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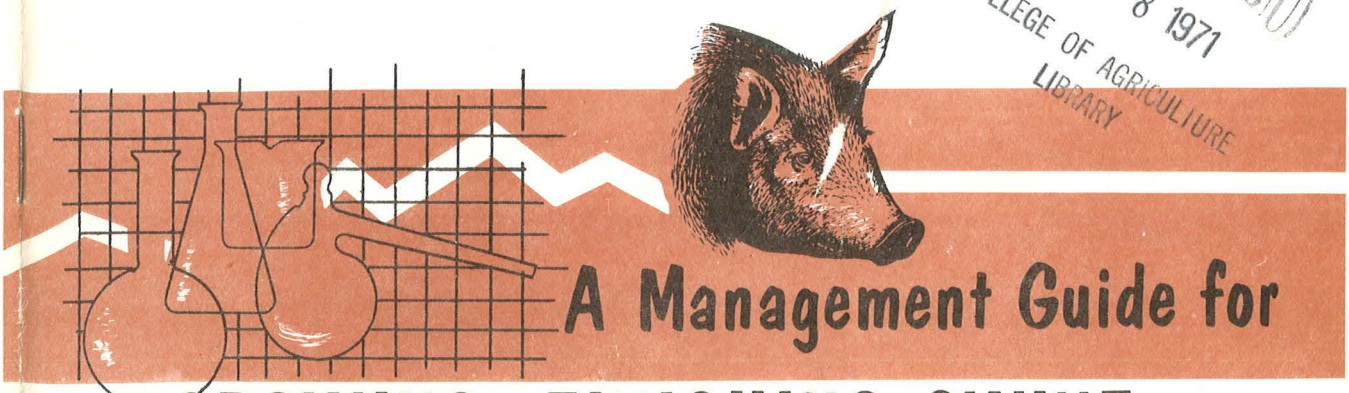
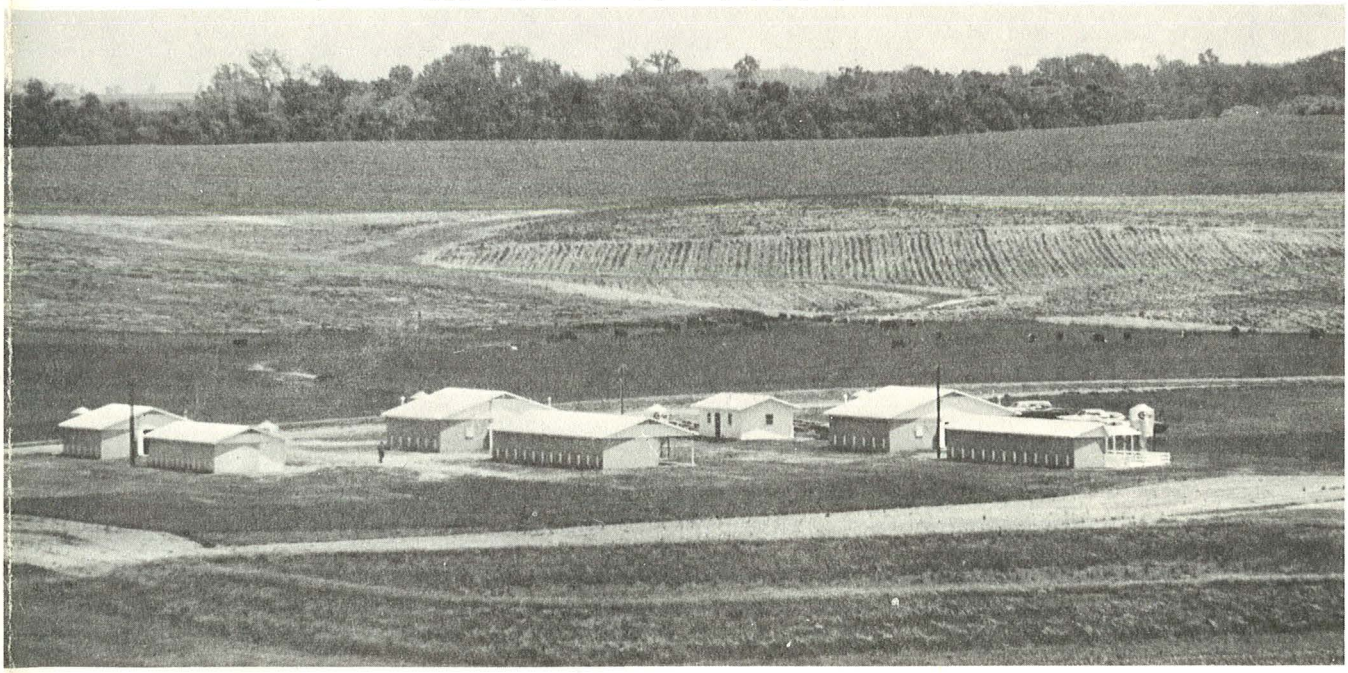


