

## Key Messages

- Progressive soil degradation and climate change require the application of sustainable tillage methods.
- Minimum tillage alone, without black fallow, already provides erosion protection and soil improvement.
- When changing the method, ensure that the required amount of fertilizer is applied.
- Minimum tillage or direct seeding is not possible without herbicides.
- Reduced tillage requires crop rotation.
- Longer vegetation periods due to climate change enable the cultivation of alternative crops.
- Application of reduced tillage requires special agronomic knowledge.

## Author

Prof. Dr. Tobias Meinel

Amazone Kazakhstan  
010000 Nur-Sultan, Rayon Saryarka,  
Saifullina Street 3, office 1  
Kazakhstan

## Dry farming in Mongolia

### Sustainable cropping systems

Agriculture in Mongolia is still characterized by traditional methods. This includes the extensive use of black fallow. Against the background of climate change, plant production faces additional challenges. The water available to plants, which is scarce anyway, will be reduced by increased evapotranspiration, and precipitation will mainly come along with heavy storms. In addition, there is the task of protecting and improving the soil which has been degraded due to many years of inappropriate use. Plant production must adapt to these conditions and challenges.

The only way to achieve adapted cropping is to apply conservation tillage methods. This means the reduction of tillage without the use of black fallow. These measures already produce very good effects related to infiltration capacity, wind erosion protection and stabilization of soil fertility. It is *not* necessary to immediately abandon any tillage and apply direct seeding. This type of cultivation is extremely complex, requires a lot of experience and is therefore too big a step. The minimum tillage variant allows for shallow tillage to improve agronomic conditions for seedbed preparation and weed control.

However, the following circumstances must be taken into account when reducing tillage and abandoning black fallow:

1. The incidence of weeds will increase significantly. This effect must be countered with appropriate plant protection.



2. The omission of black fallow may lead to greater infestation of diseases and pests. This is to be countered with crop rotation.

3. The mineralization of organic matter in the soil is slowed down by reduced tillage. As a result, fewer nutrients are available to the plants. This deficiency can best be compensated for by appropriate fertilization during sowing.

The expected further increase in annual average temperature leads to an extension of the vegetation period. This gives farmers in Mongolia the opportunity to cultivate alternative crops such as maize and sorghum and thus to establish a crop rotation with more plant species.

### Recommendations

- ❖ In order to preserve the soil, stabilize yields and prepare for ongoing climate change, soil tillage intensity should be reduced, and black fallow should be completely abandoned.
- ❖ In the transition to methods of minimum tillage, great importance should be placed on plant protection. Minimum tillage or direct seeding is not possible without herbicides.
- ❖ The arable land should be examined for nutrient supply and fertilized according to these results after the withdrawal of the cultivated crop. Laboratories should be set up or developed and staff trained who in turn can also provide fertilization recommendations.
- ❖ Farmers should be supported in the introduction of alternative crops into crop rotation. It is essential that this includes the organization of outlets for field crops. Mongolia's geographical location offers very good prerequisites for this.
- ❖ In cooperation with farmers, scientists, manufacturers of agricultural machinery, plant protection products and fertilizers and with the involvement of policy decision-makers, trials and demonstrations should be set up in the relevant agricultural regions of Mongolia and carried out over several years.
- ❖ The organization of knowledge transfer, for example through trips to similar agricultural regions such as in Kazakhstan or southern Siberia, or the organization of workshops on minimum tillage with international participation, would bring about a faster development towards sustainable tillage methods.
- ❖ Land subsidies should be linked to the need for sustainability and soil improvement. This means that money should be spent for herbicides, fertilizers, high quality seeds and adapted agricultural equipment such as field sprayers and seed drills for minimum tillage or direct seeding instead of spending it on diesel fuel.
- ❖ The transition to sustainable and resistant cultivation methods requires a higher investment in land due to the increased use of pesticides and fertilizers (increased variable costs). This represents an increased risk for land users due to the highly variable climate conditions in Mongolia. This risk should be cushioned by insurance programmes and, if necessary, by substantial governmental support.



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