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TIPS FOR

Profitable Corn Production

Minnesota Extension Service
University of Minnesota

The current farm financial situation is causing producers to look for opportunities to control production costs. Minimum cost per bushel produced and likewise maximum net profit per acre occurs when producers strive for maximum economic yield. Reducing direct cash costs (dollars spent per acre to grow the crop) usually results in lower yields. This can cause higher cost per bushel produced and lower net profit per acre. In this publication, we present the recommended levels of production inputs to produce maximum profit per acre and discuss the limited opportunities that may exist for reducing cost per acre without reducing yield.

HYBRID SELECTION

Select high-yielding, full-season hybrids with good performance traits (standability, disease resistance, dry down, etc.) for maximum yield. Large differences in yield exist among corn hybrids, even within similar maturities. Corn performance tests conducted by agriculture experiment stations are excellent sources of performance information. The University of Minnesota conducts a trial with a limited number of corn hybrids. Data will be available from county extension offices in early 1986.

While full-season hybrids produce the highest grain yields, they are higher in moisture content and therefore require a greater drying cost. A grower could plant lower yielding, earlier maturing hybrids and let them field dry to lower moisture levels to save drying costs. However, the value of the yield difference is substantially greater than the savings in drying cost. Maximum profit per acre from corn production occurs when growers select high yielding, full-season hybrids.

Seed costs per bag differ among hybrids and among companies selling seed corn. Seed cost should be determined on a per acre basis and compare the expected income differences (yield x price) with seed cost differences. Cheap seed may not lead to lower cost per bushel grown if the hybrid is not a good yielding hybrid.

There are some who promote open pollinated corn varieties. Grain yield of open pollinated varieties is about 60 percent of that of hybrids. In addition, performance of traits such as stalk quality, disease and insect resistance, and drying rates will not be as good as that of hybrids. Planting open pollinated varieties would not be a profitable corn practice.

PLANTING DATE

Early planting produces the highest grain yields, matures earlier in the fall, and is lower in moisture content when it matures. Planting early does not cost more than planting late.

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Therefore, the higher yields and lower drying costs lead to lower production costs per bushel. Corn planting can begin April 20 in southern Minnesota and April 25 in northern Minnesota. For maximum yield and harvest scheduling, full-season hybrids should be planted first followed by earlier hybrids.

PLANT POPULATION

Corn population at harvest should be 24,000 to 26,000 plants per acre to produce maximum economic yields. This requires a kernel drop of 27,000 to 29,000 per acre. As seed costs and corn prices change, the economics of high plant populations may also change. For any combination of plant population, seed cost, and yield level, the net profit per acre is reduced if plant populations are lower than optimum. Optimum population may vary due to hybrid, planting date, soil fertility, soil type, and rainfall. Growers should determine the optimum population for their conditions and establish those populations for maximum net profit.

ROTATIONS

Corn yields have averaged 10 to 15% higher when grown following other crops compared with corn following corn. In addition, cash costs are reduced because rootworm insecicide is not needed for first year corn.

FERTILIZATION

The amount of money spent each year for fertilizer is a substantial part of the total cash costs of producing a corn crop. Therefore, anything that can be done to keep fertilizer costs at a minimum without reducing yield would improve the profitablity of corn production. Several steps can be taken to reduce fertilizer costs.

1. Test soil. Soil testing has always been an important management tool for fertilizer management because it provides an accurate inventory of the nutrient status of the soil.

With the current economic outlook, soil testing helps in two major ways. If the nutrient status of a field or a farm is lower than expected, these low levels may be limiting yields. In this case, a soil test would indicate a need for added fertilizer and the extra yield produced would be worth more than the cost of the added fertilizer.

Secondly, a soil test is useful to identify situations where fertilizer rates can be reduced. Fertilizer application in previous years may have built up the nutrient status of soils to medium or high levels.

No broadcast applications of nutrients other than nitrogen is required in some of these situations.