A Management Guide for GROWING-FINISHING SWINE in confinement



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EC 71-227

A Management Guide for GROWING-FINISHING SWINE

IN CONFINEMENT

By Bob Fritschen
Area Extension Swine Specialist[1]

Introduction

Pork production systems have changed significantly in the past few years, reflecting the evolution in agriculture. Advances in pork production systems parallel other advances in agribiologics.

In spite of trends and changes in pork production, the time tested production systems probably will continue to be competitive with the newer systems, assuming equal management ability.

Pasture and drylot production systems are still an important part of many existing production systems. However, as expansion takes place in this industry, confinement pork production will become an economic necessity for many. A list of factors responsible for the trend to confined pork production would include:

Inability to obtain competent labor at reasonable salaries.

Ability to replace labor with capital in the form of facilities and equipment.

Increased cost of land.

Proven effectiveness of confined production.

Alternate uses of land.

Availability of labor saving devices.

Restrictive influence of weather upon performance in non-confined systems.

Increased pride in being a pork producer.

This circular provides accurate information on planning and managing for confinement pork systems. Some recommendations are basic and accepted by industry components while research in some areas of confinement pork production is just evolving or even lacking. Because of this, periodic revision of this circular is expected.

PRODUCTION SYSTEMS

What type of confinement buildings are available to producers?

A wide variation of systems is available to producers for consideration. However, confinement buildings generally fall into one of three types:

Environmentally regulated.

Open or modified open-front.

Open-front/outside apron.

Within any given system the pen arrangement, amount or type of slatted floor, as well as other factors, may be more important to performance than the system itself.

Define an environmentally regulated or controlled environment building.

An insulated, mechanically ventilated, supplementally heated unit is often referred to as an environmentally controlled building.

However, the inside environment is still a function of the outside conditions. The question of how much protection a pig requires and how he will respond to this environment has not been totally resolved. In general, research shows and practical evidence indicates that an artificial environment such as provided by an environmentally regulated unit is desirable in the nursery and early growing phase. The justification for controlled environment from 100 pounds to market, based upon gain, feed efficiency and animal health is questionable. An illustration of an end cut of a typical environmentally controlled building with total slats is shown in Fig. 1. Figure 2 shows the same building with an offset alley and partial slats.

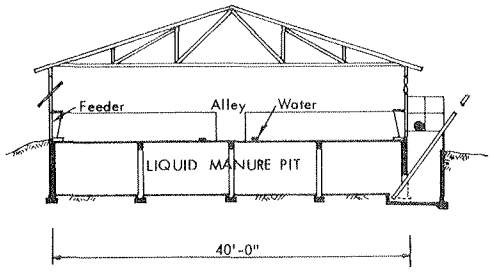

Fig. 1. Midwest Plan Service plan No. 72675. This and other Midwest Plan Service plans are available through County Extension offices.

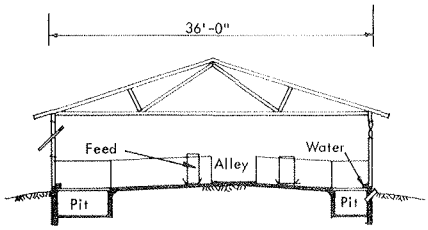

Fig. 2

Describe a modified open-front building.

