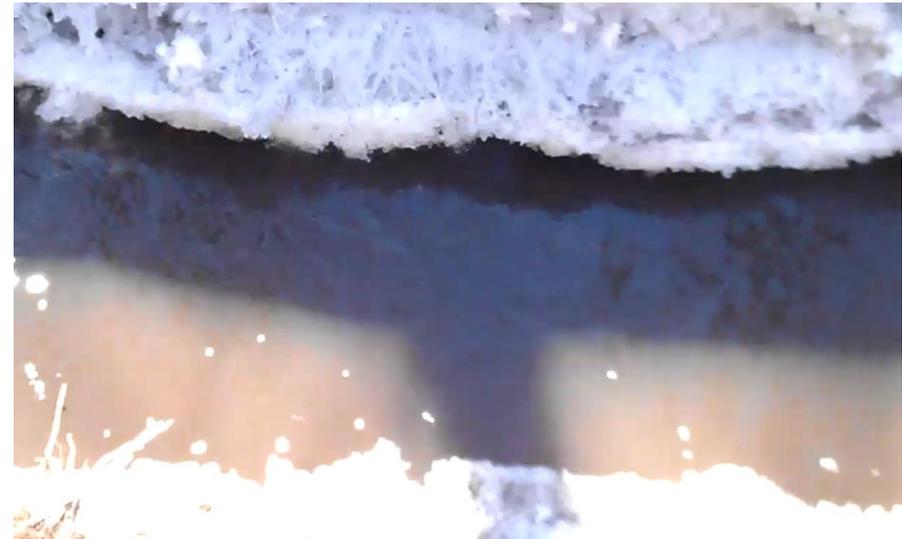
Conclusion

Introduction

➤ Serious snowmelt erosion in Northeast China



freezing-thawing and snowmelt cause
gully erosion and rill erosion



Introduction

➤ Soil and water conservation project



Introduction

- How would these conservation measures affect snowmelt erosion?

Based on the observation results of snowmelt erosion of Jixing runoff plots (Meihekou City, Jilin Province) in spring in 2015 and 2016, combined with the previous results of rainfall erosion, the practice factor values of soil and water conservation measures, the numbers of soil erosion events, the runoff depth and erosion modulus between snowmelt and rainfall conditions were compared to investigate the difference of effects of the soil and water conservation measures on snowmelt and rainfall erosion

Materials and methods

- Jixing runoff plots, Jile (125°28'~125°31'E, 42°10'~42°14'N), Meihekou, Jilin Province
- 6 plots: 7°, 30 m * 5 m
- One of the most important runoff plots
- Snowmelt erosion in spring in 2015 and 2016

