

## 9. PROBLEMS OF MAIZE CULTIVATION IN THAILAND

Ampol SENANARONG

Chief, Bangkhen Agricultural Experiment Station, and Corn  
and Sorghum Research Project, Department of Agriculture  
Bangkok, Thailand

Maize is one of the most important field crops of Thailand, second only to rice. Its exported value is more than 50 million U.S. dollars annually. However, maize is relatively a new crop to most Thai farmers compared to rice which has been grown from time immemorial. The acreage and production of maize has increased tremendously over the past ten years. Most of the present maize growers are former rice farmers who have migrated from low land rice areas, and they have little knowledge of upland crop cultivation. The methods of rice growing, which have been practised for centuries, therefore, were applied to maize cultural techniques. Although many characteristics of rice and maize are common botanically, the environmental requirements, methods of cultivation, mode of pollination and others are different. The cultivation of maize without past experience always leads to many misconcepts among Thai farmers. The supervision provided by government officials has been inadequate, since similar problems have occurred. Research work on maize cultivation has been initiated recently, but lack of funds and personnel has hampered the program. Very little information on techniques of maize growing have been revealed and many problems remain to be solved. In addition, the income of most farmers very limited compared to those in many countries. These factors contribute to many problems confronting corn production in this country at the present.

Generally, the main problems of corn cultivation may be concluded in the following topics.

### **Improper Fluctuation of Rainfall**

Most maize growing in Thailand depends mainly on rainfall which distributes more than six months a year, with average normal precipitation of 45-50 inches. It has been observed that in the past few years the problems of moisture stress due to inadequate soil moisture occurred very often and resulted in poor crops. Some years the total amount of precipitation were close to normal but the distribution was improper. The plants also seemed to wilt and lose their abilities to stand stress more easily than before. The severe destruction of forests in watershed and mountainous areas, together with improper management of soils in cultivation regions might be the main reason for these problems.

### **Inefficient Cultural Practices**

As mentioned earlier, many maize farmers are deficient in general knowledge of upland crop cultural techniques and manage their farms with inefficient methods. Their

problems may be grouped into the following categories—

1. *Unsuitable seed bed preparation.*

Although the matter of conventional method of seed bed preparation and minimum tillage is controversial among agronomists in some countries as to which method is the most suitable for maize, in Thailand it has been accepted that the average farmers do not work well enough in seed bed preparation. Many farmers prepare the fields too late without exposing the furrow long enough to sunlight in order to kill weeds. Some fields are not uniformly plowed, leaving residues from previous crops with weeds partly uncovered. Generally, only one trip of plowing is accomplished without cross disking. These practices result in poor stands and insufficient control of weeds during the season. Obviously, the reason for improper seed bed preparation is the need of suitable farm equipment. Hand hoes and native wooden plows drawn by animals are the only two implements owned by most farmers. The wooden plow has been used in muddy and soft rice fields for centuries, but is relatively ineffective when plowing on dry, stumpy or rocky upland soil, as it will be damaged very often and should be used only in moist or soft soil. Therefore, the most popular alternative method for land preparation nowadays is to hire large farm tractors with disk-plows from local merchants or dealers to do the job. The work will be contracted on the basis of area and charged according to field conditions, ranging between 9-31 U.S. dollars per hectares. Naturally, contractors and tractor owners would plow in the most profitable and rapid methods, because the demand for work will be high for only a relatively short period. If the clients do not watch closely, the work may not be as satisfactory as they expect. Plowing one strip and stepping the other row or working with high speed tractors and shallow plowing has been reported frequently.

2. *Improper time of planting.*

Since the rainy season in Thailand lasts more than six months and farmers want to obtain full use of their farms by planting more than one crop a year; hence, maize should be sown as early as possible whenever the rain permits. The dates of planting, therefore, were varied and the cropping patterns differ from year to year and from location to location, depending on the annual rainfall distribution. The only limiting factor for maize growing in Thailand is soil moisture; consequently, maize can be planted from March to September without irrigation. According to experimental results, however, suitable maize planting dates are between early May and late June. The earlier or later dates are always risky and are more harmful to maize yields than they are beneficial. A few farmers, nevertheless, waited and followed the recommendations set out by the researcher. Usually, they will plant maize as soon as the rains start, and the soil is moist. Although some fortunate farmers obtained good crops from early planting, many fail. Accordingly, they had to plow under the wilting plants and replant. Because of this, it is common in mid season to see many close fields with different dates of planting. Some fields were ready to harvest while some had just emerged or were at the knee-height stage. Many fields looked healthy while others nearby had started to wilt. The differences in dates of planting caused wide variations in the years with abnormal patterns of rainfall. Obviously, improper planting dates have the greatest effect on maize yield.

