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November-December 1960 — Volume 15, Nos. 5-6

The rural church on this month's cover seems appropriate for a combined November-December issue since both the Thanksgiving and Christmas holidays occur in the two months. Rod Fox, professor of technical journalism at Iowa State, took this photo of the Mackey Methodist Church in central Iowa.

in this issue

December Iowa Farm Science Reprints
(available about mid-month)

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chat with the editors

A series of articles scheduled for several future issues of Iowa Farm Science will be of particular interest to farm owners. But the information will be useful to others also.

The series is about estate settlements -- the methods and procedures available, the kinds of costs and taxes involved, etc. Two of the articles point up the differences in settling an estate when there is and when there is not a will or some other advance plan for transferring property.

Authors of the series are John F. Timmons and John C. O'Byrne. John Timmons is professor of agricultural economics here at Iowa State. John O'Byrne is professor of law and director of the Agricultural Law Center at the State University of Iowa, Iowa City.

The articles are based on state and federal laws and on the results of farm property transfer studies conducted cooperatively by the Agricultural and Home Economics Experiment Station and the Agricultural Law Center.

* * *

You'll note, incidentally, from the cover of this issue that this is the November-December issue of Iowa Farm Science. You didn't receive a separate November issue as such. An unusual set of circumstances combined to make this 2-month issue necessary.

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HAY CONDITIONERS?

Tests here at Iowa State and elsewhere show that, with proper management, hay conditioning can result in better-quality hay and decrease exposure risks. In good weather, conditioning can cut curing time almost in half.

by T. W. Casselman and Robert C. Fincham

HAY CONDITIONERS can result in better-quality hay and decrease the exposure risk for your crop — if used with certain common-sense management rules concerning your timing of mowing and conditioning. Tests at Iowa State show that, during good weather, conditioning can cut the curing time for hay almost in half.

It's a common farm experience to cut high-quality alfalfa for hay and then, because of weather damage, end up gathering and storing low-quality hay — with only a portion of the original dry matter and nutrients. One of the main reasons is that the periods of good drying weather during the haying season in Iowa are often shorter than the time needed for field drying.

At the same time, the leaves of common legumes cut for hay dry faster than the stems. If you leave your hay in the field long enough for the moisture content of the stems to be low enough for baling, you find the leaves dried to the point where shattering losses are serious. This has frequently prompted the idea-wish to find some way to hasten the drying of the stems or to slow down the drying of the leaves.

Actually, the common practice of raking hay into windrows at a moisture content of 40-50 percent is an attempt to do just that. The mass of stems and leaves does tend to dry more uniformly than if left in the swath, but windrowing also lengthens the over-all drying time. Windrowing does reduce bleaching, a factor that can downgrade hay quality. But, basically, windrowing does nothing to shorten the total time necessary for field curing.

It wasn't until hay conditioners came along that shortening of field-drying time became a practical possibility. These conditioners all perform the same basic operation. They crush, crimp or lacerate the stems so that more stem area is exposed to permit a more rapid release of moisture.

Types of Machines . . .

Many different makes have appeared on the market since hay conditioners were first introduced. But they can all be placed within three general classes: the corrugated roller, the smooth roller and the flail-type forage harvester as adapted for conditioning.

The corrugated roller machine (see photo 1), commonly called a crimper, consists of two cast-iron rolls with tapered flutes that mesh much like gear teeth. Hay in the swath is picked up by the lower roll, and the stems, on passing through the rolls, are cracked at uniform intervals.

The smooth roller machine operates in much the same fashion except that the stems are crushed along their entire length rather than at intervals. The rolls of some of these machines are smooth steel; others are rubber or rubber covered.

The flail-type harvester has a 5-foot rotating shaft parallel to the ground. A series of L-shaped swinging hammers or knives are attached to this shaft which rotates opposite to the direction of travel of the machine. When the machine is used as a hay conditioner rather than a harvester as such, its shear bar is removed to reduce the cutting action. The idea is to mutilate and shred stemmy material as much as possible without chopping it into short pieces.

If the material is cut too short, it won't remain fluffy. For this reason, the forward speed of the machine is increased beyond that for conventional forage harvesting, but the rotor speed is reduced. A suggested rule of thumb is to adjust and increase forward speed and to decrease rotor speed until the machine is operating at a point just short of plugging. With rough field conditions, of course, high forward speeds can't be used, so a compromise is necessary.

When used as a conditioner, a panel in back of the flail-type machine is opened allowing the green hay to fall back on the ground in a swath. A downspout attachment can be used to convey the

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conditioned hay back to the ground in a fluffy windrow (see photo 2). By swinging the downspout to the side on following rounds, as many as three 5-foot swaths can be put into the same windrow. One advantage of this method is that cutting and raking are performed as one operation. Off hand it might seem that hay conditioned and windrowed in this manner would call for a longer curing time than conventional methods. But this isn't necessarily so.

Our Tests . . .

We conducted a series of hay-drying and conditioning experiments on first-, second- and third-cutting alfalfa in 1959. The purpose: to determine the relative merits of hay conditioning as compared with the conventional mow-rake-bale method of harvesting hay. We compared harvesting and conditioning with a crimper and flail-type machine with conventional harvesting. A smooth-roll crusher wasn't included in our trials. Tests in other states, however, indicate that the drying rates of crimped and crushed hay are quite similar, with a slight advantage in favor of the smooth-roll machine.

Best results with crushing in the past were obtained when hay was conditioned immediately after mowing. We followed this practice in our tests. An efficient way to do this is to attach the crusher behind the mower so that hay in the previous swath is conditioned while the next swath is mowed. Doubling up like this saves an extra trip around the field with the crusher.

The flail-type machine used had a downspout for placing the conditioned hay in a windrow. We tried both two- and three-swath windrows, but, as far as we could tell from these tests, one size didn't cure any faster than the other. Alfalfa used in the experiments was about an average stand; with an extra-heavy growth, a two-swath windrow might cure faster than a three-swath windrow.

Both the conventional and crushed treatments were raked at about a 40-percent moisture content. The flail-conditioned material was given a half turn with a single-wheel rake at about a 55-percent moisture content as recommended by the manufacturer. This exposes the bottom side of the windrow and helps speed up the rate of drying. Careful use of a side-delivery rake would do the same job of turning as the single-wheel rake.

To follow the rate of drying, we took samples at intervals from the swaths and windrows of the variously treated hay, placed the samples on screen trays and weighed them. We took additional samples each time an operation such as raking or turning was performed to find the effect of each operation.

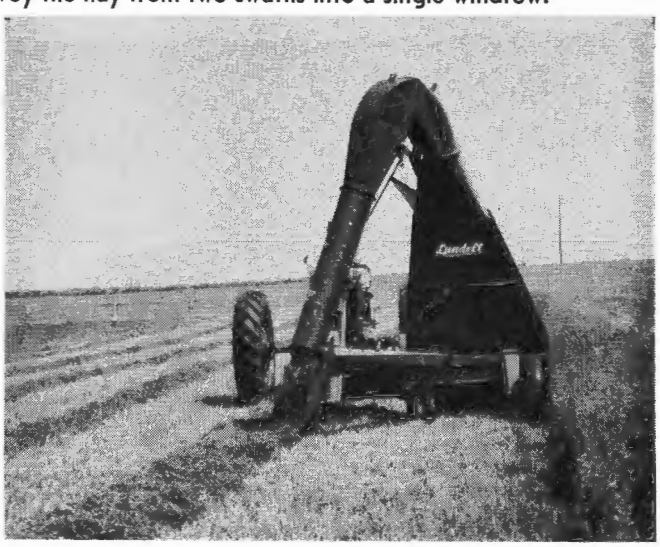
Our Results . . .

The graph shows the drying patterns for *second-cutting* alfalfa for each of the three treatments studied. Also shown is the variation in relative humidity during the period which indicates that the period wasn't ideal hay-drying weather. The results, nonetheless, furnish a comparison of the relative rates of drying for each of the three methods.

