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# Maize Cultivation Techniques in Tonnage Farmlands in Tunliu County of Shanxi

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**Abstract** In recent years, benefiting from the unique natural conditions and the promotion and application of agricultural science and technology, the level of maize production in Tunliu County continues to increase, and many tonnage farmlands are emerging. East Ligao Village in Ligao Town is famous for its tonnage farmlands throughout the county. Through a lot of research, maize cultivation techniques in tonnage farmlands are summed up in this paper from the aspects of plot selection, intensive cultivation, high-quality manure application, chemical fertilizers scientific application, disease-resistant high-yield superior varieties selection, reasonable close planting and strengthening field management, *etc*, which has certain guiding significance for the high yield of maize.

**Key words** Maize, Tonnage farmlands, Techniques

## 1 Introduction

Maize has a wide range of uses. It is both food and feed, as well as important industrial raw material. Maize has high yield and strong adaptability, and it is the main grain crop that is second only to rice in China. Therefore, fully tapping the yield potential of maize and developing the production of tonnage farmlands is of great significance to increase the level of maize production, increase agricultural productivity and efficiency, and increase farmers' income.

In recent years, benefiting from the unique natural conditions endowed by the location in the golden belt of maize production and the promotion and application of agricultural science and technology, the level of maize production in Tunliu County continues to increase, and the yield has increased from 7 500 kg/ha around 2 000 to current 9 750 kg/ha; and many tonnage farmlands have also emerged, and East Ligao Village in Ligao Town is famous for its tonnage farmlands across the county. Although the price of maize has declined in recent years, the increase in yield has compensated for the economic losses caused by price factor, so relatively satisfactory income can still be achieved. The planting area of maize in the county accounts for more than 85% of the cultivated area, occupying the forefront of local dominant crops and major food crops.

## 2 Selection of plots to lay a good foundation

The selection of plots is the primary condition for the production of tonnage farmlands. It is necessary to choose the plots with flat terrain, deep soil layer, high organic matter content, good water and fertilizer conservation and irrigation conditions. The former crop is better to be soybean, wheat, vegetables and potato. It is best not to keep continuous cropping and to keep away from pollution sources such as industrial and mining areas.

## 3 Intensive cultivation and increased manure application

After the harvest of the former crop, autumn ploughing should be carried out immediately, with a depth of 25 cm or more. In combination of deep ploughing, chicken manure, pig manure or other high-quality decomposed farmyard manures are applied according to the amount of 30 000 - 45 000 kg/ha. After the ploughing, harrowing is carried out to maintain moisture. In the early spring of the following year, harrowing is carried out around the Waking of Insects and in case of rain. Before sowing, shallow ploughing is carried out at a depth of 15 cm, combined with application of chemical fertilizers as base fertilizer. After ploughing, harrowing is carried out to make plots reach the standard of smooth ground, no soil blocks, no residual roots, loose in the upper and compact in the lower, laying a good foundation for full stand of maize seedlings. Continuous rotary tillage but no deep ploughing is avoided.

## 4 Scientific fertilizers application to balance nutrients

Normally, three-element (25% N, 15% P, 5% K) maize professional compound fertilizer (900 - 1 200 kg/ha) is applied as base fertilizer, and urea (225 - 375 kg/ha) is applied as top-dressing. As maize is sensitive to zinc, 15 - 22.5 kg/ha of zinc fertilizer is applied along the base fertilizer. The soil in Tunliu County is red soil with higher potassium content, so the application amount of potassium fertilizer is smaller. In different areas, the application amounts of nitrogen, phosphorus and potassium can be determined according to the supply level of soil nutrients and fertilizer requirements of maize so that balanced fertilization can be achieved.

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## 5 Selection of disease-resistant high-yield superior varieties

In recent years, diseases such as leaf spot, head smut and ear rot have become more serious in maize. Disease resistance is a necessary condition for selecting superior varieties. According to local conditions, Xianyu 696, Chengxin 16, Fengtian 101, Taiyu No.1, Dafeng 30 and other excellent maize varieties that have strong stress resistance and high yield potential and are suitable for close planting can be selected. In order to ensure full stand and growth uniformity of maize seedlings, high-quality maize seeds with high purity, uniform kernel size and germination rate of more than 90% should be selected.

