

Human Dimensions in the Oases in the Arid Regions in China

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1. Introduction

There are two directions of interaction between human activities and climatic environment in the arid regions. Namely, climates affect the human activities and in an opposite way, human activities do climatic environment. Desertification is one of the most typical phenomena among the problems related to these interactions.

Taking examples in the Taklimakan desert in Xinjiang, China, the present paper deals with the present conditions of human dimensions clarified by the fieldwork since 1990 and by analyzing statistical data published. The study area is given in Fig. 1. The wind and rain conditions were discussed elsewhere (Yoshino 1992).

2. Method of study

For the field work, we did interview with farmers in the Hotan and Qira oasis in the southern part of the Taklimakan desert and Korla, Aksu and Kasi in the northern and western parts. Items of interview question were: family construction, house plan, cultivation area, crop calendar, harvest and production, income, irrigation, ground water, living water demand, side work, wind damage, counter measure for desertification, fuel collection etc. The results were printed in publications by the Institute of Geography, Aichi University in Japanese. The analyzed results were published elsewhere (Yoshino, et al., 1994, 1995).

Statistical values were obtained from the officially published tables in Annual Report for 1985-1991.

3. Present status of Humam Activities

Main results obtained are as follows: (a) Annual gross production is 87-108 US dollar per head in the oasis in the Hotan and Cela regions, the southern part of the Taklimakan desert, which is 60-80% of the northern part. (b) Farmers are living in

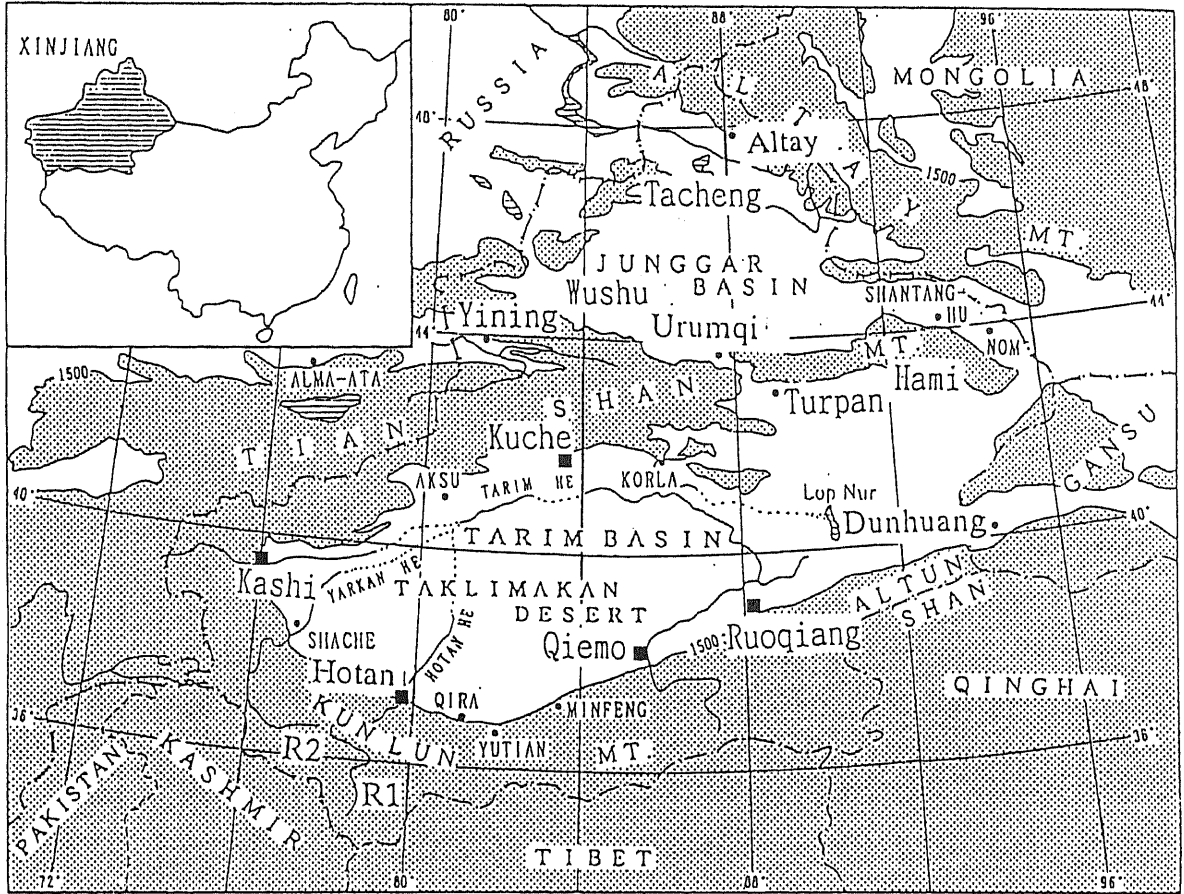


Fig. 1 Sketch map of study region and names of observation stations and oases.