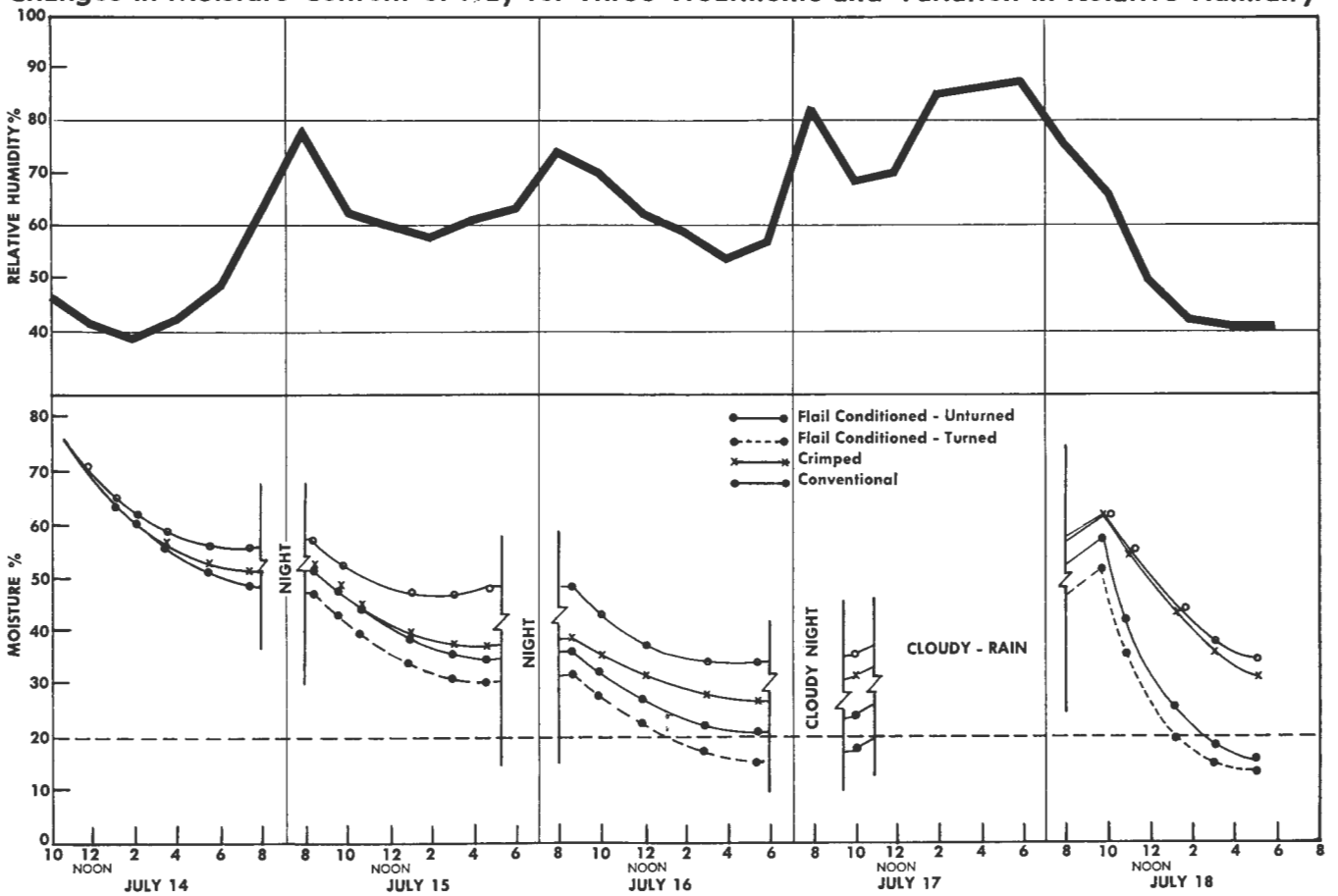
Notice that conventionally processed hay had the highest moisture content throughout the tests. This was also true for our tests with first and third cuttings. There wasn't much difference between the crimped hay in the swath and the flail-conditioned material in the windrow until the flailed material was turned to expose the underside of the windrow. At this point the flailed material dried more rapidly and continued to do so until the time of baling.

In this test, the turned flail-conditioned hay could have been baled at about noon of the third day; the unturned flailed hay, about 5 hours later. The crimped hay, when raked, begins to fall behind the flailed hay in rate of drying because of slower curing in the windrow. The unturned flailed hay, even though in windrows, tended to dry more rapidly than the crimped hay because of the flail's more severe bruising and the fluffier condition of the wind-

PHOTO 1 (left): A corrugated roller-crimper used in these tests. This machine cracks the stems at uniform intervals. PHOTO 2 (right): A flail-type forage harvester adapted for conditioning hay. The movable downspout can be used as shown to convey the hay from two swaths into a single windrow.



Changes in Moisture Content of Hay for Three Treatments and Variation in Relative Humidity



row which allowed some air movement.

Effects of rain: It did rain and remained overcast for one whole day and night during these tests. This, however, led to an interesting discovery concerning the three hay treatments.

When we reweighed samples after the rain, we found that the flailed hay hadn't gained as much water as the crimped or conventionally treated hay. This might have been chance, so we simulated a rainfall on another batch of hay with the same treatments with the same kind of results. The flailed material absorbed less moisture per pound of dry matter than either of the other two treatments. Table 1 summarizes the results for both the natural and artificial rainfall. Statistical analysis confirmed that the differences weren't due to chance or sampling variation.

TABLE 1. Pounds of moisture absorbed per pound of dry matter of hay in the windrow for three treatments.

Treatment	after natural rain	after artificial rain
Flail-cut	0.86	0.62
Crimped	1.15	1.16
Conventional	1.08	1.08

We aren't sure *why* the flailed material absorbed less moisture but it may be that the haphazard manner in which the flail-cut material is laid onto the windrow tends to shed rain more effectively than windrows of material treated by either of the other methods. Observation indicates that the flail-cut windrow may perhaps be likened to a thatched roof — where grasses are laid on the roof pointing down. If the grass stems are laid on the roof parallel to the ridge, however, the roof leaks. A similar situation exists in conventional hay windrows since the rake's action tends to align the stems in the direction of the windrow, with a greater tendency for the "roof" to leak.

After the rain, *all* windrows were given half a turn as soon as the tops were dry. Once again, the flailed material dried more rapidly. This turning is important for any rained-on hay. But we found it especially important for the flailed material. Even a moderately heavy shower will compact the originally fluffy windrow formed by the flailed material and reduce the circulation of air. This results in a wet, soggy mass subject to rapid spoilage. But turning the windrow with a single-wheel rake or carefully with a side-delivery rake tends to refluff the hay and turns up the wet underside for drying.

Other tests: Our trials with first and third cuttings gave similar over-all results. The crimped and flailed material dried at about the same rate. Sometimes the crimped material dried more rapidly until the flailed material was turned.

In our tests with the third cutting, for example, we mowed and conditioned at 8 a.m. By 4 p.m. the crimped hay had a moisture content of 44 percent; the flail cut, 52 percent. The flailed material was turned at this time and dropped to a 43-percent moisture

content by 7:30 p.m.; the moisture content of the unturned flailed hay and the crimped was 46 and 40 percent, respectively, at this time. The following morning, the moisture percentages were 41 percent for the turned flailed material, 46 percent for the unturned flailed hay and 49 percent for the crimped — indicating that the turned flail-cut hay had dried some during the night.

The drying weather was good for the third-cutting tests. The flailed material was baled at 2 p.m. of the second day. The crimped material wasn't ready until 24 hours later. The conventionally treated hay wasn't ready for bailing until about noon of the fourth day following cutting. The moisture variations over time for the three treatments for third-cutting alfalfa are summarized in table 2. The third cutting was light, and, in this case, turning the flailed material didn't have as great an effect on increasing the drying rate as expected.

Reduces Risks . . .

From these tests, we can conclude that hay conditioning, if the harvesting procedure is properly managed, can reduce harvesting risks by eliminating one or more nights of exposure. Previous testing with conditioners has shown that—if the crop is cut after the heavy dew is gone, if the windrows aren't too heavy and if drying weather is good—conditioned hay can be baled the evening of the same day, thus avoiding any night-time exposure. But cutting later than 10-11 a.m. doesn't allow enough time for even conditioned hay to dry enough to be baled by evening. Then the hay must be exposed during the night and baled the following day.

Handling . . .

Other states with similar weather patterns to Iowa's during the hay-drying season have reported getting the best cured hay when an operator cuts about as much green hay as he can safely handle in one day. Cutting the entire field at one time, on the other hand, increases the weather hazard.

The advantages of limited cuttings are obvious. (1) The operator has more control over the quality of his hay. The hay generally tends to be of more uniform quality since the time taken to cut each day's batch is short. In a large field cut all at once, the last hay baled often is much too dry, even though baling is started when the moisture content is just right. (2) If the mowed hay does get rained on, with limited cuttings, there's much less loss than if the entire field is mowed at one time.

A disadvantage is that the hay harvest can be extended beyond the time that the standing crop is at optimum maturity for highest-quality hay. Harvesting with limited cuttings, of course, isn't as efficient in terms of field operations as mowing the entire field at once. You must decide whether you want high-quality hay with some loss in operating efficiency or higher efficiency with a possible loss in hay quality.

One other point is important if you use a flail harvester as a hay conditioner. Especially if you place the hay directly into the windrow, take care that the tractor wheels don't run over any part of the windrow to cause packing. We found that, when this happens, only the uppermost layer of hay dries, while that below remains quite wet. Even turning the hay a half turn doesn't refluff the hay to its original state of looseness. When combining two or three swaths to make one windrow, it's necessary to straddle the windrow already made. To do this properly, we found that we had to spread the tractor wheels as far as possible.

Highlights . . .

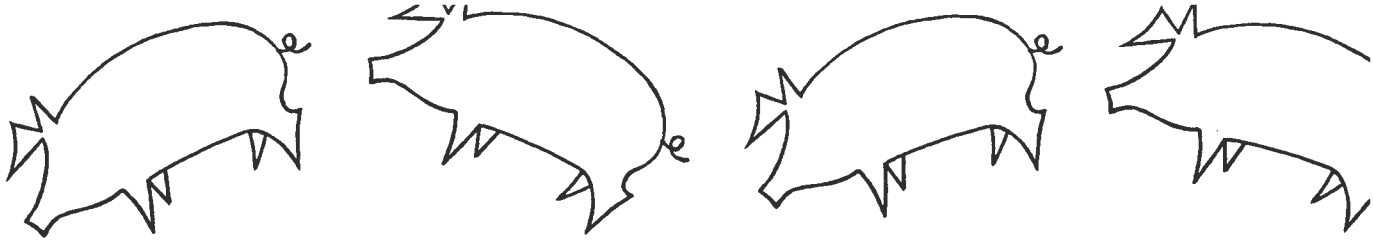
Our tests here at Iowa State and results elsewhere show that hay conditioners can give you better quality hay and decrease exposure risks if you follow the suggestions outlined about the time of mowing and conditioning. During good weather, conditioning can cut curing time almost in half. We've had reports from farm users stating that they've successfully made "hay in a day" under good drying conditions. But to do this, it's necessary to cut the material early in the morning to take advantage of full drying benefits.