## 6 Timely sowing and reasonable close planting

Sowing can be carried out when the temperature of the soil of 5 – 10 cm depth stabilizes at 10℃. The best sowing date is generally from April 20 to May 1. If seeds are sown too early, low ground temperature will cause rot of seeds, inconducive to full stand of maize seedlings. In addition, germinating seeds are susceptible to pathogens. This is one of the factors causing the occurrence of diseases such as head smut. Mechanical (or manual) precise sowing is adopted. According to the level of soil fertility and variety characteristics, the planting density is generally maintained within 60 000 – 63 000 plants/ha. Due to the higher density of seedlings, wide- and narrow-row planting is generally used to facilitate ventilation and light transmission and to increase production. The spacing between every two adjacent wide rows is 60 – 67 cm, the spacing between every two adjacent narrow rows is 40 – 47 cm, and the spacing between every two adjacent plants is 27.5 cm. Replanting is not recommended in production to avoid the difference in seedling growth. Therefore, attention must be paid to the quality of sowing to ensure full stand of seedlings at one time. The field emergence rate of high-quality seeds can reach 90%. When 66 000 – 70 500 seeds are sown per hectare, 60 000 – 63 000 seedlings can be retained per hectare.

## 7 Returning straw to field to improve soil fertility

Due to the reduction of livestock breeding in Tunliu County in recent years, manure is generally insufficient. The former crops are dominated by maize, of which the large amount of straw should be take full advantage of. After harvest, the straw of maize should be immediately smashed (when the water content of the straw is high) and buried into the soil along with deep ploughing to increase soil organic matter content and make up for the lack of manure. The smashing length is 5 – 10 cm, and the qualified rate of crashing is greater than 95%. Urea is applied according to the amount of 90 kg/ha to accelerate rot of the straw, so as not to affect the seeding in the coming year.

## 8 Strengthening field management

**8.1 Tillage and weeding** Tillage at the seedling stage has the effects of increasing the ground temperature, removing weeds, promoting the growth of weeds, controlling the growth of stems and leaves and improving the growth of seedlings. Mechanical or artificial weeding is recommended. Application of herbicides may produce a certain influence on the latter crop.

**8.2 Topdressing and watering** In the flare opening period, 225 – 375 kg/ha of urea is applied along with watering to speed up the growth of stems and leaves, and promote ear differentiation. In the tasseling and flowing period, one time of irrigation is carried out.

**8.3 Prevention and control of diseases and pests** In recent years, the pests and diseases that occur in the maize of Tunliu County mainly include northern leaf blight, southern leaf blight, head smut, maize borer and armyworm. First of all, agricultural control measures should be adopted such as choosing disease-resistant varieties, rotating crops, cleaning up diseased plants and applying decomposed manure. Insecticidal lamps, swatches, sex attractants and other physical control measures, the protection and use of natural enemies, the use of biological pesticides and other biological control measures are the dominant. When the prevention and control indicators are met, high-efficiency, low-toxicity and low-residue pesticides can be used for chemical control. For example, if there are 20 borers in 100 maize plants, 1.5% phoxim granule (1 g/plant) or 3.6% bisultap granule (3 750 – 4 500 g/ha) can be mixed with a certain amount of fine soil and sprinkled in the end of the heart leaf stage; if there are 25 armyworms in 100 maize plants, 2.5% lambda-cyhalothrin EC (1 000 × – 1 500 ×), 4.5% beta-cypermethrin EC (1 000 ×) or fenvalerate and phoxim 25% EC (1 000 ×) can be spayed before the 3rd instar stage. When primary infection focus of northern leaf blight and southern leaf blight appear in field, pyraclostrobin and metiram 60% WDG (1 000 × – 1 200 ×) or pyraclostrobin and thiophanate-methyl 45% suspension (1 000 ×) can be sprayed. When head smut occurs in field, the diseased plant(s) must be pulled out, brought out of the field and buried in soil immediately. The spraying of all pesticides should be before 10:00 am or after 5:00 pm, at an interval of 5 – 7 d, for 2 – 3 times. Attention should be paid to rotation of pesticides so as to avoid drug resistance.

## 9 Timely harvest

When stalks turn yellow and ear leaves turn yellow-white and become loose, the maize can be harvested. After the harvest, the maize ears must be promptly dried. When the grain moisture content declines to 14% or less, the ears are promptly threshed and stored in shady, low-temperature, clean, dry and pest-free place.