2. Set a realistic yield goal. A corn grower must set a realistic yield goal before a complete fertilizer program can be finalized. Guidelines for setting yield goals are:

—Don't aim for average yields—we go backward if we aim for the county or neighborhood average.

—Don't aim for the world record—record yields are above maximum economic yields.
—A high yield reported from your neighborhood may be a goal to shoot for.
—A realistic approach would be to take your average yield for the past five years and increase this by 15 to 20 percent. When calculating an average for five years, don't use low yields caused by hail, drought, or insect damage. The best way to get a profit is to aim for higher yields but make the goal realistic.

3. Use starter fertilizer. Phosphate and potash needs can be met by applying them as starter fertilizer. In this way rates can be cut substantially. In many cases, the rates can be cut in half. For example, if the results of a soil test call for a broadcast application of 80 lb. P_2O_5 (phosphate) per acre, this rate can be cut to 40 lb.P_2O_5 per acre if applied in a starter. If the cost of a pound of P_2O_5 is $.25, this amounts to a savings of $10 per acre. Expected yields will be the same. Other cost reductions can be achieved if K_2O (potash) and Zn (zinc) are applied in a starter. The revised fertilizer recommendations from the University of Minnesota give specific recommendations for starter fertilizer use. Ask for bulletin AG-BU-0519 at the county extension office.

Research trials at several locations have shown that fertilizer recommendations from some soil testing laboratories are higher than can be economically used by the crop. This information is available at county extension offices.

4. Don't forget the nitrogen credit for legumes. The large majority of corn produced in Minnesota is grown in rotation with a legume. The nitrogen credit for these legumes is important. Adjustments to the recommended nitrogen application rate due to legumes are included in the recommendations from the University of Minnesota. Making adjustments for the nitrogen may save from $6 to $12 per acre in nitrogen fertilizer expense.

5. Nutrients in manure are important. A large portion of the nutrients contained in manure is available to the corn crop. The nutrient content of manure can vary over a wide range. Therefore, it is a good management practice to get manure analyzed. The savings in fertilizer expense will more than pay for the cost of the analysis. There are several reliable testing laboratories that will provide an accurate analysis of manure.

6. "Build-up"nutrient levels not necessary. It is not necessary to "build up" the nutrient levels of soils. While it is not desirable to have very low levels of phosphorus, potassium, and zinc. It is not necessary to have high soil test levels for these nutrients to achieve maximum economic yields. Remember that soil test levels will increase slowly if the recommended rates of fertilizer are applied each year. The rates needed to produce these optimum yields have been determined from the results of several research trials conducted over a number of years.

7. Calculate costs of nutrients. Usually, there is more than one fertilizer product that can be used to supply the nutrients needed for growing a corn crop. In general, the prices of these various sources are not the same. The cost of nitrogen, for example, currently varies from $.15 per pound of N to $.24 per pound of N. If all sources are equally effective, then the cost of a pound of nitrogen can have a major impact on the choice of the source to use. There is also a wide variety in the price for zinc and other micronutrients. So take time to calculate the price of individual nutrients when planning a fertilizer program for 1986. Contact your fertilizer dealer or your County Extension Office if you have questions about these calculations. In calculating fertilizer costs, don't forget to include the cost of application.

Fertilizer materials are normally sold by the ton. There are, however, some products that are sold by the gallon. For these products, convert the price per gallon to a price per ton basis so costs can be compared. For example, if a liquid fertilizer weighs about 10 pounds per gallon, there would be 200 gallons in a ton. At $3 per gallon, the price for the liquid fertilizer is $600 per ton.

Some fertilizers with a high price tag per ton or gallon are sold with advertising claims that they are more efficient or more effective than other fertilzer materials. Research has clearly shown that there is no difference in the efficiency or effectiveness of fertilizers sold today. The chemistry of the soil determines the effectiveness of any fertilizer applied.