If you're considering "hay in a day" harvesting, we'd suggest cutting only as much hay at one time as you can mow, turn or rake, bale and haul away in 1 day. But if, despite your best plans, the hay does get rained on, you've only a portion of your hay ruined.

The people with whom we've talked in conjunction with our tests and who are using hay conditioners are convinced that they pay for themselves in quality hay. With proper management, a hay conditioner can be a profitable investment.

TABLE 2. Variation of moisture content of hay for three treatments.

Date and time	Treatment and moisture percentages			
	Flail cut		Crimped	Conventional
	Unturned	Turned		
Aug. 19				
8:45	78%	—	78%	78%
12:45	66	—	62	68
2:45	58	—	51	60
4:45	48	48%	42	53
6:45	46	44	39	50
Aug. 20				
8:45	43	40	42 (Raked)	54 (Raked)
10:45	34	30	38	48
1:00	23	20 (Baled)	33	43
5:00	Baled at 2 p.m.	—	27	38
Aug. 21				
8:00	—	—	33	45
12:00	—	—	26	33
2:00	—	—	20 (Baled)	30
4:00	—	—	—	28 (Baled) Aug. 22



States Share in Creating Hog Cycle

by Raymond R. Beneke, Donald R. Kaldor and James Herendeen

HOG PRICES bounce up and down like a well-oiled roller coaster. Just in the last 2 or 3 years: Hog prices on interior Iowa markets dropped from $18 in November 1958 to $12.25 in the same month of 1959. July prices — the month of the typical seasonal price peak — dropped from $23 in 1958 to $14 in 1959. But they rebounded to $17.85 in July 1960.

These sharp ups and downs are clearly related to shifts in hog supplies. Spring farrowings, for example, jumped from 7.4 million sows in 1958 to near 8.3 million in 1959. The 1960 comeback in hog prices followed a 15-percent cutback in spring farrowings from 1959.

Not a New Pattern: This roller-coaster pattern in hog numbers and prices isn't new. Sow farrowings have been fluctuating cyclically with the hog-corn price ratio for many years. Nobody seems to like the hog cycle—except a relatively few producers who, by plan or accident, operate counter-cyclically or against the cycle. In terms of income, however, producers as a group, processors and consumers would be better off without the cycle. Yet it persists.

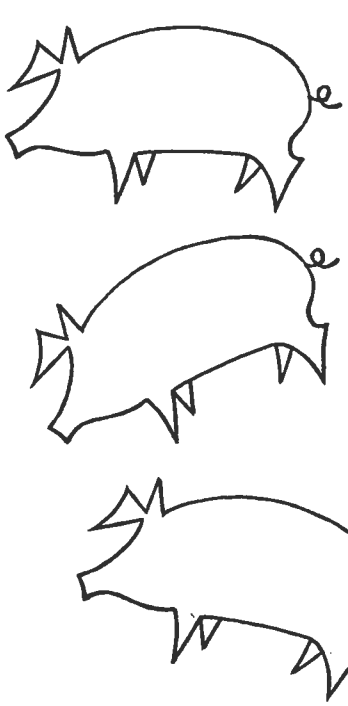
To gain a better understanding of the hog-price cycle, we've analyzed statistics on hog production to try and find if there's any geographic source or basis for the ups and downs in farrowings. In this article, we want to report what we found on a national or regional basis about the pattern in sow farrowings. Later on, we'll look more specifically at the pattern within the state as well as the factors we found associated with shifts in farrowings on 100 selected Iowa farms.

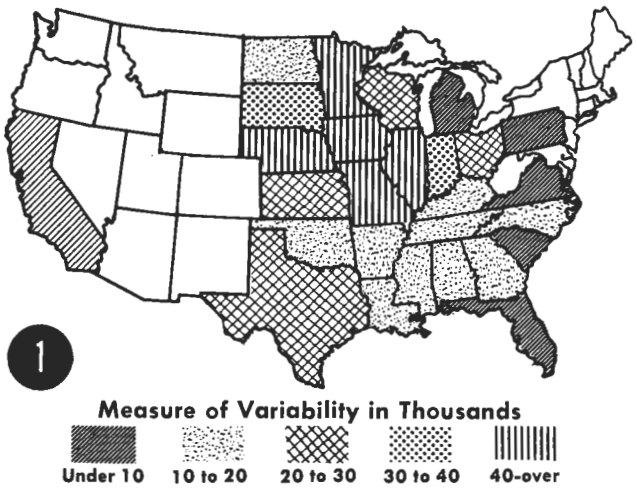
RAYMOND R. BENEKE and DONALD R. KALDOR are professors of agricultural economics, and JAMES HERENDEEN formerly was a graduate student in agricultural economics.

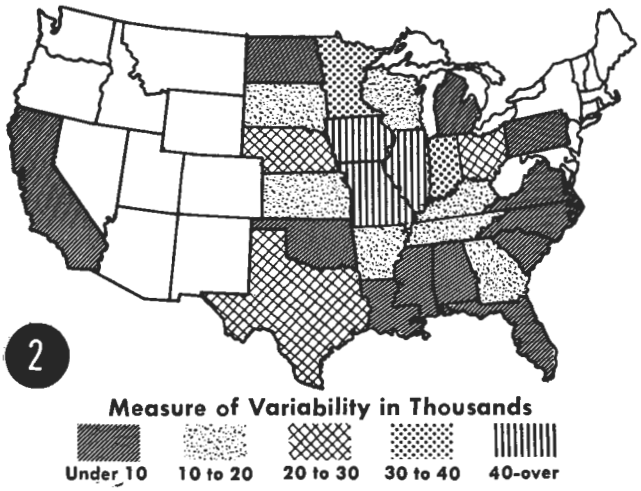
We studied hog production figures from 1948 through 1958—an 11-year period coinciding with two complete hog cycles. We omitted the 21 least important hog states from our study. Each of these accounted for less than ½ percent of total national farrowings and all 21 for only about 3 percent of the total. The USDA farrowing reports round to the nearest 1,000, and this results in wide percentage variations for states where only a few thousand sows are farrowed. So including these states would have distorted the pattern of relative variation.

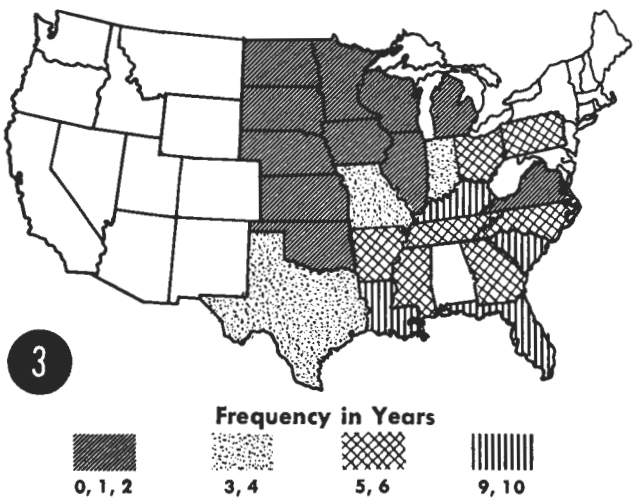
To measure the amount of absolute variation in hog production in each state, we found out how much hog production changed each year, whether up or down, for each state. We divided the total of these differences by 10 (for 10 year-to-year shifts over the 11-year period) to find the average variation from year to year. We computed this variation yardstick for each of the 27 states and also for the total. We worked separately with spring and fall crops. Following the reporting pattern of the USDA reports, the spring crop included December-June farrowings, and the fall crop included July-November farrowings.

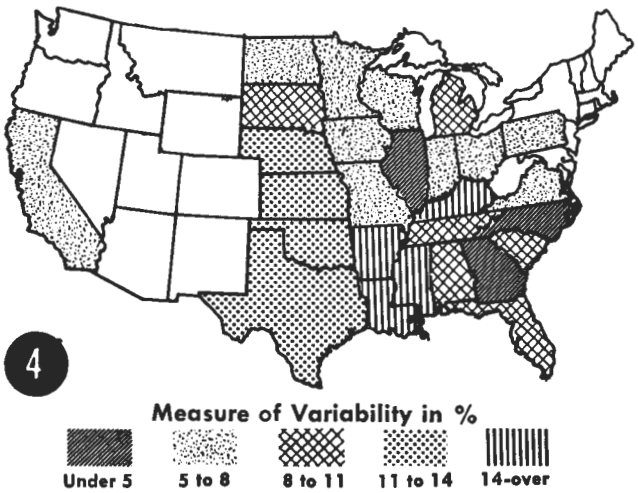
Main Hog States: Generally we found that the states producing the most hogs have the most year-to-year variation in sow farrowings. This is because they raise the most hogs; even a small percentage variation in farrowings











MAP 1. Variation in numbers of SPRING sows farrowed.