3. *Inappropriate rates of planting.*

According to the experimental results, it has been found that the suitable rate of planting is 40,000–60,000 plants per hectare. It is more practical to instruct the recommendation in terms of methods of planting, such as distance between rows of 100 centimeters and between hills 50 centimeters, with 2–3 plants per hill. Frequently, the

viability and germination of farmer's seed was rather poor and environmental conditions were not always favorable. Many plants did not germinate and stands were lower than optimum. In order to compensate for missing plants, most of the farmers sowed their seed in double or triple numbers of the stand they needed. If seed germination was good and weather conditions normal, the stands would be higher than the suitable rate. This resulted in higher plant population with resulting low yielding crops, since the farmer rarely thins excessive plants.

Unpredictable weather patterns and wide variations of soil fertility are certainly major problems in determination of the suitable rate of planting. Normal plant population would be too high for low rain years or in dry zones, and so on.

#### 4. *Inefficient weed controls*

Generally, it is well accepted that most of the maize farmer's fields are too weedy and control measures are inefficient. The main reasons consist of—

##### 4.1 *Lack of suitable farm equipment and labourers.*

On small farms the farmers usually hand-weed by themselves, but it is necessary to hire labourers for large farms. Generally, the cost of hired-hand weeding is about 40 U.S. cents per day, or per 0.04 hectares. About 2–3 times for weeding is required for the season. Since the labourers are scarce during the planting season, many fields have been left without sufficient weed control.

Similar to seed bed preparation, the native hand-hoe and wooden plow are the only two farm utensils used in weed control. The former works more effectively but more slowly than the latter; however, the plow is not efficient enough for weeding. The combined work of these two implements, plowing between rows and hoeing within plants, is believed to be the best method. Nevertheless, with such primitive equipment the capability of the work is limited.

Attempts have been made to introduce many small implements drawn by animals; however, results so far have not been successful. The reasons are due to high cost and the inexperience of both farmer and animals.

##### 4.2 *Unsuitable seed bed preparation.*

As mentioned previously, the seed bed is not well prepared. This condition would assist growth of weeds and their competition over maize.

##### 4.3 *Unfavorable pattern of rainfall.*

High rainfall, wet soil and cloudy days during the growing season always prevents mechanical control at the most suitable time. Consequently, the efficiency of weed control varies from year to year depending on rain patterns of each year.

#### 5. *Poor techniques of soil improvement.*

Generally, the soils of maize growing regions may be classified into two main groups. Firstly, the land is fertile and recently cleared. Maize planted in such soil is productive without fertilizers. On the contrary, the second soil type is usually lacking in fertility and has been cultivated for years, and corn production is likely to be unprofitable. However, in either types of soil, farmers find it necessary to use no chemical fertilizers at all. The reasons are quite obvious and will be pointed out hereafter—

5.1 The main maize areas fall in the first group, in which the soil is very rich. Despite the gradual decline in yield after years of cultivation, maize can still be produced profitably without fertilizers. The significant role of chemical fertilization has, consequently, not been recognized by the farmers.

5.2 The farmers do not really understand the facts of fertilization, such as, kinds, rates and methods of application. Although research in this field have been carried out for many years in the country, results have not been satisfying. Some results can

not applied to commercial fields, and the recommendations are not practical or profitable.

5.3 The cost of fertilizers is very expensive relative to that of maize (2:1), so investments on fertilization are very high compared to other farm expenditures. As mentioned before, maize growing in Thailand is likely to be risky due to abnormal weather conditions; therefore, it is difficult to convince the farmer to risk such high investments, of which the only large source of credit comes from local bankers, who offer loans with high rates of interest.

5.4 In areas where soils are relatively poor but show very sharp response to fertilization, particularly in the Northeastern part of the country, the costs of maize products are much lower and those of fertilizers are higher than in the main growing areas, due to the high cost of transportation. This is added discouragement for farmers to use fertilizer.

Besides the uses of chemical fertilizers as mentioned, other methods of soil improvement such as crop rotation, green manuring, farm manuring, soil conservation, etc. have not been practised by the farmers. The main reasons are—

5.5 Farmers do not have sufficient information on techniques and procedures of these methods. Extension and demonstration work in these fields has been inadequate and much research work needs to be done.

5.6 The economic factor of farmers is excessively low. With a great demand for food and cash, farmers have to plant any crops which give immediate returns. It is impractical for them to plant any crops that can not be sold or utilized as food.

5.7 Since maize has been grown primarily for exportation and not for feed, no cattle are raised commercially in corn areas. Accordingly, it is difficult to obtain sufficient amounts of farm manure for maize fields.

5.8 Many farmers do not own the land themselves and have to lease the farm annually, certainly, they would not be interested in developing or improving land which requires high investment and long range programs.

5.9 At present, the Government has no effective method to control the pattern of farming, which depends on the demand of local markets. Usually, the farmers selected to plant or rotate any crops on the basis of their own needs without realization of their significant roles in soil improvement. Such management sometimes leads to the destruction of soil nourishment, for example, corn rotation with legumes was a method of soil improvement used by Thai farmers for years. However, farmers now prefer to rotate corn with sorghum or cotton as the increase in cost of these two crops makes production financially feasible. Soil depletion is believed to be quicker with this cropping pattern.