A modified open-front building is completely under roof but has the south or east side open. This type of unit can be completely enclosed in the winter by closing the open side. Corrugated fiberglass or plywood, hinged at the top, are commonly used to enclose the open side.

Fiberglass doors are favored by some because they enhance warmth when lowered on days when the sun shines. Fabric curtains that can be rolled up when not in use offer another inexpensive alternative.

About a third of the back wall should be made into doors that can be opened and adjusted for summer ventilation. Little, if any, mechanical ventilation is required. However, a ridge opening or ridge fan is desirable

[1]Many recommendations and comments in this publication are based upon studies conducted at the Swine Housing and Management Center, Northeast Station, Concord. Technical inputs in these studies are provided by scientists in the following departments: Animal Science, Agricultural Engineering, Veterinary Science and Agricultural Economics.

for winter exhaust. Fig. 3 shows an end cut of a typical open-front or modified open-front building. Figure 4 shows a typical modified open-front growing-finishing building. The same unit with hinged fiberglass panels being lowered is shown in Fig. 5. Figure 6 shows the same unit with adjustable pivot door (one per pig) for cross-ventilation.

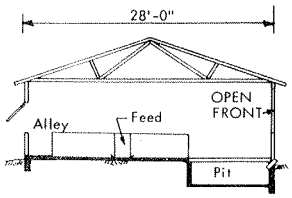

Fig. 3. End cut of Midwest Plan Service plan No. 72673R1.

Describe an open-front/outside apron system.

This sytem has a sleeping area under roof and a feeding area outside. The feeder and waterer usually are located at the lower end of the outside apron. Slatted floors are not part of this system but bedding is. Since pigs must go out to eat and drink, this system cannot be completely enclosed in winter such as the modified open-front system. A typical open-front/outside apron unit is shown in Fig. 7.

When comparing environmentally controlled, modified open-front and open-front/outside apron systems, what performance level can one expect?

All three support comparable performance in mild or warm weather. However, during winter and spring, the open-front building with the outside apron does not support a performance level equal to the modified open-front or environmentally controlled systems, especially when young pigs are involved.

Research at Nebraska indicates that growing-finishing pigs reared in modified open-front units in the winter will gain as rapidly as pigs grown in environmentally controlled units but require slightly more feed per unit of gain. It is important, however, that when small pigs are placed in modified open-front units in the winter they should receive some supplemental heat. Infrared heaters on a pen basis or hot water floor heat work well and are economical. Some important considerations when comparing the three systems are shown in Fig. 8.

What is a two-unit production system?

Since a pig's space requirement doubles from 100 pounds to market as compared with weaning to 100 pounds, it appears advisable to consider a two-unit production system. Provide a nursery-growing unit with four square feet per pig up to about

Fig. 4. Typical modified open-front growing/finishing building. Note: Small ridge fans for winter exhaust.