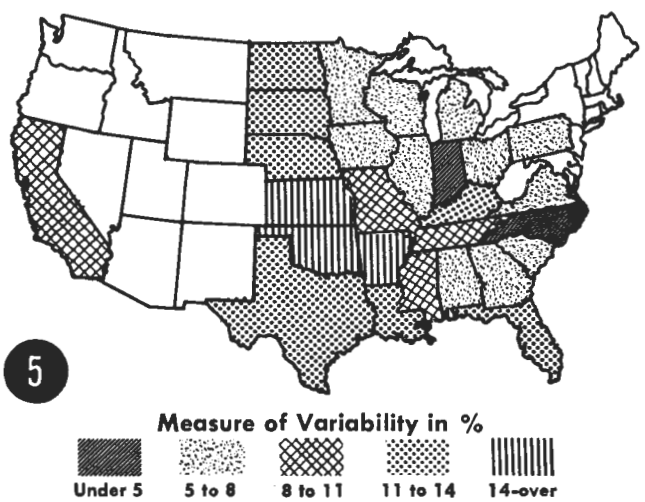
MAP 2. Variation in numbers of FALL sows farrowed.

MAP 3. Number of times spring and fall farrowings were counter-cyclical.

MAP 4. Percentage variation in SPRING sows farrowed.

MAP 5. Percentage variation in FALL sows farrowed.

All maps for the 27 main hog-raising states, 1948-58.



results in a large change in total numbers. Thus, the important Corn Belt states — Iowa, Illinois, Nebraska and Minnesota — showed the most variation. By computing the percent which each state's year-to-year difference is of the total year-to-year difference for all states, we get a rough measure of the relative part of each state in the national variation in hog production.

Iowa, of course, leads the parade in sows farrowed—nearly 23 percent of the total over the 11 years. But Iowa also leads the parade in the amount of variation contributed to the total, about 22 percent of it. Though there are some exceptions, the states that contributed most heavily to the

variation in spring farrowings also had the greatest fluctuations in fall farrowings.

We analyzed a number of factors other than the sheer volume of hogs produced to see if they were related to the variations in hog production. We found, for example, little relationship not accounted for by other factors between the variation in sow farrowings and the variation in numbers of beef and dairy cattle. The volume of feed-grain production — and particularly the stability of feed-grain production — on the other hand, does seem to influence stability of hog production.

States with heavy feed-grain production showed more variability (other things being equal) in hog production than states with a lesser production of feed grains. And states with greater variation in feed production had more variation in hog production than states with a more stable feed production.

Counter Forces: The amount of year-to-year variation in the different states doesn't tell the whole story. One state or region, for instance, could have a great variation in farrowings and yet contribute little to the troublesome ups and downs in the total national hog supply. That is, a state or region could have a pattern of decreasing hog production in periods of generally increasing supplies and vice versa. These would be counter-cyclical adjustments. Whenever this happened, it would tend to dampen both the national production and national price cycles.

To check on this, we found the directions in which total sow farrowings shifted in each of the 27 states for spring and fall farrowings over the 11-year period. Each state had 10 opportunities to change spring farrowings and 10 opportunities to change fall farrowings for a total of 20 chances to shift with or against the national trend.

We found no evidence of any real counter-cyclical movements in the major hog-producing states. Only the southern states, where few hogs are produced, showed any counter-cyclical tendencies. Florida, Louisiana and South Carolina appeared to move in a different direction from the rest of the nation 50 percent of the time. Close examination of these shifts, however, shows that they're chiefly a lag in the way these states change their pattern in relation to other areas. These states continued to increase their farrowings for a few months after others had started to cut back. And, at the other end, they continued to reduce farrowings after other states had shifted to heavier farrowings.

Who Adds Most? We indicated earlier that the states studied contribute to the total year-to-year ups and downs in *total* hog production roughly in proportion to the numbers of hogs produced. But do some states contribute *more than their share* of the variation considering the volume of hogs they produce?

To answer this question, we found the average percentages by which hog production in different areas varied from the national trend over the 11-year period.

We found that the states with the greatest percentage variations tended to be among the Great Plains and South-Central states. Of the 20 states included in this part of the analysis, Iowa ranked thirteenth in percentage variation in spring farrowings and fifteenth in fall farrowings; only seven and five states, respectively, had more stable patterns percentagewise.

Generally the states with the highest percentage variations produced relatively small numbers of hogs. So, while the less important hog-producing states show greater relative instability, they don't contribute greatly to the variation in national hog production. Five states of the 27, for example, with the greatest percentage variation in their spring pig crop (Texas, Kansas, Mississippi, Louisiana and Arkansas) farrowed only 6½ percent of the total number of spring sows and accounted for only 11½ percent of the total instability over the 11 years.

Nebraska, however, showed up as an exception. It's a heavy hog-producing state and also ranks highest of all states in the percentage variability in both spring and fall farrowings. It farrowed 5½ percent of the spring litters during the 11 years but accounted for 9⅓ percent of the total variation in spring farrowings. Its fall farrowings accounted for 3⅓ percent of the total crop while contributing 6 percent of the variation.

Summing Up: The results of our studies indicate that all sections of the country contribute to the ups and downs in total hog production. There's a high degree of uniformity in the production cycle in all states. Producers all tend to expand and contract farrowings together. Most of the variation is *not* caused by marginal areas moving in and out of production. It's the areas of heaviest hog production that add most to the total variation in production — even though their percentage fluctuation is somewhat lower.

Hog producers all across the country seem to be caught in the same "cobweb"—basing their farrowing plans on present cost and price relationships. When immediate feed-hog ratios are favorable, they encourage expansion in production. The resulting larger supplies, because of the nature of the demand for pork, result, in turn, in a sharp drop in hog prices. This is followed by a general reduction in farrowings. Hog prices again rebound, and the stage is then set for the whole cycle to repeat itself.

It seems from this, that the best strategy for an individual producer would be to work against the tide — reducing his production when others are increasing and vice versa. But this is more difficult than it seems. The timing of the ups and downs vary enough from one cycle to another to make any counter-cyclical planning uncertain. And a successful counter operation by a sufficient number of producers would tend to eliminate the production and price cycles, making their counter operations less profitable.

In a following article, we'll report on a study of how individual hog producers in Iowa respond to the cycle. Some of them apparently have been successful in outguessing the cycle a high percentage of the time.

Why Do We Let Our Soil Erode?

by Melvin G. Blase and John F. Timmons

MUCH OF IOWA'S heritage —the soil—is still eroding away through gullies and sheet erosion. Despite public programs to reduce soil erosion and widespread knowledge of erosion-control practices, progress toward control still is slow. Why? Why aren't more farm operators doing a better job of erosion control?

MELVIN G. BLASE is agricultural economist, Farm Economics Research Division, ARS, USDA, currently on military leave. JOHN F. TIMMONS is professor of agricultural economics at Iowa State. Opinions expressed are those of the authors and do not necessarily represent those of the Farm Economics Research Division, ARS or the USDA.

For the past 10 years we've been studying this problem, along with possible solutions, on the rolling erosive soils of western Iowa. Farm operators in the area have been interviewed three times —in 1949, 1952 and 1957. Landlords of the sample farms were interviewed in 1957.

What's Happened?

Though much progress was made in reducing losses from erosion between 1949 and 1957 in the area, soil losses are still greater than the goal of public erosion-control programs—to reduce soil loss to 5 tons per acre per year. (An acre of topsoil 1 inch deep weighs about 140 tons.) Between 1949 and 1957, soil losses decreased from an average of about 21 tons per acre per year to about 14 tons on the 138 farms studied. The farm operators also changed their erosion-control goals in this period—from an estimated average of 16.4 to 11.7 tons per acre.

So we can draw two initial conclusions from the studies. First, both erosion losses and operators' estimates of the losses permissible to maintain soil productivity decreased. And second, erosion losses were greater than the level of control farm operators believed necessary to maintain productivity of the soil.

Between 1949 and 1957 there also was a change in the types of erosion-control practices that soil conservationists considered to be needed to reach the 5-tons-per-acre goal. Results of research at Iowa State and other Midwest experiment stations showed that some practices were more effective and others less effective than was formerly believed.

The effects of that research showed up in the differences in two sets of erosion-control plans for the sample farms in 1949 and 1957. In each of the two years, the Soil Conservation Service prepared (1) a mechanical practice plan — which included terraces and a high proportion of row crops—and (2) a high-forage rotation plan — which included no terraces and a high proportion of forage crops—for the 138 farms in the sample. Both the 1949 plans and the revised 1957 plans would have reduced soil loss to 5 tons per acre if fully carried out.

The revised mechanical practices plans in 1957 included more terraces and substantially higher proportions of row crops than did the plans in 1949. But there was little change in the high-forage rotation plans with respect to the amount of land in row crops. The revised plans showed that combinations of mechanical practices would reduce soil loss and still enable operators to follow rotations with about the same proportions of row crops that were on their farms in 1957.

Though there weren't as many mechanical practices on farms in

1957 as recommended, the number of farm operators using these practices had increased since 1949. Grass waterways and contouring were found more frequently than other practices in 1957, while operators objected most frequently to high-forage rotations and terracing. In spite of these objections, the percentage of land in forage increased between 1949 and 1957. In percentage terms, grass waterways and terracing increased more than other practices. Contouring had become readily accepted by farm operators in 1957.

Major Obstacles . . .

The farm operators we questioned identified 15 different obstacles to adopting erosion-control practices. The three most important were (1) need for immediate income, (2) custom and inertia and failure to see the need for a particular practice and (3) field and road layout.

Need for Immediate Income: Many operators said that need for immediate income was an obstacle —either because of the high cash costs of the practice or because they felt their income would be reduced if they adopted these practices. Other operators, however, didn't have enough information to estimate the expected consequences of erosion-control plans. More than half of the operators couldn't estimate the cost of any part of the mechanical practices plan.