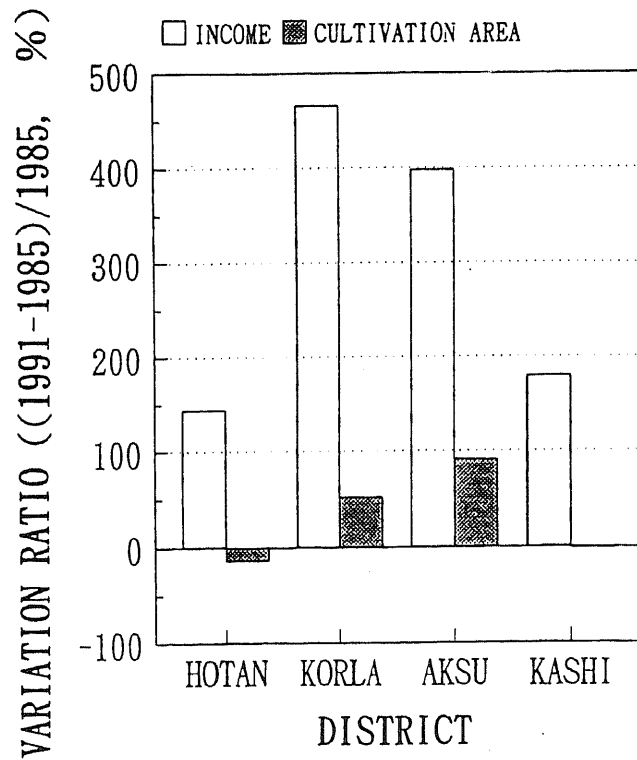


Fig. 2 Variation of farmers' income and the area of cultivation per person from 1985 to 1991 (expressed as $(\text{value of 1991} - \text{value of 1985}) / (\text{value of 1985}) \times 100\%$).

most cases with old parents and several childrens. (c) The area of cultivated fields, houses and gardens is 9.6a per head. In the case of the interview farmers, the average is 58.0a per family. (d) The income and cultivation area in the northern and the southern parts of oases are given in Fig. 2. There are striking differences. (e) Corn, wheat, and cotton are main crops. Fruits such as grapes, apricots, peaches, jujubes, figs, and pomegranate are dominating. (f) Irrigation water is going to shortage particularly in spring. In such case, ground water is used. (g) Increase of population results in increasing demand of food and further expansion of cultivated area. But, the water amount needed has mostly reached the upper boundary. (h) Fuel consumption types are; i: materials of fire woods collected from desert for all season, ii: woods in summer, but coal in winter, and iii: coal for all season. Farmers with good income by side works can buy coal and use coal for all season. (i) Farmers go into the desert, for collecting fire woods by donkey-coaches. In the maximum case, they travel — from the oases to the places apart 125-135km. (j) Wind damage on wheat is serious in spring. Sand storms cause eye disease and lungs disease. (k) Carpet production is good side work. Annual production is 1,200-4,000 yuan per one worker. (l) In the northern part of the desert, there found no serious desertification. (m) Salinization is serious in the northern part, because they utilize enough water for irrigation.

4. Climatic Conditions

The climate in the arid regions in China has been changing. Surface air temperature has increased by 2℃ or more in winter during the last 40 years. On the other hand, it has decreased by about 1℃ in summer. Therefore, annual range decreased significantly. Precipitation has increased by 5-100% in summer, although the annual amount does not show any systematic trend as a whole. Figure 3 shows the tendencies as given for the Taklimakan desert, which is an average value obtained at five stations at Kuqa, Kashi, Hotan, Qiemo and Ruoqiang (Du et al., 1996).

The increase of air temperature at the ground surface level in winter is probably due to the effect of global change. It is suggested, however, that the causes for the increase in precipitation and the decrease in air temperature in summer are to be both the global change effect and the local environmental change, due to expansion of areas of oases, increase and grown-up of windbreak forests. That is: local environmental change is probably the main cause.