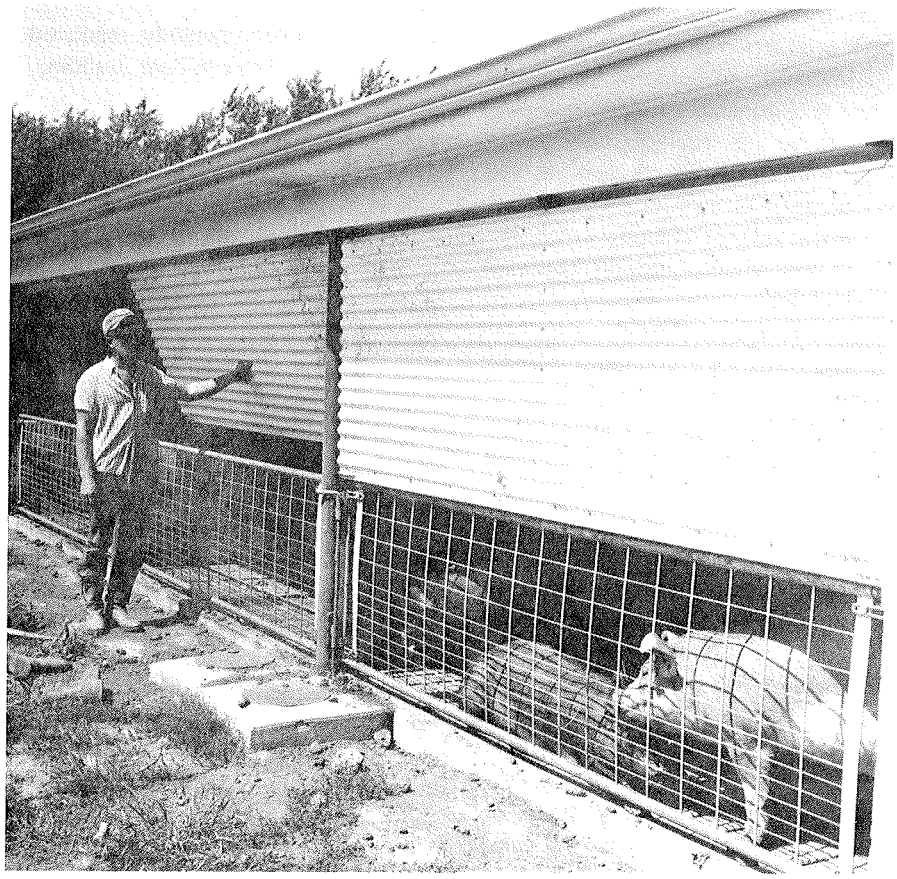

Fig. 5. Same unit with hinged fiberglass panels being lowered. Plywood panels cover lower half in cold weather.

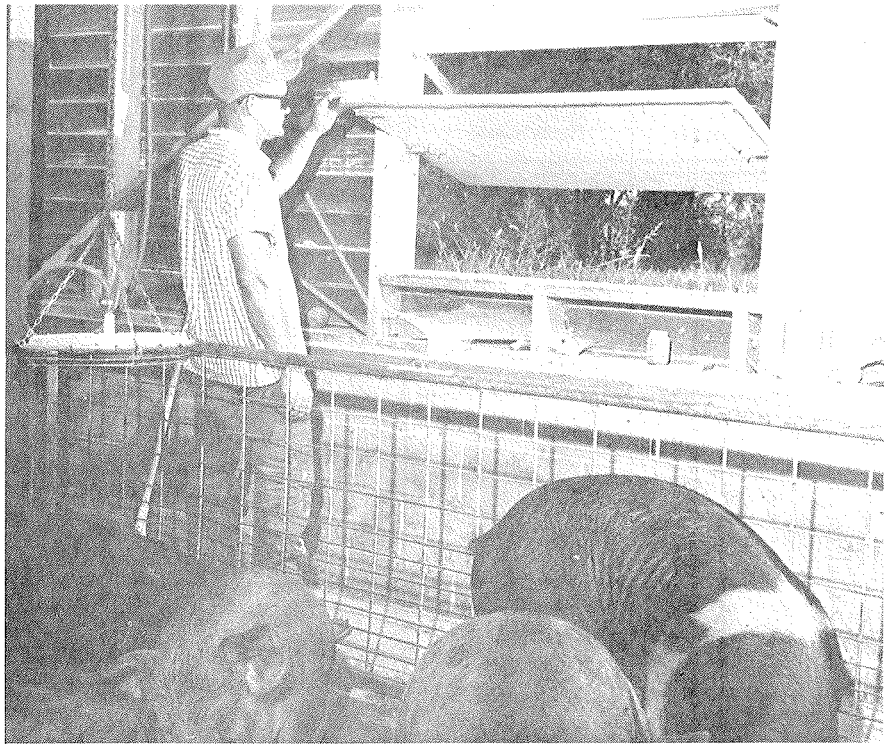

Fig. 6. Same unit showing adjustable pivot door (one per pen) for cross-ventilation.