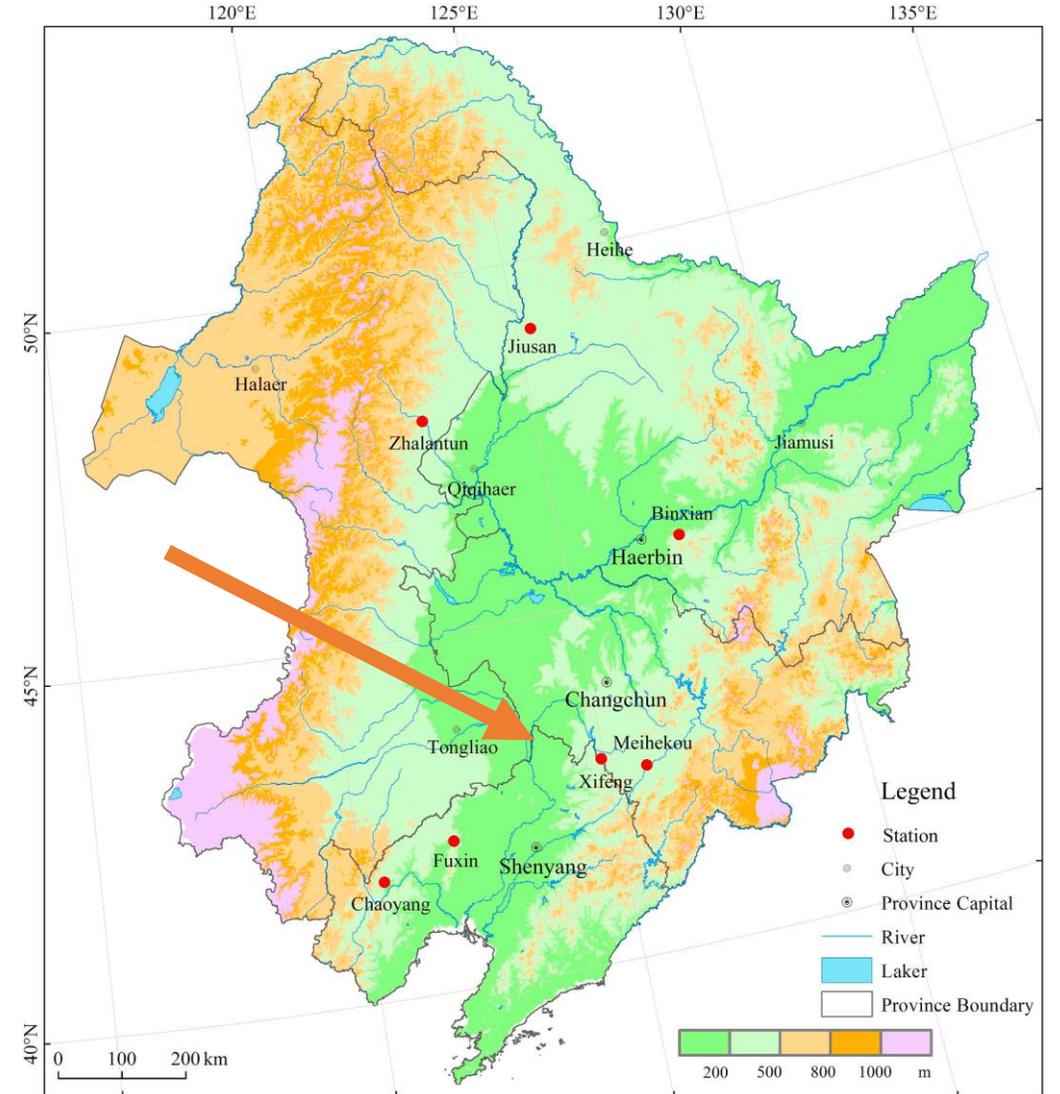


Fig. from Yan Xin, et al., 2019

Materials and methods

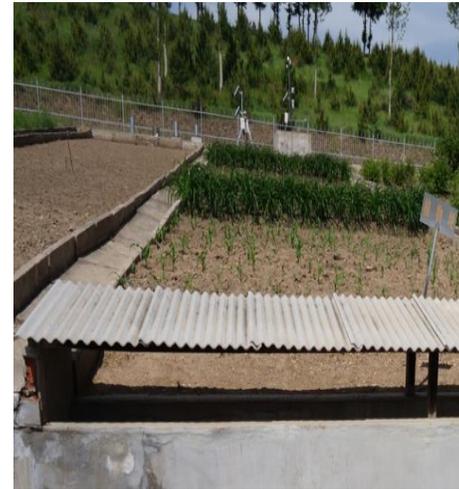
➤ runoff plots:



ecological restoration
ER



bare land
BL



grass belt
GB



shrub ridging,
SR;
cut-off drain, CD

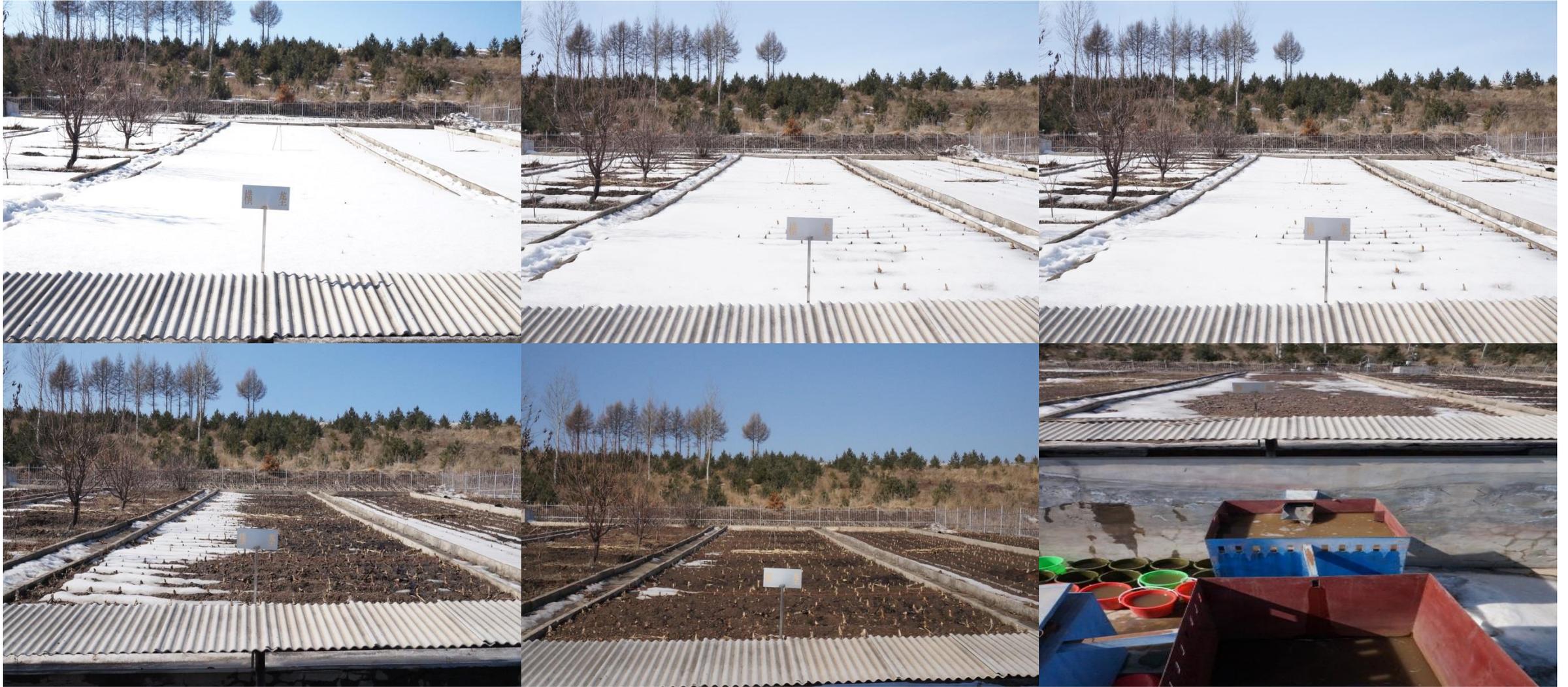
Materials and methods

➤ runoff plots:



Downslope ridging, DR
Contour ridging, CR

Materials and methods



Snowmelt erosion process of CR plot

Materials and methods

➤ data sources:

Tab. Measured snowmelt erosion and rainfall erosion from previous studies

No.	years	measures	data	sources
1	2004、2007	all	Runoff, sediment (rainfall)	<i>Zhang yubin et al.</i>
2	2005	all	Sediment (rainfall)	<i>Cheng guang et al.</i>
3	2005—2006	ER, SR	Measure values (rainfall)	<i>Fan jianrong et al.</i>
4	2005—2006	all	snowmelt	measured data

Materials and methods

➤ data analyses:

CSLE (*Liu baoyuan et al.*): $A=RKSL\underline{B}E\underline{T}$

✓ B (divided by BL): ER, SR

✓ E (by DR) : GB, CD

✓ T: BL, DR (by BL), CR (by DR)

- *Note: CSLE: Chinese Soil Loss Equation; B: biological measure factor; E: engineering measure factor; T: tillage measure factor*
-

Results and discussion

➤ Values under rainfall and snowmelt erosion

Tab. Measure factor values under two types of soil erosion

values	measures	2004R	2005R	2007R	2015S	2016S
B	EC	0.0277	0.0338	0.0001	0.0009	0.0023
	SR	0.1958	0.1177	0.3197	0.0252	0.0218
E	CD	0.0003	0	0.0001	0.0693	0.0384
T	CR	0.2091	0.301	0	0.2478	0.3175
	GB	0.0987	0.0143	0.1271	0.4592	0.3735
	DR	0.9798	0.6428	1.0912	0.0724	0.0769