8. Don't look for miracles. Each year, corn growers are confronted with "sales pitches" for various products that, if used, will produce "miracle" yields at low cost. These products are usually sold by someone who travels from farm to farm and are usually described as being so new that others have not heard about them. The price is usually high. The person selling these products is usually new to the community and will disappear soon after the sale is made.

Be careful! Don't get fast-talked into a sale. Several of these products have been evaluated in research trials and have shown no beneficial effect on crop production. If you're not sure of a product, don't buy before you ask questions. If a product is useful for corn production, there will be ample chance to buy. If the product has no value, it was well worth the time taken to learn more about the product.

WEED CONTROL

Weed control in corn is essential to prevent corn yield losses. Weed pressure must be controlled at a level that not only prevents yield losses but also stops significant weed seed production—the source of weed problems in the future. Minnesota farmers spend an average of $25 per acre on corn herbicide treatments and cultivation to control weeds. There are numerous alternatives for weed control. The wise selection of effective, economical alternatives can result in substantial savings in weed control costs. A number of factors must be considered:

1. Weed species identification. The "best" herbicide(s) for a specific field cannot be selected unless the major weed species are known. Records of weed infestations in a specific field in past years are now a must in herbicide selection. Once the weed species are known, the herbicides of choice can be readily determined from the publication "Weed Control in Corn" (AG-FO-0892) or by means of the WEEDIR computer program of weed control recommendations. Both are available through Minnesota county agriculture agents. The WEEDIR program will also aid in the mapping of weed infestations in specific fields and in calculating the cost per acre of recommended herbicide treatments. The best treatment at the lowest cost can be selected in this manner.

2. Herbicide cost cutting. Cutting herbicide costs should not be accomplished by reducing the application rate below the labeled rate. This approach results in poor weed control and costly yield losses.

Band applications to corn can reduce the cost of herbicides by one-half to two-thirds, depending on the band width used. Additional timely cultivation is necessary to control the weeds between the rows. For example, assuming an average cost of $18 per acre for herbicides used on corn in Minnesota, the herbicide cost saving could be from $9 to $12 per acre. This would be partially offset by an additional cultivation at an approximate cost of $4.50 per acre—giving a saving of $4.50 to $7.50 per acre.

Combined purchases with neighbors of larger quantities of herbicides may result in significant savings, especially if bulk tank purchases are possible. Dealer prices frequently vary and soliciting bids for your herbicide needs from several distributors may result in lower herbicide costs. A number of herbicides are available in several formulations. A review of 1985 prices for commonly used herbicides revealed a $7 per acre savings, by selecting the lowest cost formulation. Also, if a herbicide mixture is selected, a price comparison should be made between herbicide costs if a formulated mixture is available versus costs of the same rates of individual herbicides in a tank mix. Furthermore, sometimes the ratio of the herbicides in a formulated mix differ from the ratio recommended for a certain soil type. Herbicide cost savings may be possible by using the recommended herbicide ratio for the specific soil type.

The calibration of sprayer output per acre and also for nozzle uniformity is an important means of assuring that the proper rate of herbicide is applied. Sprayer error resulting in underapplication results in poorer weed control and costly yield losses. Sprayer error resulting in overapplication may result in crop injury and increased per acre herbicide costs.

3. Tillage and cultivation. Tillage and cultivation are alternatives to herbicides that should not be ignored as possible means of cutting weed control costs. The example of band application described above, replacing between-the-row herbicide treatment with cultivation was an excellent example of this possibility. Fall tillage of perennial weeds can be as effective as more expensive herbicide treatments in reducing weed vigor next spring by preventing fall build-up of food reserves in the underground storage organs. For example, a disking or field cultivation at $5 per acre could replace a glyphosate (Roundup) or dicamba (Banvel) treatment at $20 per acre. For annual weed control, the rotary hoe used at the proper time will control small, emerging, annual weeds at a cost of $3 per acre per time over the field as effectively as widely used, $20 per acre, herbicide mixtures.