Though their information was limited, operators rated erosion-control practices relatively low as an investment preference. Funds for adopting erosion-control practices were limited more by the operators' preferences not to borrow than by credit not being available. Part of the resistance to borrowing may have been due to the unfavorable weather and falling farm prices in the area in the mid-50's. But the presence of the income obstacle in the earlier studies indicates that weather and prices of the mid-50's weren't entirely responsible for the attitude toward borrowing.

We also looked for a relationship between soil loss and changes in land values between 1949 and 1957. But there didn't seem to be any measurable change in land prices as a result of changes in soil loss. Nor did variations in the amount of erosion among farms seem to affect the differences in land prices.

Custom and Inertia: Erosion-control practices weren't adopted on many farms because of failure to see the need for the practices and because of custom and inertia. Farm operators stated that they didn't want or didn't need many of the recommended practices. Others said they preferred not to change their established methods of farming.

Field and Road Layout: Difficulties because of field and road layout seemed to increase in importance as terracing and contouring were more widely recommended in the area. Operators objected to short rows and the difficulty of farming over terraces in fields with rectangular boundaries.

Other Obstacles: Other obstacles mentioned, which were less important in explaining high soil losses, included objections to choice and amount of particular practices recommended, insufficient roughage-consuming livestock on the farm and preference not to increase the amount, unsuitable rental arrangements and too little cooperation by the landlord.

The Farms . . .

In addition to the obstacles mentioned by the operators, we looked at relationships between characteristics of the farm businesses and soil erosion. We found that soil losses were considerably lower on farms where the operators participated in Soil Conservation districts and were higher on farms where the operators didn't participate. And soil erosion was lower on farms where the operators recognized the seriousness of the erosion problem.

More soil was conserved on farms where the operator worked at some nonfarm job—thus relieving the pressure for immediate income. Soil losses were higher on farms with large natural erosion hazards than on those without large erosion problems. Finally, we found that soil losses were much lower on farms when the operators were willing and able to borrow funds to install erosion-control practices.

Landlord Objections . . .

Tenants and landowners decide together which erosion-control practices are to be used on rented farms. So we interviewed the nonoperating landlords also. Landlords objected more frequently to the high-forage rotation plans than to any other practice. Terracing was disliked by two-thirds of the landlords interviewed.

Many of the landlords objected to the recommended practices for the same reasons as did tenants. Not enough roughage-consuming livestock and the need for immediate income seemed to be most important. Their expectations of costs and returns from erosion-control plans were more important than their debt positions in determining the immediate income obstacle.

Some of the landlords believed their gross income would be either unchanged or decreased from using the erosion-control plans. But more of the landlords were uncertain about the effects of the plans. They were more doubtful about the profitability of the high-forage rotation plans than of mechanical practices plans. About half said they would need to borrow funds to adopt the control practices—and about a fourth of the landlords interviewed said they wouldn't be willing to do so.

A lack of livestock — and no provisions in rental arrangements for increasing the number of roughage-consuming livestock — were often mentioned as reasons for not adopting erosion-control practices. Lack of awareness of the problem was another obstacle for some landlords.

As with farm operators, we analyzed the characteristics of the farm business of the landlords we interviewed. On these farms, we found soil loss best explained by the short expectancy of continued ownership of the farm, the need to borrow funds for erosion-con-

trol practices and the tenants' need for immediate income.

Looking at Groups . . .

We also looked at selected groups of farms in the area. For example, we examined in detail, 18 farms on which soil losses were over 5 tons per acre higher in 1957 than they were in 1949. Failure to recognize the need for erosion-control practice plus a need for immediate income were reasons for the large soil losses on these farms. These farms were relatively small in size, and their operators were unable to borrow funds to establish erosion-control practices.

Another group of 13 farms had high soil losses in 1949 which had not been reduced by 1957. Here we also found an inability to borrow funds and a need for immediate income. These operators indicated that lack of financial resources was the most important problem.

On 27 farms where soil losses were estimated to be *less* than 5 tons per acre in 1957, the natural erosion problem was not great. Compared with the rest of the farms studied, the operators of these farms generally were Soil Conservation District participants, had ability to borrow funds and operated large businesses with respect to number of acres farmed and animal units per farm.

There also was a group of 20 farms with relatively large natural erosion hazards on which soil losses were below the average. Operators of these farms generally cooperated with the Soil Conservation District program, recognized the seriousness of the erosion problem and worked off the farm more than the average operator.

In 1957 there were 26 farms whose operators said there were no obstacles to prevent adoption of erosion-control practices.

What Can Be Done?

Assuming that erosion control is in the public interest as well as that of the individual farmer, the results of this series of studies suggest several possible ways to overcome obstacles to erosion control. Three possibilities—education, additional research and direct public action—were considered in developing the following suggestions.

Educational Programs: Additional education about the seriousness of the erosion problem is needed if we want to overcome custom, inertia and failure to see the need for erosion-control practices. For example, educational programs are needed which show the costs and returns of erosion-control practices. With a better basis for appraising the profitability of conservation practices, farm operators can then decide whether the reduced immediate income is balanced by the longer-run benefit. More information is needed, too, about the advantages and disadvantages of including the costs of erosion-control practices in long-term loans.

Expanded Planning Aid: Experience with the Soil Conservation District program has shown the importance of farm plans in reducing erosion. But this phase of the program needs to be revised and expanded. Objections to the choice and amount of a recommended practice indicate that additional effort should be made to make erosion-control plans more acceptable. This could be done by making them more comprehensive —economic as well as physical considerations are essential. The need to revise plans for the sample farms, and the desire of many operators to adopt practices slowly over a long time period show that farm plans need to be flexible.

Since public agencies have limited resources, the follow-up work of improving and updating farm plans is pretty much impossible with present methods of farm planning. Budgeting with electronic computers is one possible low-cost method of enlarging the amount of farm planning for erosion control.

Research Needs: Further research is needed to develop an estimate of future land use needs in the United States. This would be a guide in determining the total amount of erosion control needed —as well as the particular practices that would be consistent with the economic advantage of each area. The growth of surpluses and the need for immediate income indicate that this information is needed both by public agencies and by individual operators in making long-range plans. Federal farm programs also need to be analyzed with respect to their expected effects on erosion control over time.

Additional and better information about costs and returns of erosion-control practices will be needed. The obstacle of field and road layout suggests that further research is necessary to determine ways of modifying some erosion-control practices. Farm operators frequently state that terraces would be acceptable if they were laid out in parallel fashion. Research on the physical possibilities and economic feasibility of parallel and cut-and-fill terracing may help overcome this obstacle.

Direct Public Action: Additional research, particularly on estimating costs and returns of erosion-control practices, may show that individual landowners' interests in erosion control fall far short of public interests to warrant an increase or revision of incentive payments for control practices. Incentive payments can be justified only when practices in the public interest are not profitable for individuals to assume. For example, incentive payments seem to be justified as part of the remedy for the obstacle of field and road layout. In 1957 the Crawford County Agricultural Conservation Program made incentive payments for changing fences to conform to the contour. The public benefit from reduced soil losses, and the inadequacy of economic incentives for individuals to undertake the practice, justified this use of federal funds.

The Conservation Reserve Program has facilitated continuous forage production on many farms since 1957. It's also possible that future farm programs may aid both in the control of soil erosion and of the production of surplus crops.

Shade trees contribute in many ways to make our lives more comfortable, interesting and enjoyable. That's why they should be chosen and located with care and judgment. Here are some pointers and suggestions to help.

by Margherita Tarr

FROM THE standpoint of comfort and beauty, trees are the most important plants in our Iowa landscape.

Trees provide shade for man and beast in his home surroundings and along country lanes and busy thoroughfares. Trees purify the air. (As a result of scientific research it has been determined that for every automobile there should be at least 10 trees to help correct air pollution.) They form a canopy or ceiling for outdoor activities. They serve as a setting (background and frame) for buildings and other plantings. In fact, trees serve to supplement and complement all man's outdoor and indoor activities.

Trees add to the joy of everyday living by casting beautiful shadow-patterns on ground and building; by the variety and interest of their silhouettes against the sky; by the play of light on their waving branches when in leaf or when bare and encrusted with snow or frost; by providing shelter, food and nesting sites for birds which give delight through their song and flight; by their many voices made by wind moving gently or riotously across the land. Some add to the delight of living because of the fragrance of their blooms, and many contribute to the fleeting riot of color in the fall and the ethereal atmosphere they lend to late winter and spring.

One tree may contribute in all these ways to make life more comfortable, interesting and enjoyable. That is why the location and selection of each tree is important.

Street Trees . . .

Trees along a street may be set in the parking strip (the space between the curb and the sidewalk) or just inside the sidewalk on private property. If the trees are in the parking strip, then the community (by state law and local ordinance) may have control over them and responsibility for their location, selection, care and removal. If they are on private property, under existing laws, we need to keep in mind that property owners may cut them down, top them or do anything they choose to them. Street trees serve not only those who live on the street but everyone who passes by.

Street trees should be located from 40 to 100 feet apart, depending on conditions such as building and drive locations and the mature spread of the trees. They should be located so they will frame views of buildings. Avoid setting a tree directly in front of a building where it will block the view and possibly interfere with the natural flow of traffic to and from the building.

Finally, if there are utility poles and overhead wires in the parking, they must be considered in the location of the trees. A tree should never be planted directly under wires. The best solution is to put the wires underground. If this will not be done then the street trees should be planted inside the sidewalk on private property. If poles, wires and trees are already in the parking strip, make the best of it. The trees can be pruned so they will continue to be beautiful and *natural* in appearance. If street trees have been "butchered" by topping and lopping, so they now look grotesque, cut them down and put in new tree plantings.