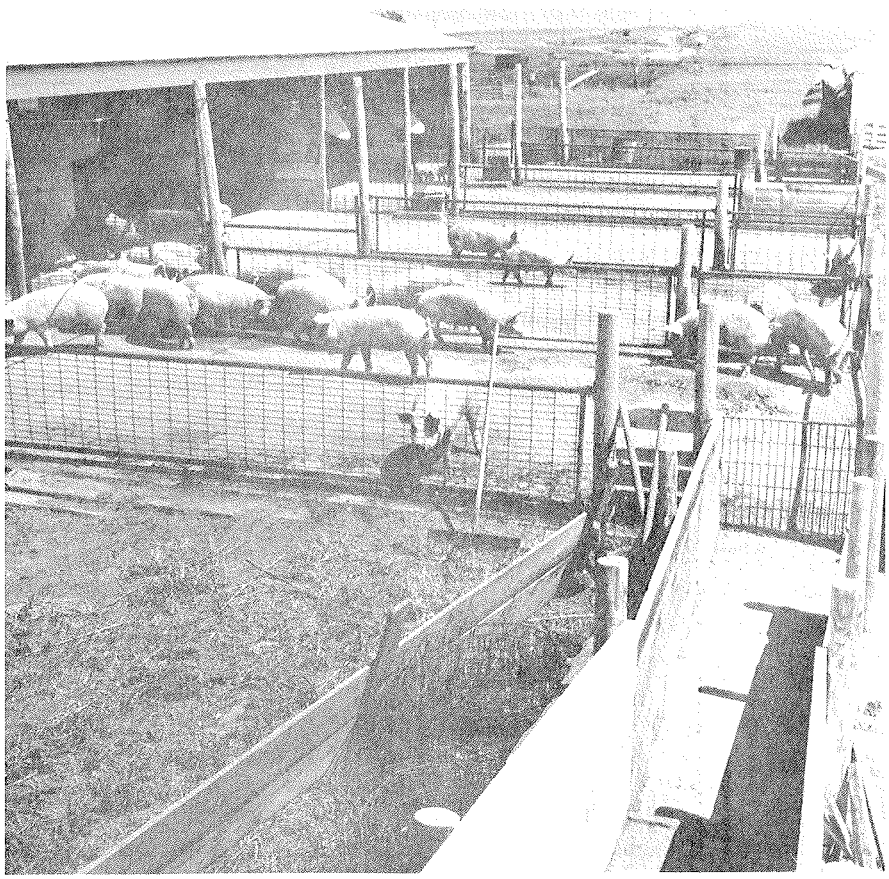

Fig. 7. Open-front/outside apron system.

100 pounds and a finishing unit that provides eight square feet per pig from 100 pounds to market. This system provides for a greater economy of space than when pigs remain in the same unit from weaning until market. However, current research in Nebraska indicates that there is a greater chance of respiratory problems in the two-unit system than in the one-unit system.

A variation of this system is one building with two different size pens (Fig. 1). In this system, as pigs outgrow the smaller pens they are moved across the alley to the larger finishing pens. A disadvantage of this system is that there are usually older pigs in the unit when younger, more susceptible pigs are brought in. Thus, the value or effect of disinfecting in this system is generally limited since there are usually pigs present.

Can I justify a nursery or a nursery-finishing combination?

Being able to provide special climate control for early-weaned pigs to a weight of 40 to 50 pounds has definite merit. While the cost per square foot is high, the cost per pig is not, as the area to weight ratio is only 2.5 to 3 square feet per pig.

The nursery should be capable of providing supplemental heat in a uniform distribution pattern, starting at 80-85° F. for early-weaned pigs. Dampness, humidity and drafts all cause stress problems such as scours to the young pig and must be controlled if health problems are to be avoided.

Is it more feasible to have a farrowing-nursery combination than to combine the nursery with finishing unit?

Yes! It is more feasible to combine a nursery with a farrowing unit than with a finishing unit. Several factors are involved:

Economics. Since nursery age pigs require and respond to greater environment control, the construction and utility similarity between farrowing and nursery systems could represent a savings.