The effect of oases in Turpan (Du et al., 1994) on the diurnal change of air temperature is striking as shown in Fig. 4. In July, daily maximum and minimum air temperatures are higher and occur earlier in the desert than in the oasis. But in December, daily maximum and minimum air temperatures are lower and earlier in the desert than in the oasis. This means "oasis effect" is very clear: (i) cool in

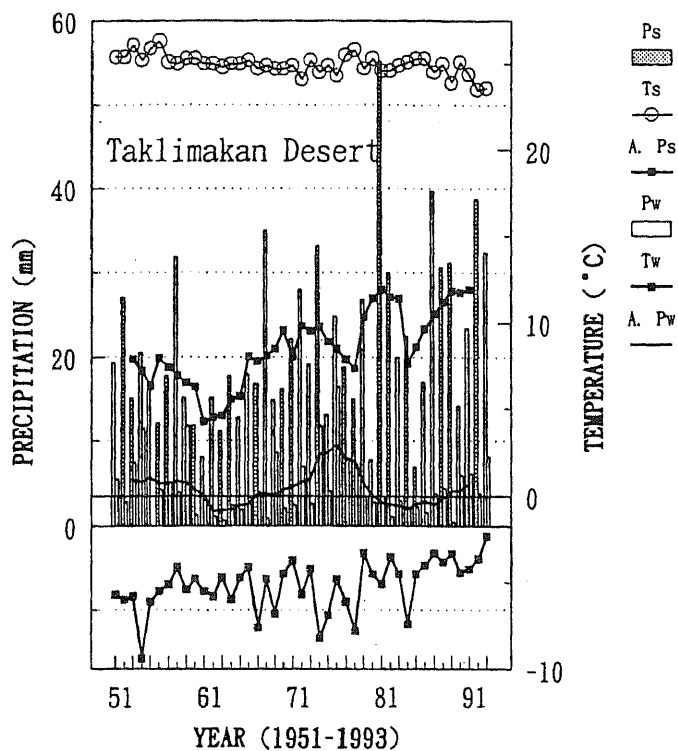


Fig. 3 Comparison of 5 years means of annual variation of temperature and precipitation in the Taklimakan desert (mean of 5 stations) between 1975-1979 and 1989-1993.

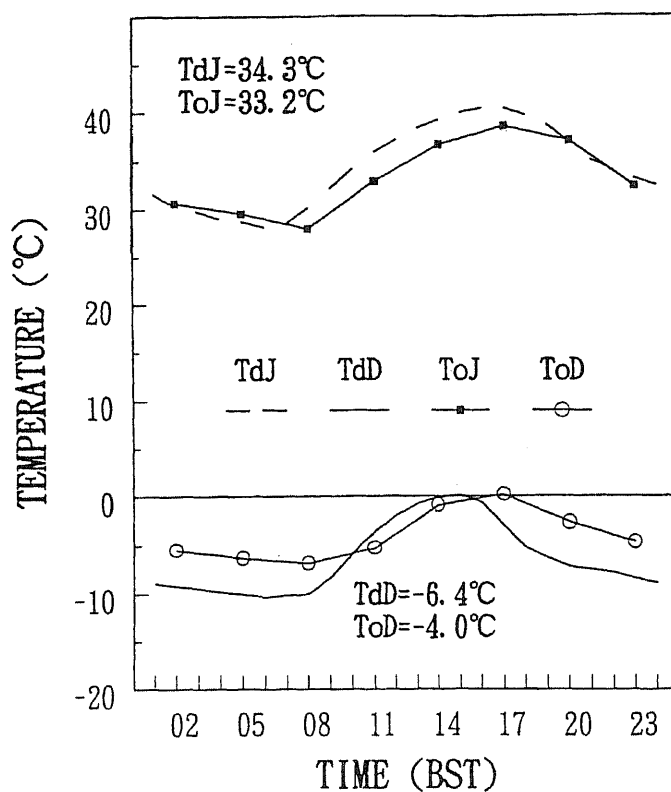


Fig. 4 Comparison of monthly mean diurnal variations of air temperature between an oasis (o) and desert (d) in Turpan, China, for July and December.