Lawn Trees . . .

Shade trees should be located so they will provide needed shade and where they will fit in with the total design of the property. Large shade trees are our best air condi-

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tioners, indoors as well as outdoors, by providing shade for buildings and grounds. The closer a tree is to a building the less it will interfere with views from the building. Usually, however, shade trees close to buildings should be set about 20 feet diagonally out from the corners of the buildings. Never locate a tree on center line with a window. A tree trunk is no more interesting to look at than a utility pole or a post at a theater between you and the stage.

If a tree is not closely related to a building, it should be near a boundary planting or fence or close to a drive or walk. Do not set isolated trees out in the center of lawn areas. Trees are a part of the total design of a development. They, along with structures and other plantings, shape lawn areas.

In large scale developments such as parks and cemeteries, the shapes of large lawn areas are sometimes determined entirely by the location of the shade trees, singly and in groups.

The number of shade trees on a property depends on its size. On small home grounds, there may be only one or two large shade trees while, on a large property, there may be many, planted singly or in groups.

Kinds of Trees . . .

Trees for shade along streets and highways and on public and private property should be those that are hardiest and that require the least maintenance. Avoid planting only one kind of tree. Plant a variety. Combine trees that look well together because they have several characteristics in common. Use one kind of tree as the dominant tree. Put in several of that kind. The kinds of existing trees and their locations in the neighborhood must be considered when deciding on new tree plantings. A single property is not an island, it is part of a whole landscape.

The list in the table is a selective one from which you can safely choose trees for shade. For more details on the listed trees and for a more complete list refer to Pamphlet 212, "Landscape Plants for Iowa," available at cost (15c) from your local county extension office or from the Publications Distribution Room here at Iowa State. The plant numbers in the table with this article refer to key numbers in Pamphlet 212.

The following trees should *never* be planted as street trees and only seldom in a home grounds or in an urban situation unless the area is a very large park or a similar park-like development:

Soft Maple *(Acer saccharinum)*, Boxelder *(Acer negundo)*, Black Walnut *(Juglans nigra)*, Poplars (including Cottonwoods, Lombardy and Bolleana), Willows (including Weeping Willow), Chinese Elm *(Ulmus pumila)*, Catalpa *(Catalpa speciosa)*, Tree-ofheaven *(Ailanthus altissima)*, Mulberry *(Morus alba)*, or Spruce, Fir and Hemlock.

The following trees are *not* recommended for Iowa:

Norway Maple *(Acer platanoides)* and varieties of it, Crimson King and Schwedler, because they often are not winterhardy which is indicated by their susceptibility to sunscald (cracking and loosening of bark on the south or

Key No.	Botanical name	Common name	Height in feet	Spread in feet	Adaptation	Growth rate	Foliage texture
301	Acer saccharum, *NEB(St)	Sugar Maple	80	40-50	General	Medium	Medium
302	Fraxinus americana, N(St)	White Ash	80	50-60	General	Medium	Medium
305	Platanus occidentalis, ND	Am. Planetree (Sycamore)	80-100	50	Moist	Medium	Coarse
309	Quercus alba, NBD	White Oak	70-80	60	Dry, acid	Slow	Medium
310	Quercus borealis, *NBD(St)	Northern Red Oak	70-80	50-60	General	Medium	Medium
311	Ulmus americana, °NBD(St)	American Elm	80-100	50-80	General	Medium	Medium
312	Ulmus carpinifolia var. B(St)	Christine Buisman Elm	75	40-50	General	Medium	Medium
320	Acer nigrum, *NB(St)	Black Maple	75	50-60	General	Medium	Medium
322	Acer rubrum, NB	Red Maple	60-70	30-40	Moist	Medium	Medium
324	Celtis occidentalis, *NDB(St)	Common Hackberry	60-70	50	General	Medium	Medium
326a	Fraxinus pennsylvanica lanceolata, N(St)	Green Ash	60	40-50	Dry, moist	Quick	Medium
327	Gleditsia triacanthos inermis var. *(St)	Honeylocust in var.	75	40-50	General	Quick	Fine
331	Quercus palustris, NDB	Pin Oak	70	40-50	Acid soil	Medium	Medium
335	Tilia americana, *NF(St)	Am. Linden (Basswood)	75	50-60	General	Medium	Coarse
346	Betula nigra, *N	River (Red, Black) Birch	60	40	General	Medium	Fine
349	Ginkgo biloba, HO(St)	Ginkgo (Maidenhairtree)	60	40	General	Slow	Medium
355	Tilia cordata, SF(St)	Littleleaf Linden	50	35	City, rich	Medium	Medium
205	Pinus nigra, *BW	Austrian Pine	60	40-50	General	Medium	Coarse
207	Pinus strobus, NDBW	Eastern White Pine	75	40-50	Moist	Medium	Fine
208	Pinus sylvestris, B	Scotch Pine	60	40-50	General	Quick	Medium

N, Native (grows wild) in some sections of Iowa.

D, Frequently affected by disease, insects or other growth inhibitors.

B, Fruits and seeds especially valuable for food for birds.

*, Hardy plant and one generally recommended where a plant of this size and type is desired.

F, Flowers fragrant.

E, Does best in northeast Iowa.

S, Southern Iowa only.

(St), Street tree.

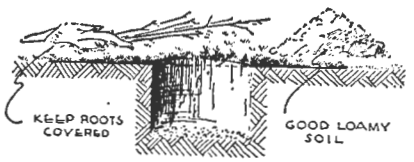
W, Windbreak.

O, If possible buy non-fruiting trees, as fruits have an obnoxious odor.

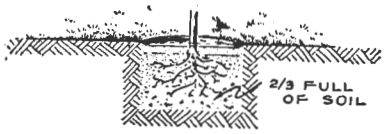
°, Plant only if there is a community Dutch Elm Disease control program.

PLANTING . . .

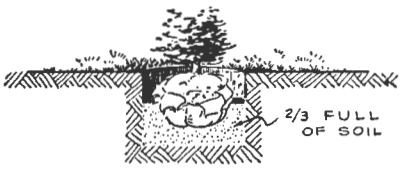
Never allow roots of plants to dry! On receiving plants from nursery, give roots a good soaking and keep damp until ready for planting. Keep out of wind and away from heat.



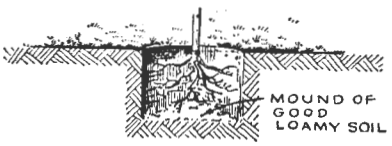
For bare-root plants dig hole large enough to prevent crowding of roots. Loosen subsoil if very hard. Keep roots covered.



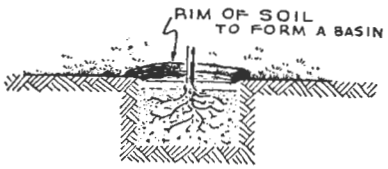
Work soil about roots by hand as hole is filled with soil or when hole is completely filled, by settling with water. After watering, settle plant by shaking gently.



For balled and burlapped evergreens dig hole a foot larger and deeper than the ball. Set evergreen at same depth it was in nursery row. Fill hole ⅔ full, water, cut twine and turn back burlap. Fill and pack firmly.



Put mound of soil in bottom of hole with roots spread to natural position over it. Set plant at same depth as it grew in nursery.



Pack soil firmly. Leave basin to catch water. Put on layer of loose soil to act as mulch. Water deeply once a week for the first 2 years.

southwest side of the trunk in late winter).

Paper (canoe or clump) Birch *(Betula papyrifera)* and Cutleaf (weeping) Birch *(Betula pendula)* because, in Iowa, they always become infested with the bronze birch borer which eventually kills them.

Avoid using trees that have other than green foliage such as sunburst locust. These should only be planted when recommended by a landscape architect who has planned the planting very carefully and recommended their use for a desired artistic effect or atmosphere.

Planning for Trees . . .

Trees are the most permanent plants in a development. They are even more permanent than many structural elements. In addition, it takes time to grow mature trees. Fine, large, mature existing trees on a property increase its value. Their locations should determine the future location of structures, drives and walks, and the grading of the property. Only by careful, advance paper planning can they be saved.

It is also necessary to plan the locations of new tree plantings carefully in relation to a whole development. This means paper planning in relation to everything that now exists and that can be anticipated as being needed in the future. If trees are planted in the wrong places, later they may need to be moved or cut down. This will result in a great waste of time, energy and money.

For detailed information on the planning process, refer to the "Your Yard" series, LA-182 through 186, available from your county extension office or the Publications Distribution Room here at Iowa State.

If development of a large area — such as a park, cemetery, school grounds or subdivision—is being considered, consult a landscape architect for the over-all planning. He can plan the entire development, including the circulation, building and utility locations, grading and the tree locations and selections. If a home ground development is complicated by interesting topography or unusual requirements in a limited area, consult a landscape architect to help with this over-all planning, too.

Planting Trees . . .

Plant all trees where shown on the plans. Set them after the finished grade has been established. Early spring planting, after frost has left the ground and before growth starts, usually is best in Iowa. For best results, buy freshly dug trees or ones growing in tubs, rather than storage plants. They will be more expensive, but it will be worth the extra cost. Buy trees that are 1½-2 inches in caliper (diameter of trunk at breast height) except for the maples and the slower growing oaks which are more difficult to move. Buy these 6-8 feet high if they are not in tubs or balled and burlapped. Buy the trees from the nearest reliable grower of nursery stock. Set out the plants as soon as they are received.

Shade Tree Care . . .

