

# Trial Garden with Urine Reuse from an Ecosan Urine-Diversion Toilet, Khatgal, Northern Mongolia

JACQUELINE VON ARX & KATHARINA CONRADIN, September 2007

## Objectives

The trial garden served on one hand to research the effects of fertilizer in a soil that was previously not used for agricultural purposes in Northern Mongolia. The garden was part of the ecosan pilot project in Khuvsgul Inn in Khatgal, Northern Mongolia. On the other hand, it was also meant to demonstrate local people and tourists – who were both visiting the toilet in significant numbers – that urine really works as a fertilizer.

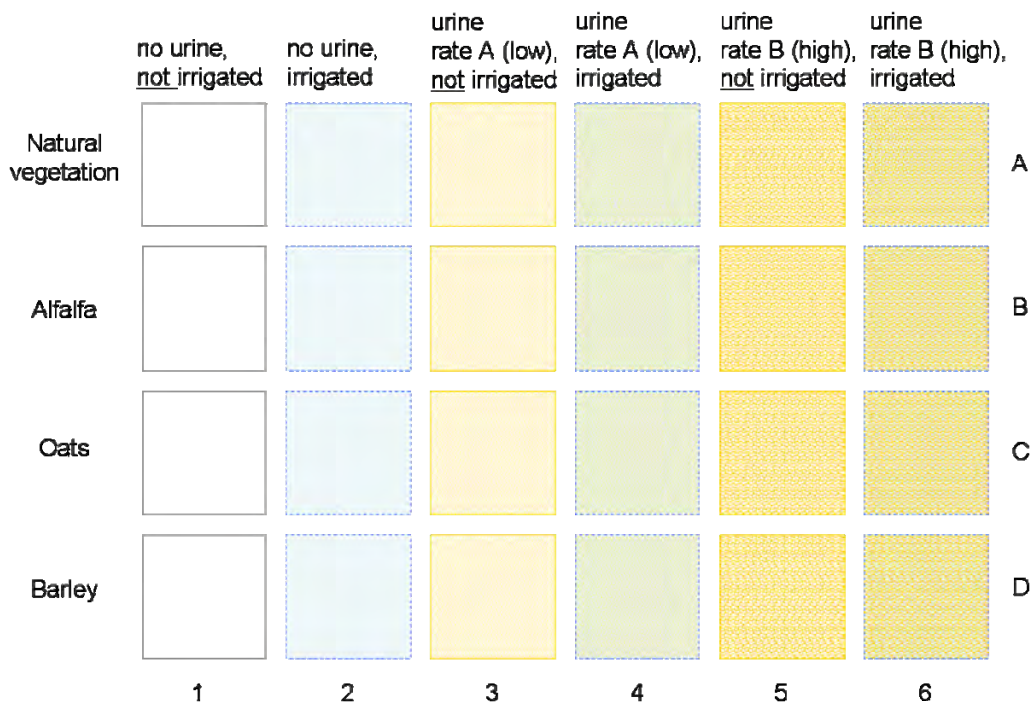
## Design of the Trial Garden

For each crop, there were 6 test plots measuring 1x1m. Like this, we could make sure to discern differences not only between fertilized and non-fertilized crops, but also depending on whether the plants were irrigated or not.

The first two columns (No. 1 and 2) received no urine fertilizer at all, while the 1<sup>st</sup> one received nothing at all, and the second one was only irrigated when necessary.

Column 3 and 4 received a low rate (Rate A) of fertilizer, i.e., 1.5 L / m<sup>2</sup> per growing season (i.e., one year), whereas column three was not irrigated, and column four was irrigated when necessary.