IMPORTANT CONSIDERATIONS

	Type of Housing[a]	Initial Cost	Expected Summer Performance	Expected Winter Performance	Operating Cost	Labor Requirement
1	ENVIRONMENTALLY REGULATED	Greater than 2 or 3	About equal to 2 or 3	Slightly better than 2 and somewhat better than 3	Greater than 2 or 3	About equal to 1 but less than 3
2	MODIFIED OPEN FRONT	Less than 1 or 3	About equal to 1 or 3	About equal to 1 and better than 3	Less than 1 and same as 3	About equal to 2 but less than 3
3	OPEN-FRONT OUTSIDE-APRON	Less than 1 more than 2	About equal to 1 or 2	Less than 1 or 2	Less than 1 and same as 2	Greater than 1 or 2

[a]Assuming equal slatted area within each system.

Fig. 8. Comparing environmentally controlled, modified open-front and open-front/outside apron systems.

Stress-reduction. There should be less stress moving pigs from farrowing to nursery when the two are combined and separated by a wall as compared to moving from one building to another.

Disease control. There is less chance of disease transmission when combining farrowing-nursery as compared to nursery-finishing. However, it should be noted that a pit wall separating the two units is necessary in effective disease control.

Why not combine the farrowing, nursery and finishing systems into one building?

There is no clear-cut reason why such a system will or will not function satisfactorily. However, several factors must be considered:

Building dimension—will the farrowing, nursery and finishing sections require the same building dimension?

Separate ventilation—since each section has a different class of animals, a separate ventilation requirement exists.

Feed delivery system—how many different rations will be needed, where will they be mixed, stored and how will they be handled?

Sow traffic—can sows be moved in and out without going through other production areas? Does the unit compliment the "all in-all out" practice?

Labor—how many steps will this combination save? Generally, less labor but greater management is required.

Disease—will this system detract from disease prevention or will it actually "set-up" disease conditions?

The need to separate sections of a common system by walls from pit to ceiling is important to the pigs' health. There is a need also to have a small room between each section to aid management and provide flexibility in pig handling.

DESIGN-PERFORMANCE FACTORS

How much area is recommended per pig for the growing-finishing period?

Following are the space requirements per pig:

Weight	Area
to 40 lb.	3 sq. ft.
40-100 lb.	4 sq. ft.
100-150 lb.	6 sq. ft.
150 lb. to mkt.	8 sq. ft.

What is the space requirement per pig when using an open-front/outside apron system?

The requirement is to have the same area per pig outside as inside. Thus, if you are finishing pigs to market weight in this system, you will need a total of 16 square feet per pig (8 sq. ft. inside and 8 sq. ft. outside).

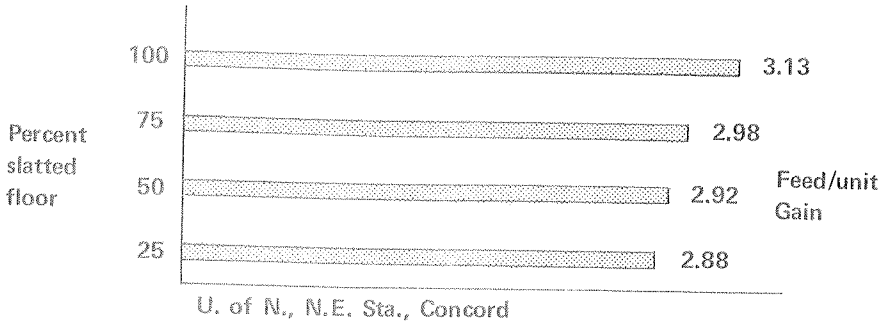

Fig. 9. Effect of slatted floor on feed efficiency.

How much of the floor should be slatted?

Recent research has demonstrated that labor saving and floor cleanliness can be obtained by using a partial slat system. This system usually results in lower construction cost when compared to total slats. In addition, Nebraska research indicates that the feed requirement per unit gain increases as the amount of slatted floor area increases. Fig. 9 shows the following relationship between slatted area and feed efficiency.