Pruning: Prune out dead or diseased wood and broken twigs and branches as they occur. Prune out unruly twigs and branches that spoil the shape of the tree and also the poorer of two rubbing twigs.

Watering: Newly set trees

should be watered deeply once a week during the growing season for the first two years, unless there are rains that soak the soil to the full depth of the roots. Water slowly by laying the hose close to the tree with a tiny stream of water flowing from it. Do not sprinkle the surface or water lightly. Mulch newly set trees and leave the mulch for at least 2 years. This helps prevent grass from growing close to the trees.

During extreme drouths it may be necessary to water established trees. Water deeply so the ground is completely soaked. Do not do frequent surface sprinkling.

Fertilizing: Fertilizing trees grown under abnormal conditions —not under natural conditions in an undisturbed woods—is important to help keep them in a healthy, vigorous condition. Fertilizing will not prevent or cure diseases or insect invasions, but it will help the trees resist the ill effects of diseases and insects.

Fertilize trees with a complete fertilizer such as 10-8-6 or 10-6-4 or with well-rotted manure when available and where it won't be objectionable. For commercial fertilizer, apply at a rate of ¼ pound total nitrogen per inch of trunk diameter at chest height. If this is 5 inches and you're using 10-6-4, for example, use 12½ pounds of fertilizer ($¼ \times 5 \times 10 = 12½$).

Fertilize trees starting 1 foot from the trunk (if less than 6 inches in diameter) or 2 feet from the trunk (if more than 6 inches in diameter) and out to the full spread or "drip line" of the tree. For smaller trees, the fertilizer may be spread evenly over the ground. For large trees of 12-inch or more trunk diameter, apply the fertilizer in holes 18 inches deep. Make the holes in concentric rings spaced about 2 feet apart. Slant them toward the trunk with a 1¼-inch soil auger or crowbar. Fill the holes with fertilizer to within 6 inches of the top. Put topsoil in the top 6 inches and compact with your heel. Finally, water with a hose soaker or with a very slow stream of water, moving the hose as each area becomes soaked.

Do not use more fertilizer than recommended and do not use commercial fertilizer closer to the tree than specified.

Sickly or Dying Trees: Diseases, insects and adverse physical conditions may be causes for an unhealthy tree. If there are *several different kinds of trees* in poor shape, first consider an adverse physical condition as the cause. In a city or town consider the possibility of a gas leak; smoke or other air contaminants; chemicals such as sodium chloride, road salt and 2,4-D damage; sewage line toxic chemical leaks; over-fertilization; changes in soil grade; soil compaction; etc. In the country or in large-scale developments, suspect chemicals or rabbit, rodent and gopher damage or a change in the water table. Tree damage also can be caused by wind, ice and lightning. An individual tree may be strangled by a wire fastened around it or by girdling roots. On a farm, evergreens can be killed by barnyard runoff.

Trees deserve attention because it takes so long to grow them and because they are so important in our daily lives. Watch them and be aware of any unhealthy changes in their conditions. Learn what the trouble is. Quick action may save an important or many important trees. Extension specialists here at Iowa State and your county extension staff are always "at your service." Ask them, if you don't know what's wrong with your tree. Be sure to bring in or send in a representative cutting from the tree and package it so it is in good condition when it is received.

PRUNING MATURE TREES

Never top a shade tree. Prune to strengthen it and to retain its natural, beautiful shape. Each cut should be clean and as close as possible to the main stem. When larger branches are removed, cuts should be made in the order shown. Cuts No. 1 and No. 2 are made to prevent stripping of the bark.

When twigs and small branches are to be pruned, the cut should be made just above a bud.

A sharp-angled crotch will cause splitting and eventually decay. One branch should have been removed when the tree was young. One still should be removed as shown at left.

Treat a wound, 1 inch or over in diameter, with a material (tree paint) which will waterproof and disinfect it and serve as an antiseptic, but not injure the plant cells.

PRUNING YOUNG SHADE TREES

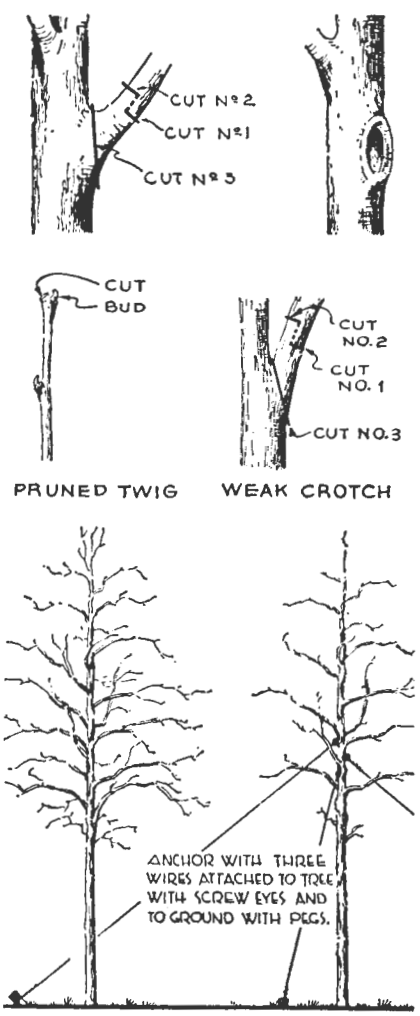
To balance top with remaining roots, remove about ⅓ of top of newly transplanted trees by:

1. Removing weaker of sharp-angled and crowded branches.

2. Removing all but one leader if top is divided. Never shorten central leader which is left.

3. Cutting back side branches to just above a bud, retaining natural shape of tree, to accomplish the full ⅓ reduction of top.

Note: As a young tree grows, remove lower branches each year while they are still small enough to be cut off with hand shears. This should be done until the lowest branch is the height you want it from the ground when the tree is full grown; for a shade tree, 8 to 12 feet from the ground, depending upon the tree's location. Also, continue to remove the weaker of sharp-angled, crowded or crossing branches while they are still small.



For your Interest

horticulture

Announce 1961 All-America Roses

ENTRIES SELECTED for the 1961 award in the All-America Rose Selections Trials of unintroduced roses are "Duet," a bi-color salmon-pink Hybrid Tea, and "Pink Parfait," a pink Grandiflora. These roses are now available from commercial sources.

Other new roses which have done well in the Iowa State University Rose Garden are: Hybrid Teas—Gail Borden, Pink Lustre, Garden Party, Hawaii, Pink Duchess and Day of Triumph; Grandifloras — Cherry Glow and El Capitan; and Floribundas — Encore, Lavender Princess and Sarabande.

New Melon Hybrids Appear Promising

THREE MUSKMELON hybrids were included in the yearly trial of new varieties maintained by the Experiment Station to compare promising new varieties with commercial varieties. Among the commercial varieties, Edisto continues to perform well. And the three hybrids included in the trial performed exceptionally well, according to L. E. Peterson and L. C. Pierce who conducted the test. Burpee Hybrid and Supermarket Hybrid appeared to be about the same in appearance and performance, and both showed some promise for commercial planting. The third hybrid, Harper Hybrid, performed well but could not withstand shipping as well as the other two hybrids because of its thin rind.

List Outstanding Stone Fruit Varieties

A GOOD CROP of peaches was produced on most varieties tested in 1959 in the stone fruit variety trials conducted by the Experiment Station on Ida and Monona soils in southwestern Iowa.

C. C. Doll, who directed the trials, reports that some thinning of fruit was required on the hardier varieties — A-123, A-134, Prairie Dawn, Prairie Daybreak and Tremmel. Of this group, A-123 and Tremmel are good quality fruits suited for home use, whereas the remaining varieties are of questionable value except for hardiness.

Early White Giant, Jerseyland, Raritan Rose, Red Haven and White Hale are other good peach varieties that have some hardiness and produced a good crop in 1959, says Doll. Of the varieties fruiting for the first time in these trials, Surecrop and Radiance appear hardy but have only medium quality. Combining more quality with less hardiness were the varieties of Fairhaven and Triogem.

The apricot varieties Earli-Orange and Golden Giant produced good crops in 1959 as did the Missouri 223, Mt. Royal and Stanley plums.

Fertilizer Raises Yearly Grape Yield

A 10-YEAR summary of fertilizer treatments for Concord grapes indicates an average yearly increase of from 0.6 to 1.8 pounds per vine from the use of fertilizers, reports C. C. Doll of the Experiment Station. The greatest yield increase was obtained with treatments of 30 pounds of P_2O_5 alone or with 40 pounds of nitrogen.

All fertilized plots produced more vegetative growth in last year's test than did the unfertilized vines, with increases ranging from 0.2 to 0.4 pound of prunings per vine. This is very close to the average pruning weights from the use of fertilizers during the 10 years of this study.

Application of 0.6 and 1.2 pounds of K_2O per vine resulted in increases of 0.6 and 2.7 pounds of fruit, respectively, in 1959. This is the third successive year that increased yields were obtained from the treated vines. An increased pruning weight of 0.3 pound per vine was measured from both levels of potash in 1959.

soils

Examine Fertilizer Needs for Establishing Brome on Basin Terraces

PRESENT FERTILIZER recommendations for establishing alfalfa-bromegrass cover on areas disturbed by basin terraces call for application of 50 pounds of nitrogen and 200 pounds of P_2O_5 per acre. Experiment Station and USDA agronomists, under the direction of W. C. Moldenhauer, further checked these recommendations for the possibility of eliminating the nitrogen applications.