Column 5 and 6 received a high rate (Rate B) of fertilizer, i.e., 6 L / m<sup>2</sup> per growing season (i.e., one year). Column five was not irrigated, and column six was irrigated when necessary.<sup>1</sup>



Source and Graphics: K. Conradin

Fig. 1: Layout and fertilizing plan for trial garden

<sup>1</sup> As no data was available on fertilizer use in Mongolia, the „rule of thumb“ described in the following publication was used. However, it is always recommendable to get exact figures on fertilizer demand and the specific needs of plants from local agricultural institutions: JÖNSSON, H., RICHERT STINTZING, A., VINNERÅS, B. & SALOMON, E. (2004): Guidelines on the Use of Urine and Faeces in Crop Production. (= Ecosanres Publication Series 2004-2). Stockholm, Stockholm Environment Institute: 1-35.

## Plants

Plants that were naturally growing in Mongolia were chosen for the Trial garden. In order to be able to compare the growth to the natural vegetation, nothing was sowed in row A. The natural steppe vegetation with various grasses and ambrosia was growing there. In row B, alfalfa was sown – a plant that is traditionally used as animal forage in Mongolia. In rows C and D, Oats and Barley were grown – both cereals that are quite resistant to cold and have. Both oats and barley are traditionally consumed in Mongolia.

### The following aspects have to be noted:

- All irrigated rows received the same amount of water when they were irrigated.
- Fertilizer was diluted at a ratio of about 1:8. Thus, also those rows that were not irrigated received some water. This amount was however limited, as the fertilizer was given in three doses. Thus, they maximally received about 24 L/m<sup>2</sup> more water during the whole growth period than those test plots that were not irrigated at all.
- Fertilizer was given in three doses at the beginning and in the middle of the vegetation period.
- Sowings took place on the 7<sup>th</sup> of June 2007.

## Results

The first effects of the fertilization were visible about 6 weeks after sowing. There were already significant differences between the plot that received no additional water or fertilizer at all, and the plot that received the highest rate of fertilizer and irrigation.