CORN DISEASES

Corn diseases are present to some extent in Minnesota corn field every year. The most widespread disease problem is stalk rot. Seedling blights, leaf spots, ear and storage rots may be more severe in some areas but are usually only local problems.

Stalk rots are caused by several fungi and bacteria. When stalks are attacked early in the growing season, ears are poorly filled with lightweight kernels. Stalk rot developing later causes stalk breakage and/or lodging. Stalk rot damage is greatest when plants are stressed during the grain filling stage.

Hybrid selection for stalk rot resistance is a low cost method of disease control. Stalk rot potential is greater in short-season hybrids if they are left in the field to allow harvesting at low moisture levels. Avoid populations above the optimum population since high populations cause plants to have weaker stalks. These plants, if attacked by stalk rot, have less strength and lodge easier than a stand at the recommended population. Proper fertilization based on a soil test produces corn with maximum stalk strength.

Leaf diseases such as Eyespot, Northern and Southern Corn Leaf Blight, Anthracnose and Gray Leaf Spot may be present and reduce yields. Scout fields to determine when these diseases are present. Control of these leaf diseases is obtained by selecting resistant hybrids and crop rotation.

Prompt harvest when the crop is mature prevents losses from lodging. Don't delay harvest of shorter season hybrids—harvest these first. Always scout fields showing early ripening corn for stalk rot and if present harvest these first. Use proper grain storage methods to reduce losses to storage decay fungi. Little expense is incurred to prepare grain for proper storage when compared with storage loss figures.

CORN INSECTS

Economically-sound management of insect pests involves 1) knowing which insects pose a serious economic threat, 2) recognizing high risk situations, and 3) using sound, cost-effective management practices.

Know Your Key Pests

"Key" pests frequently cause economic damage and pose a serious economic threat. Thus, key pests should be routinely considered in farm management decisions. Key pests on corn include cutworms, corn rootworms, and European corn borer. Every corn producer should know the life cycles of these pests, their identification, the damage they cause, how to scout for these pests, and how to make sound economical decisions about their control. Information on these pests and their control can be found in "Controlling Corn Rootworms" (AG-FS-1101), "Controlling Cutworms" (AG-FS-1032), and "European Corn Borer Control in Field Corn" (AG-FS-1025), available at County Extension Offices.

Corn rootworm. Problems are generally associated with continuous corn production. The odds of significant corn rootworm damage increase with the number of years in corn, e.g. <1 percent during year 1, 40-50 percent during year 2, 75-80 percent during year 3, 90-95 percent after year 3. Because the risk is generally high, use a soil insecticide on all continuous corn. If you want to reduce insecticide cost, base your treatment decisions on adult beetle counts in August. The best return for scouting efforts will occur during the second year in corn.

Cutworms. A wide variety of both overwintering and migrating cutworms cause stand losses. Problems are sporadic and difficult to predict. Labelled soil insecticides only suppress populations. Therefore, rescue treatments are preferred over the routine use of soil insecticides. Proper identification is crucial because control of subterranean cutworms, such as the glassy cutworm, is marginal and the control of climbing cutworms, which tend to leaf feed rather than cut plants, is less likely to be cost-effective. The migrating black cutworm poses the greatest threat because of its cutting ability. High risk situations for the black cutworms occur in reduced tillage situations where weed growth and soybean residue trigger oviposition. Scouting is highly recommended and decisions should be based on cut plants, not leaf feeding.

European corn borer. Populations fluctuate widely among fields and years. This fluctuation and the continual potential for yield losses make scouting individual fields an absolute necessity. Efforts should be directed at scouting for the first generation in taller, earlier-planted corn fields since these will attract heavier infestations. Granular insecticides generally provide the best control. Cost-effective control of second generation is more difficult because of reduced insecticide effectiveness, increased scouting requirements, and increased timing sensitivity. Therefore, concentrate efforts more on first generation control.

Follow Sound Management Practices

Scout your fields. Profitable insect management decisions require knowing what's happening in your fields. Each field is different so timely scouting of each field is crucial. If you lack scouting skills or time to scout, hire the service.