Various fertilizer treatments were used on bromegrass seeded alone, with oats, with alfalfa and with both alfalfa and oats. Oats held bromegrass back, but alfalfa didn't. Alfalfa, on the other hand, was more vigorous when planted with oats than when planted with brome alone. Adding nitrogen

These overhead views of corn were photographed throughout the growing season in studying the amounts of solar energy reaching the ground at various stages of corn growth.

Above: More energy reaches the ground during early stages of growth; corn in this photo is 24 inches high. Right: Here, the corn has reached a height of 54 inches.

Left: Energy reaching the ground is reduced by about half when corn reaches maximum height. The corn in this photo is 87 inches tall.

fertilizer increased the average bromegrass stand, though the increase didn't show up for individual companion crop treatments.

All in all, the results show that some nitrogen was helpful in establishing a bromegrass stand under these conditions. But 50 pounds of nitrogen didn't give much better results than did 25 pounds. At the particular location tested—which was in better shape than many with which work has been done — 200 pounds of P_2O_5 gave little or no better results than 100 pounds.

Examine Sun's Energy in Soil Moisture Study

MANY QUESTIONS have been raised recently about crop placement and spacing to get top yields and the most efficient use of available water.

To find out more about this, Leo Fritschen, Tom Denmead and R. H. Shaw of the Experiment Station are studying radiation — how much of the sun's and sky's energy reaches the ground. They're testing this on cornland under many different conditions— on cloudy days, on clear days, on wet soil, on dry soil and when the corn is at different heights.

In preliminary studies of checked corn planted in a normal hill spacing, the researchers found that, in mid-July, 40 percent of the radiation reached the ground. This figure gradually decreased to 20 percent by late August. But even when the corn had reached its maximum height there was still considerable radiation reaching the ground surface.

Some of the energy from this radiation is used for evaporation of the moisture that corn gives off (transpiration), for heating the air and the plant and for photosynthesis. The energy reaching and retained in the soil can heat the soil or be used for evaporation.

The information from these studies will be useful in predicting yields and in understanding the effects of soil moisture on plants and the relationship between yield and weather. The USDA and the United States Weather Bureau are cooperating with the Experiment Station in conducting these studies.

Colo Clay Loam Soil Suited to Irrigation

COLO CLAY LOAM soil is well drained from below and should respond well to irrigation in dry seasons, reports George R. Benoit of the Experiment Station.

This conclusion is based on the results of a study to determine the field capacity and maximum plant-available water in Colo clay loam. Results show that water is absorbed by this soil at about 1.3 inches per hour, and it takes a field about 20 hours to reach field capacity after 2 to 6 inches of water have been added. The field capacity of the soil, on a volume basis, is 38 percent at 0 to 4 feet, 30 percent at a depth of 6 feet and 38 percent at depths greater than 6 feet. There are 7 to 7.5 inches of plant-available water in the top 6 feet of soil at field capacity.

Farm Outlook...

CATTLE FEEDERS in the main feeding states reported 1 percent more cattle on feed Oct. 1 than a year ago. The Corn Belt states were down 5 percent -- with Nebraska down 10 percent and Iowa unchanged. But the western states were up 13 percent -- California, up 20 percent; Colorado, up 19 percent.

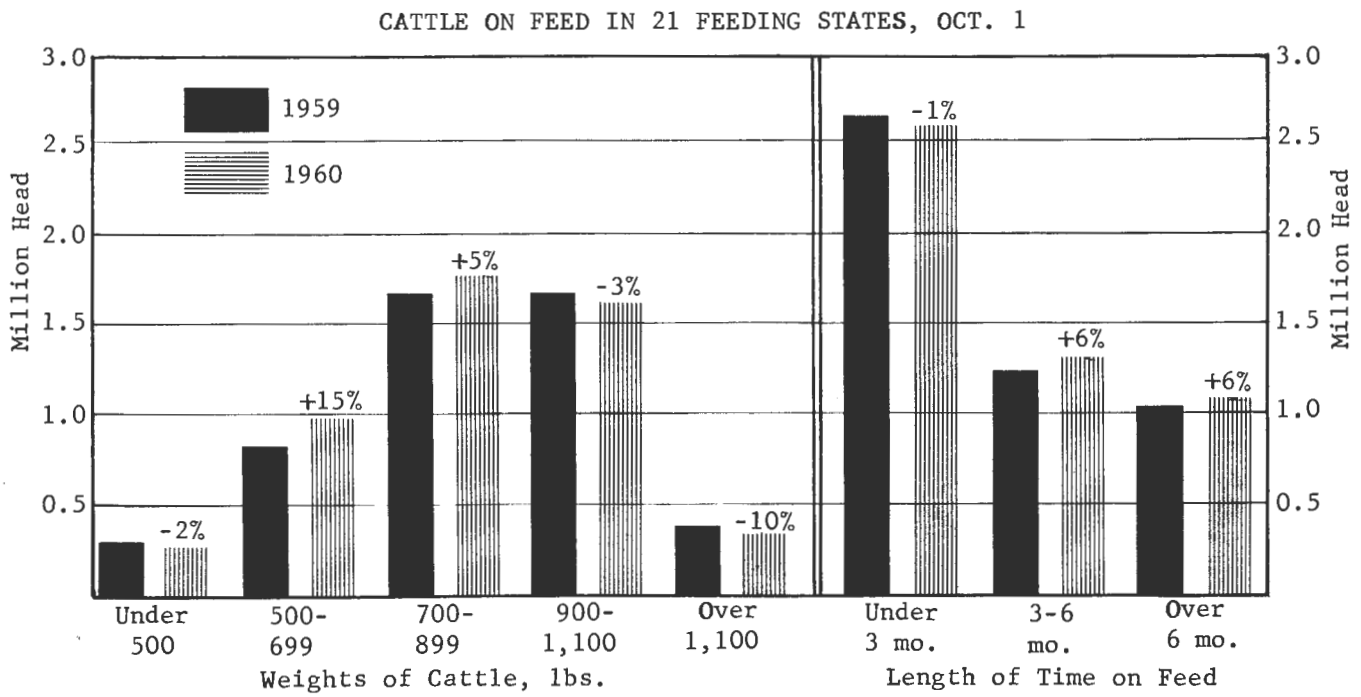
On Oct. 1, 22 percent of the cattle had been on feed over 6 months; 26 percent, on feed 3-6 months; and 52 percent, on feed less than 3 months. Compared with a year ago, a smaller proportion had been on feed more than 3 months. Feedlots haven't been filling up as rapidly this fall as last year. Marketings of fed cattle for the summer quarter were reported up 3 percent over last year, with the 21 main feeding states showing replacements down by 2 percent.

Cattle on feed over 6 months were up 6 percent from last year. So were those on feed 3-6 months. Those on feed less than 3 months were down about 1 percent.

Looking at the weights of cattle on feed (see large chart), we find that cattle over 1,100 pounds were off 10 percent from last year. Cattle in the 900-1,100 pounds weight bracket were 3 percent fewer than last year. But the 700-900 pounders were up 5 percent, and the 500-700 pounders were up 15 percent. The number under 500 pounds was down 2 percent.

This cattle-on-feed situation points to a letup in marketings during the winter -- with some price advance likely then. With the lateness of cattle in moving into feedlots, however, the chances are that this winter price advance will be followed by spring and early summer price declines -- much as has taken place in the last 3 years. But the year's peak could come a little earlier in 1961 than it did in 1960.

Cattle marketings have been running ahead of a year ago. The prospect for 1961 is a further increase in cattle slaughter. We're at the stage of the cattle cycle where some of the earlier buildup in cattle numbers is bound to show up in increased marketings. But the big bulge in cattle slaughter won't come until we stop the buildup in num-



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bers and begin to liquidate. This still seems to be a couple of years off. But with numbers where they are now, we're vulnerable to a drouth situation.

Perhaps the most bullish part of the cattle picture is the indication that the number of cattle on farms has been overestimated by 3-4 million head. The census reports from the first 30 states show fewer cattle in the country on Jan. 1, 1960, than the estimates by USDA had indicated. (Typically, USDA revises its count of livestock every 5 years as federal census data becomes available to check earlier estimates.)

Cattle numbers increased again this year. But the increase isn't as great as seemed probable according to the unrevised figures on total cattle numbers. The result: The number of cattle on farms Jan. 1, 1961, probably will be no greater, and perhaps even a little less, than had been estimated to be on farms at the beginning of 1960.

This revision of cattle estimates means that, barring the development of widespread drouth, cattle slaughter in 1961 won't be as large as anticipated earlier. And it makes the predictions of cattle prices for 1961 less gloomy.

HOGS . . .

The big unknown in the hog outlook is what's going to happen to pig production next spring.

Reduced marketings are holding hog prices above the low levels of fall prices a year ago. The 1960 spring pig crop (which provided the supply for hog slaughter this fall) was about 13 percent lower than the 1959 spring crop.

The 1960 fall crop that'll soon start moving to market is about 4 percent below the 1959 fall crop. So, for the next 6 months, our hog marketings will be 5-10 percent below last year's.

The improved hog market this fall and winter may encourage increased farrowings this spring. If so, this will be one of the shortest hog production downturns in the history of hog cycles.

If 1961 spring farrowings are boosted upward, hog prices next fall won't be as high as they have been this fall. But the chances for a large enough increase in the spring pig crop to cause a crisis in hog prices next fall aren't great at this time.

A winter price rise for hogs can be expected in 1961, with prices moving to their seasonal peaks in June, July and August. Prices then probably will be as high or higher than in mid-1960.

-- Francis A. Kutish

Estimated Federally Inspected Cattle Slaughter