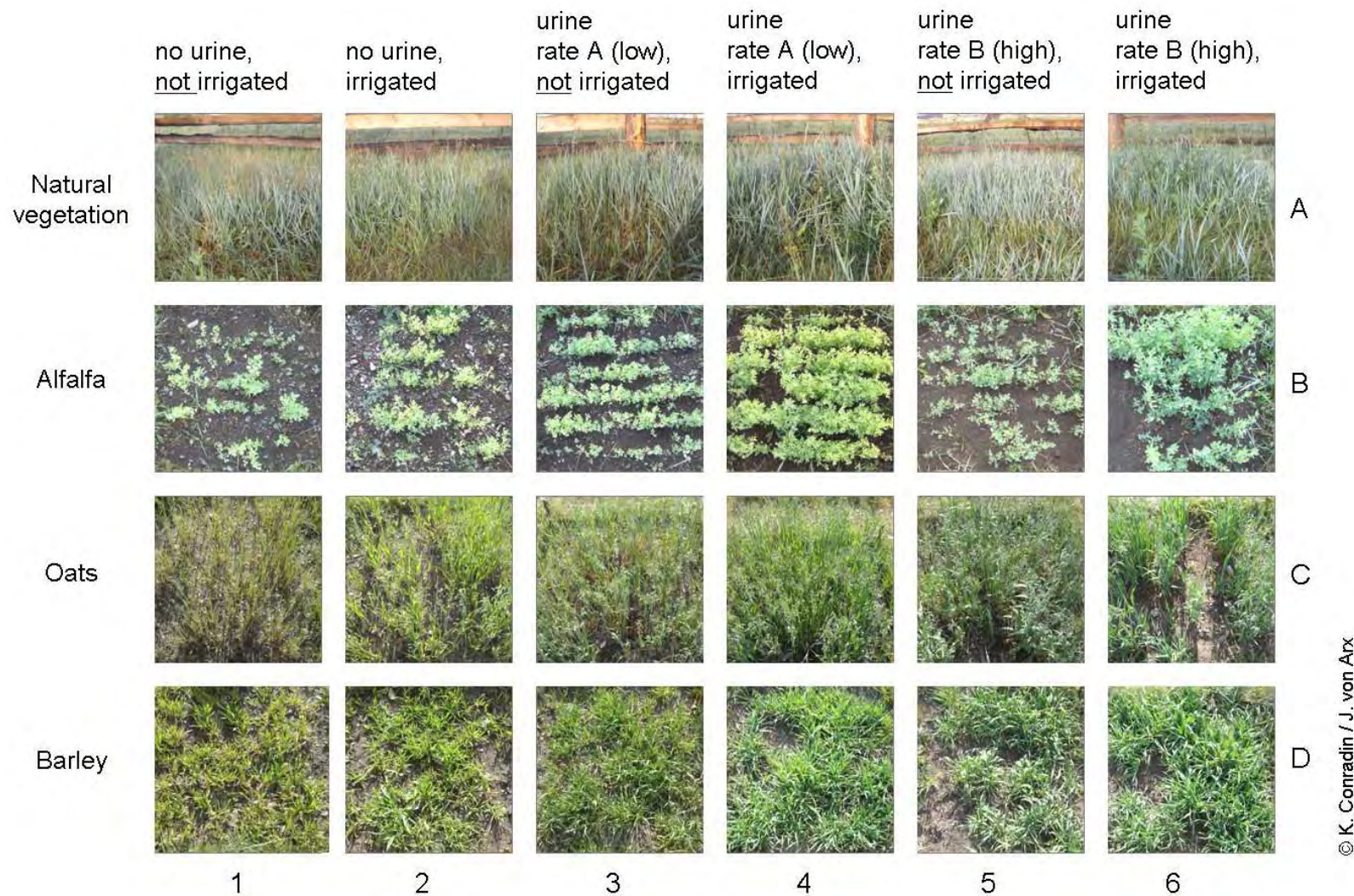


**Fig. 2: Barley plants 6 weeks after sowing (July 17<sup>th</sup>, 2007)**

The plant on the left was growing on the plot with Fertilizer Rate B + irrigation and had received two thirds of the fertilizer dose (4L/m<sup>2</sup>), the plant on the right had received no fertilizer or water at all.

After 10 weeks, very good results were visible. There were significant differences not only in the height of the plants, but also in colour – which is always an indicator of some nutrient lack. A detailed analysis of the soil characteristics will be done in November and December 2007.

Figure 3, 4 and 5 document the growth differences of the test plots in the trial Gar



© K. Conradin / J. von Arx

**Fig. 3: Trial Garden "Aerial view" after 10 weeks of growth (August 18<sup>th</sup>, 2007)**

Clear colour and density differences are visible from left to right

A: no urine, no irrigation    B: no urine, irrigated    C: low rate, no irrigation    D: low rate, irrigated    E: high rate, no irrigation    F: high rate, irrigated



Alfalfa



Oats



Barley

**Fig. 4: Alfalfa, Oats and Barley after 10 weeks of growth (August 18<sup>th</sup>, 2007).**

The first picture in each row is the one that did not receive any water or fertilizer. Going further to the back, the plots received more water / fertilizer as according to the layout described above. Differences in colour and growth density are visible, especially in the Oats row. The first plot in the Barley row also shows obvious signs of dryness (yellow tips).