The 25 and 50% slatted floors both supported excellent feed efficiency. However, the 25% slatted floor required some labor and lacked sufficient pit capacity. Thus, it appears advisable to consider making about half of the total pen area slatted in modified open-front or environmentally regulated systems.

How big should my pens be or how many pigs per pen?

Research has shown that 25 uniform pigs per pen works well. For example, this would require a pen 8 by 24 feet. This is a total of 192 square feet or about 7.7 square feet per pig. Since the feeder generally takes up about the area of one pig, it may be sound management to reduce the number to 24 pigs.

A smaller pen with correspondingly fewer pigs per pen will also perform well. However, since additional feeders, waterers and pen dividers would be required, economics usually do not favor the smaller pen size. Larger pens with more pigs per pen generally result in poorer total performance. In certain cases where management chooses to group greater numbers, the importance of strict uniformity in size becomes increasingly important.

How important is it to allow 8 square feet per animal?

If pigs are crowded into pens with less than the recommended area, the feed required per unit of gain generally increases and daily gains decrease. In addition, social problems such as tail biting and/or cannibalism may occur.

If too much area is allowed, poor dunging habits generally develop and these habits may cause poor performance. Some producers have found it advantageous to install a crowding gate that can be moved back as the pigs require more room. In systems where bedding is used, a 4" x 4" or 2" x 6" board placed on the floor to hold the bedding in place generally reduces the problem of messy or wet sleeping areas. As the pigs need more sleeping area, the 2" x 6" board should be moved forward.

Where should I locate my feeder and waterer?

The proper placement of feeders and waterers is important from a management as well as a pig performance viewpoint. Assuming a partially slatted floor is used, it is well to have the waterers at the lower or slatted end. A second choice is to locate the waterers at the edge of the solid area.

From a management viewpoint, waterers located near the outside end of the pen in a modified open-front unit work well as the waterer can be checked and flushed without entering the pen. Locating the waterers over the slatted area also has the effect of encouraging the pig to move onto the slats for dunging.

The feeder location will depend upon the general pen arrangement. However, the general recommendation is to have the feeder closer to the sleeping area than to the waterer or desired dunging area. For example, assuming a pen 8 by 24 feet is partially slatted, Fig. 10 shows two feeder and waterer locations.

Locate the feeder on a solid area so that feed wastage can be detected early. If the feeder sits on the slatted area, it may be advisable to place a piece of plywood under the feeder and extend it 10 to 12 inches beyond the feeder to indicate feed wastage and to allow the animal to salvage some of the waste feed.

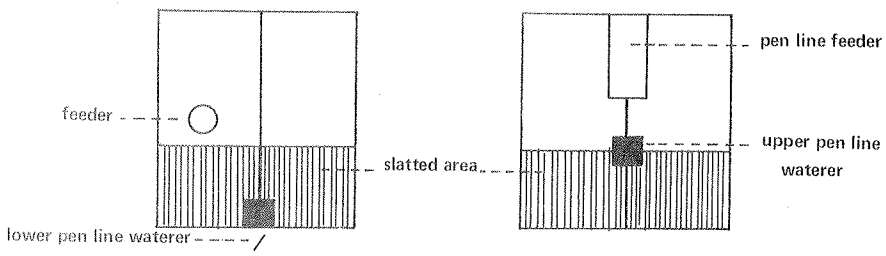

Fig. 10. Feeder and waterer locations.

Do slats at the lower end of an outside apron function on a year-around basis in Nebraska?

Generally not! Winter-time management of open-front/outside apron units that have slats at the lower end are difficult. In cold weather, pigs are reluctant to walk to the slatted area to dung. Other potential problems include freezing of manure pit contents, freezing over of slatted area and inability to drain or pump pits.

What type of waterer should I use?

There are a number of automatic waterers available that work well. Mount waterers so that water is easily accessible to all pigs. Since the waterer is generally placed at the end of the pen where dunging occurs, an effort should be made to prevent fecal contamination to the waterers. This can be done by placing the waterer on a small concrete pad 6 to 8 inches above floor level, thus making the growing pig place its front feet on the pad to reach the drinking cup. Some waterers are constructed high enough so that this is not necessary.