Use economic thresholds. Insecticides don't increase yields,they preserve the yield potential already set by your inputs of variety, fertility, tillage, planting date, etc. Poor decisions on insect management, such as unnecessary insecticide use or tolerating excessive insect damage, can rob you of any profit. Economic thresholds represent the break even point when yield benefits from treatment equal insecticide cost. Therefore, before using an insecticide, make sure that insect abundance or damage exceeds the economic threshold.

Select insecticides carefully. Insecticides vary in effectiveness, consistency of performance, and cost. Select a labelled insecticide that will give the best performance for the cost.

Apply insecticides correctly. Learn to handle insecticides safely by becoming certified. Proper calibration of application equipment will prevent performance problems caused by underapplication and unnecessary costs from overapplication.

DRYING AND STORAGE

The cost of drying and storing the corn crop affects profitabilty and is a part of the operation where significant improvements may be possible. Increased dryer capacity, reduction in fuel costs, improved grain quality and better storability may be realized through changes in drying and storage management practices.

Several cost penalties can result from overdrying. In addition to the increased fuel costs and reduction in dryer capacity there

is an extra shrink cost when the corn is sold. Also, overdrying will increase the susceptibility of the kernels to physical damage resulting in increased broken kernels and fine material during subsequent handling. A reduction in storability is the net result.

The use of improved drying metods such as dryeration, in-storage cooling and combination high-speed natural air drying should be considered. Those alternatives have the potential for increasing dryer capacity and improving grain quality in addition to reducing operating costs. It may be possible to incorporate one or more of these alternatives into the drying operation without a major investment cost. They are explained in a series of University of Minnesota Extension publications (AG-FO-1323, 1324, 1325, 1327; AG-BU-1326, 1328) on grain drying and storage available at all county extension offices.

Good storage management is essential to prevent spoilage which is caused by mold growth and insect activity. A properly managed aeration system greatly improves the "storability" of grain by maintaining a cool, uniform temperature throughout the storage to reduce mold growth and insect activity and to prevent moisture migration. Proper aeration management is discussed in AG-FO-1327, "Management of Stored Grain With Aeration." Stored grain must be checked on a regular basis to made sure it is maintained in good condition.

MARKETING THE CROP

Two-thirds of the corn crop is sold at a price below the seasonal average. Opportunities exist every year to improve the gross margin by improving the price through careful marketing. Every producer should have a marketing plan. A schedule of how much to price and when, plus a set of decision rules concerning how much to deliver depending on the basis, constitutes a marketing plan. That plan should be sketched out before the decision is made to plant the crop. The plan should be based on projected supply and demand fundamentals, seasonal average and seasonal price pattern. Make a distinct separation between the decisions about when and how to price and the decisions about when , where, and how to deliver the crop.

The plan needs to recognize storage interest and other holding costs. It needs to recognize the economic impact of risk exposure when one is not priced. As the growing and harvest season progresses, new market data becomes available concerning supply-demand fundamentals and current market behavior (technicals). The plan needs adjustment accordingly. Regardless of the pricing option chosen, basis change needs to be monitored. A narrow basis encourages delivery. A wide basis assures returns to storage.

When your crop is not priced, you are speculating. When your crop is priced, you are hedging. Most producers have a combination of some crop in the hedged position and some in the speculative position that is good risk management consistent with a desire to improve their gross margin while still surviving as a business. The alternatives of how to price and when to price are many. They include cash market, forward contract, futures market transactions and the options market.

Maintenance of the quality of the crop kept in storage is also part of marketing management. Discounts to price due to crop deterioration are costly.

Build a Gross Margin Budget

A gross margin per acre and crop budget that expresses the amount and timing of the production and marketing process has several uses. It assists in projecting and controlling farm activity and cash flow. It details what materials to use, how much and when. When compared with actual experience, it helps one to plan for next year. The budget provides data for managing your farm financial future as a farm business.

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