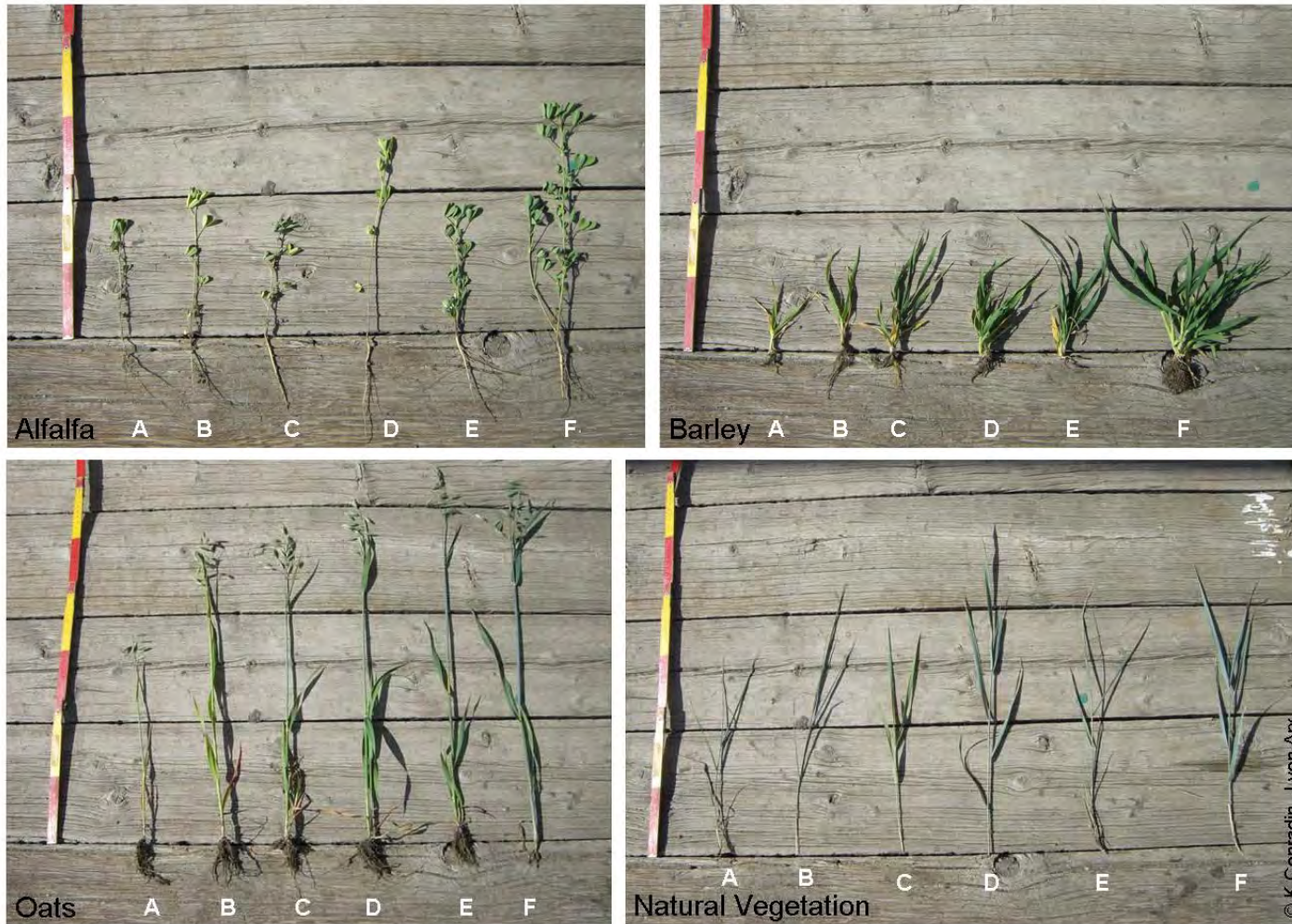
A: no urine, no irrigation    B: no urine, irrigated

C: low rate, no irrigation

D: low rate, irrigated

E: high rate, no irrigation

F: high rate, irrigated



**Fig. 5: Individual Plants of the different columns after 10 weeks of growth ( August 18<sup>th</sup>, 2007).**

The rows were irrigated and fertilized according to the scheme described above. While very results are visible with oats and barley, corresponding exactly to the amount of fertilizer and water received, the height of the alfalfa plants is quite obviously heavily influenced by irrigation. It is difficult to see clear results with the natural vegetation here, though some trend (darker colour, greater height) is visible from left to right.

A: no urine, no irrigation    B: no urine, irrigated    C: low rate, no irrigation    D: low rate, irrigated    E: high rate, no irrigation    F: high rate, irrigated