Diagram of the Desertification Process in Areas of Agriculture Interlaced with Animal Husbandry in Semiarid Zones

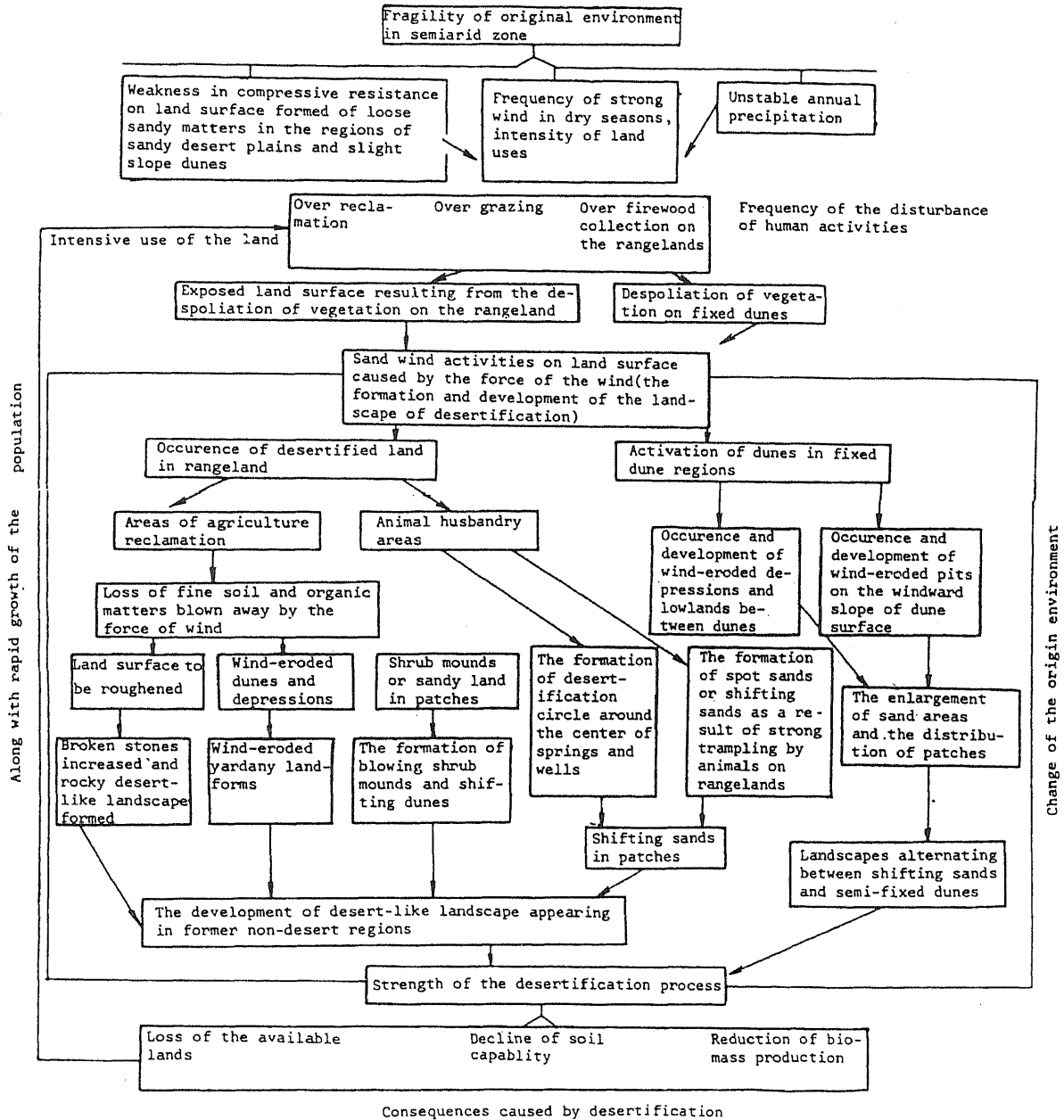


Fig. 5 Diagram of desertification processes in agricultural areas interlaced with animal husbandry in semiarid zone in China (Zhu, et al., 1994).

summer and warm in winter and (ii) the delayed occurrence of maximum and minimum in the oasis.

5. Desertification Processes

Desertification Processes are very complicate and are different place to place and region to region in accordance with the related causes. For example, Zhu et al.(1994) has presented a diagram, as given in Fig. 5, on the desertification processes in agricultural areas interplaced with animal husbandry in the remiarid segions in China. It is stressed that the rapid growth of population in the region plays an important srole as written on the left side of the diagram.

In conclusion, the whole regional plan is needed to development, considering food demand caused by populetion increase, which results in the increase of cultivation fields and water demand in the oases. Also, economically, income of farmers should be increased.

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