Results and discussion

➤ values ↓ & ↑

- Values ↓: EC, SR, DR
- Values ↑: CD, CR, GB

Tab. Numbers of runoff & erosion events

measures	2015S	2015S (eroded)	2016S	2016S (eroded)	2007R
CR	5	3	5	4	1
DR	7	4	6	5	3
GR	5	4	5	4	2
SR	5	4	5	4	2
CD	4	4	4	2	1
ER	4	1	2	1	3
BL	7	6	6	5	3

Results and discussion

➤ values ↓ & ↑

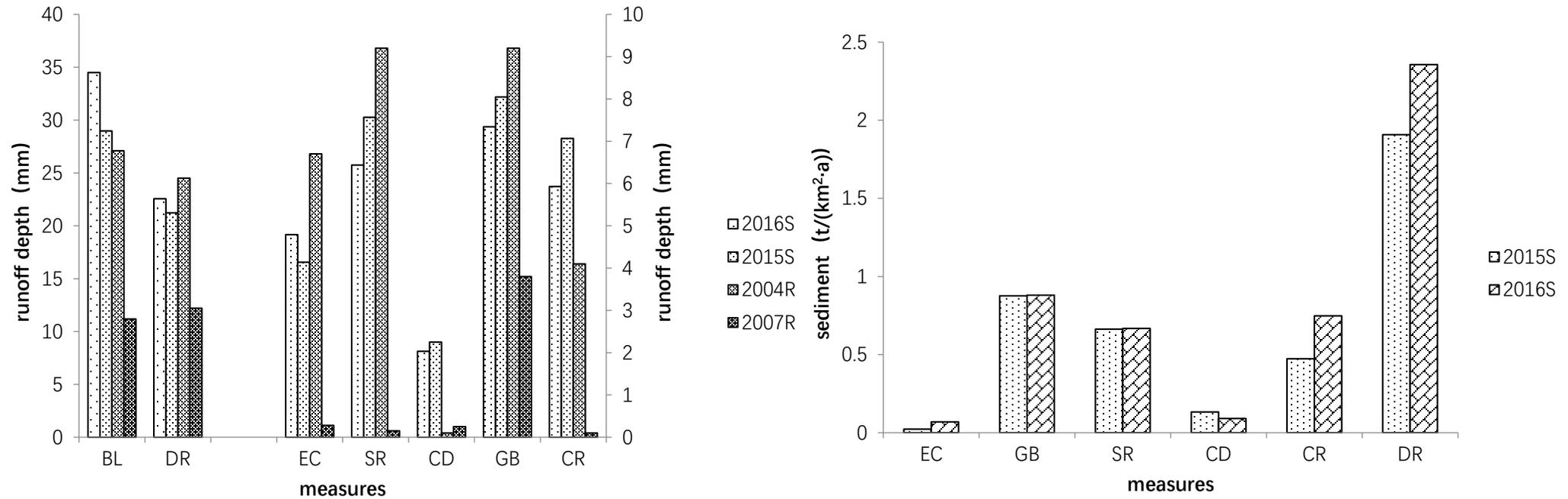


Fig. Runoff & sediment of the plots

Results and discussion

➤ values ↓ & ↑

- The measure factor values during snowmelt erosion shows a larger range and variation, compared with rainfall erosion
 - Early snowmelt event may not cause erosion
 - During snowmelt period, the morphology and the influence of the plant are not the same with rainfall erosion
 - Snowmelt process is not the same among these plots
 - The thawed soil is also different
-