#### 6. *Lack of farm mechanization.*

At present, there is very little farm equipment employed in maize cultivation, and the capability of the equipment has not been utilized thoroughly. Farm tractors with disk-plows, of which a small number belong to the farmers, are used mainly to prepare the land early in the season. At harvesting time, with a mounted maize sheller in the rear, some of the travel into remote areas, where the roads are very poor, to render shelling or transportation service to the farmers. No implements, other than these two, have been used with tractors.

Small garden tractors, or rotavators, which are very popular in many developing countries, seem to have no place here. The main reasons are: (1) Inadequacy of farmers' knowledge and experience in farm mechanization; (2) Lack of credit and capital for investment; (3) Spare parts and repair are expensive and difficult to obtain.

locally. It is generally known that cost of travel to obtain a spare part in the nearest town is many times higher than the cost of a spare part itself.

On the average, the size of a maize farm is about 4 hectares, and at this size, it is hard to do a good job of farming with only manual labour.

#### 7. *Unsuitable harvesting time.*

Generally, the harvesting period of the best planting season is between September to October, which is the highest peak of annual rainfall and relative humidity. Harvesting is difficult and drying creates many problems. It is very difficult to decrease the moisture percentage of grain below the safety point under these conditions, and the grain tends to decay and damage easily by fungus and insects. In addition, mechanical harvesting would be difficult, since the soil is wet and muddy. Late planting seasons might solve most problems; however, the yield of crops would certainly be lower than early planting ones, and it is not likely to replace any crops that are more suitable to the early rainy season.

### **Inadequacy of Good Quality Seed**

The weather conditions of Thailand are not favorable for seed storage. With high relative humidity, high temperatures all year round, and many pest insects, seed stored at normal room conditions would be deteriorated and destroyed within a few months. Since commercial good quality seed is not sufficient, the farmers have to select and save seed for their own use or obtain it from the warehouse locally. Such seed, in spite of good care, were generally poor in quality and produced very poor stands with low yielding crops.

At present, the Department of Agriculture, in order to solve these problems, is the only organization that produces food quality seed for the farmers. However, the quantity is so limited that about 1% of the total demand seed has been produced annually. No other private commercial seed farms or seed associations have been established. This weak system of seed production is considered to be one of the obstructions in maize development in Thailand, since the superiority of a new variety or synthetic could not reach to farmers throughly.

### **The Increase of Insect and Disease Damage**

The repetition of maize in the same area for years and the rapid destruction of forests and natural vegetation recently has affected the balance of nature and the ecology of many pests. In addition, the cultural practices are not good enough to be used as control measures against them. As a result, the outbreaks of many serious pests such as locust (*Patanga succineta* L.), army worms (*Pseudaletia* spp.), stem borer (*Ostrinia salentialis*), and many others have occurred frequently. Not only has maize yield been decreased by these pests, but the government has to spend considerable monies to control them annually.

### **Low and Unsteady Grain Income**

The present commercial system of maize production in the country is believed to be improper and unfair to farmers. In spite of the high grain cost on the world markets, farmers still obtain a relatively low premium for their product. The farmers are always discouraged to grow maize and are not able to improve their farming capabilities with such an unsteady and low income.

The causes of these mentioned problems, nevertheless, mostly due to lack of cultivation knowledges and inexperience of the farmers themselves together with the inadequacy of technical supervisions, therefore, it will be hoped that in the very near future

when the farmers gain further experiences and receive more and more assistances provided by various Government and private agencies which are being operated extensively at the present, these difficulties would be gradually solved. At the present, the Government of Thailand also placed much more considerable emphasis on research and extension work of maize production than ever before. There is every reason to believe that in the next few years, a high percentage of farmers in various important maize growing regions will be growing good varieties or synthetics with modern cultivation techniques and the yield and production of maize will be increased successfully.

### Discussion

**F. Iwata**, Japan: Would you like to show the chemical analysis data of soils about N,  $P_2O_5$  and  $K_2O$ ?

**Answer:** I am sorry, I don't have the information with me now. As I remember, however, the soil of Saraburi corn growing area is deficient in  $K_2O$  and  $P_2O_5$  and soil of Pakchong is deficient in  $P_2O_5$ .

**V. R. Carangal**, Philippines: What proportion of the corn farmers are using fertilizers, insecticides, and herbicides?

**Answer:** Very few farmers have used fertilizers at the present.

**S. Harada**, Japan: I know that you are an expert of corn breeding. So please explain us briefly what kinds of breeding technique are undertaken in your country, and also some remarkable results achieved on your breeding works.

**Answer:** Most of our breeding technique is the improvement of variety *per se*, such as mass selection, ear-to-row selection, varietal hybridization, and so on. This year, we have developed more than 15 synthetic varieties and are hoping to release to the farmers in the very near future.

**S. Harada**, Japan: On the effect of chemical fertilizers, I have heard that a rather large amount of fertilizers dressed for corn is taken by the weeds. Please explain us the method you recommend for the application of fertilizers.

**Answer:** We recommend the farmers who use fertilizers to do the good cultivation techniques such as weeding, planting in suitable season, etc., but many farmers fail to practise so. This is the reason why the application of fertilizers is unprofitable.