Results and discussion

➤ Compare of two types of soil erosion

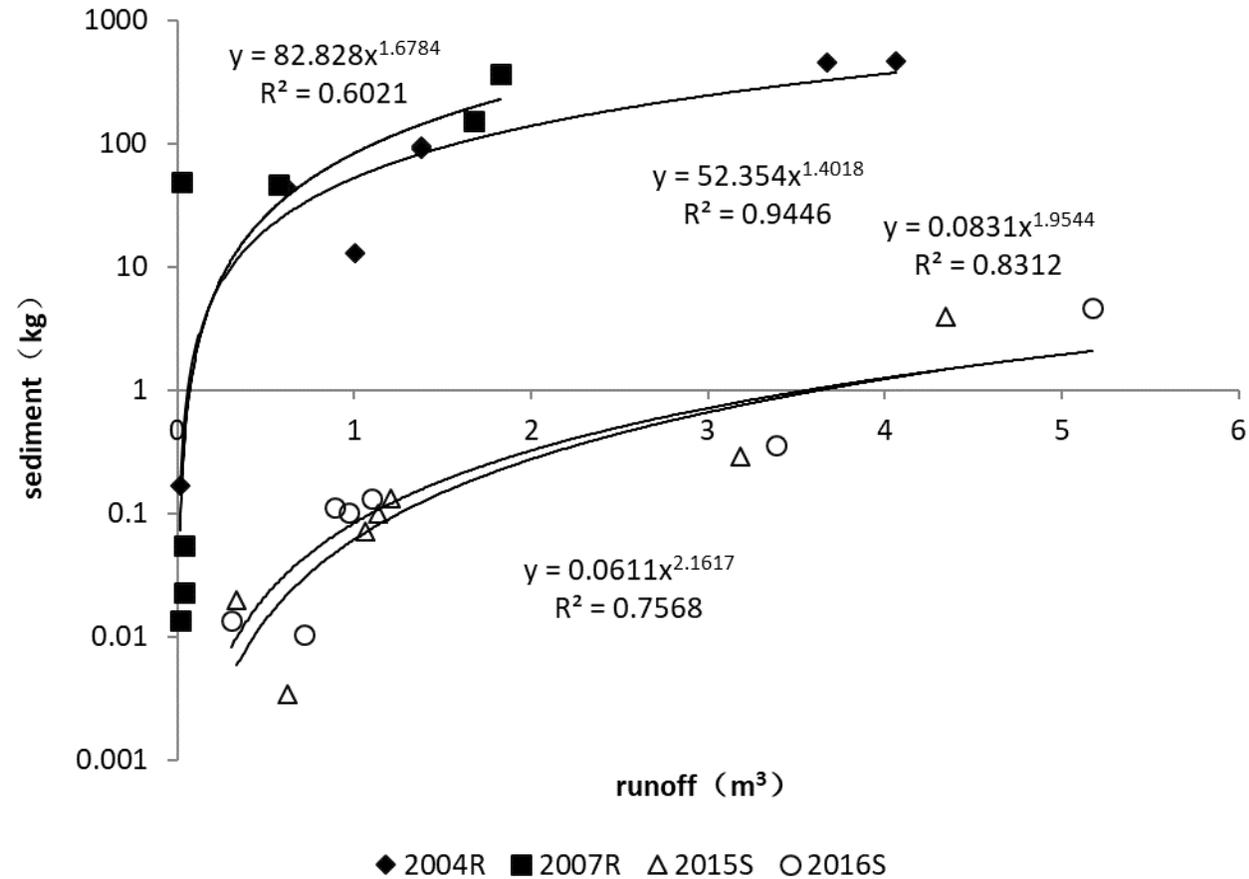


Fig. Compare of runoff and sediment amounts

(the difference of sediment is obvious)

Conclusions

- The results show that the practice factor values range from 0.001 to 0.46, while the best measure for prevention of snowmelt erosion is the ecological restoration measure, with the characteristics of shorter period, less amount of snowmelt runoff
 - The effect of the cut-off drain measure, a typical engineering measures, on snowmelt erosion is mainly controlling the amount of snowmelt runoff. The erosion modulus and runoff depth of the shrub ridging are larger compared with the contour ridge and furrow planting, another kind of tillage measure, under snowmelt condition
 - Both snowmelt and rainfall erosion, should be taken into account in planning and design of soil and water conservation measures in areas with snowmelt erosion, especially for the cultivated land
 - Snowmelt erosion needs investigation at various spatial and temporal scales in the future
-

Thanks for your attention

More information: 谭娟,范昊明,许秀泉,贾燕锋,武敏.融雪与降雨侵蚀条件下水土保持措施因子值对比研究[J].水土保持研究,2017,24(03):29-32+38. <http://stbcyj.paperonce.org/oa/DArticle.aspx?type=view&id=20170306>,
<https://doi.org/10.5194/egusphere-egu2020-2834>

Contact: xuxiuquan1986@126.com; fanhaoming@126.com