Waterers called "drinking taps" are now available. The advantage of the drinking taps is that fecal contamination is not possible, thus assuring the animal a clean drink. This type waterer is generally adapted only to heated buildings or the seasons of the year when freezing is not a problem. When purchasing this type waterer, follow the manufacturer's recommendations.

What is the recommended floor slope?

The recommended floor slope is 1/2 inch per foot. The slatted area should be level. The recommended slope on the manure pit floor is 1 inch per 20 to 25 feet.

If I put more than 1/2 inch slope per foot, will the floor be self-cleaning?

The answer is no! Some producers feel that more slope will make the floor self-cleaning, especially the outside apron. Actually, the more slope, the faster the liquids run off and leave the solids behind. Also, when the floor is wet, slopes in excess of 1/2 inch per foot make it more difficult for the pig to travel and may cause leg damage. Cleanliness of the solid area is mostly dependent upon the training of the pig and management, not floor slopes in excess of 1/2 inch per foot.

PERFORMANCE LIMITING PROBLEMS

What causes tail biting and how do you prevent it or treat it?

The cause of tail biting is not clear. It is more commonly associated with confinement than with other forms of pork production. Thus, it has been assumed by many that "boredom" may set off tail biting.

Some producers have tried various ideas to alleviate pig boredom. Some of these include: hanging a chain from the ceiling to the floor; putting a piece of tire in the pen; placing an old bowling ball in the pen or a semi-round rock; providing music via the radio, etc. These and other techniques provide varying and questionable results.

The most effective way to prevent tail biting appears to be by docking the tail. This procedure should be done early in the pig's life, preferably the first week. A small tool called a side-cutter works well for this operation. About 1/2 inch of the stub should be left. The stub should immediately be treated with iodine to prevent bacterial invasion.

Tail biting can be reduced, if not prevented, in totally enclosed buildings by keeping the building dark. This has the effect of reducing animal activity and thus, tail biting.

When tail biting does occur, the recommended treatment will vary. A commerical product called "Tail Guard" is somewhat effective in totally enclosed units while less effective in open buildings. This product should be sprayed on animals as well as the general interior of the building as per the manufacturer's directions.

It has been noted that a sudden weather change or rapid fluctuation in barometric pressure coincides with tail biting. Thus, some producers use this product when sudden weather changes occur as a preventative as well as a control. When acute tail biting occurs, it is generally best to medicate the victims individually.

Occasionally only one pig is responsible for the damage. Close surveillance may reveal this to be the case; if so, prompt isolation of the offender is called for.

Some people say nutrition may be a factor in tail biting. Before making any ration deletions or additions, consult a knowledgeable nutritionist and make changes based upon requirements and not rumors.

Will continuous use of slatted floors and/or concrete cause or increase leg problems?

The stress of slats and concrete does not in itself cause leg problems. This type of stress magnifies latent weaknesses in the animal that are thought to be inherited or due to management. All efforts to prevent bacterial invasions, including clipping and treating the navel cord at birth, generally are rewarded by fewer leg problems.

Research at Nebraska has shown that pigs grown and finished on either 25, 50, 75 or 100% slatted floors have about equal leg strength. However, growth rate is a factor in bone strength as the most rapid gain causes the weakest bones. There is other evidence also that suggests that rapid gain is a severe stress in itself.

It appears that the pig is more mobile on slats when the slats are parallel to the long dimension of the pen rather than at a right angle to the pen. In this manner, the pig may walk down or along the slat rather than across them. Proper ration formulation of vitamins and minerals is a "must" for growing and finishing pigs in confinement.

How much of a problem is gastric ulcers in confinement pork production?

Ulcers in pigs grown in confinement can be a serious problem. Research has shown that fineness of grind may support improved feed efficiency in young pigs to about 50 pounds. However, fine grinding tends to increase feed wastage and may increase the incidence of gastric ulcers. From a practical standpoint, it appears that a medium grind (3/8" to 1/2" screen) will support the best total results.

A typical pig suffering from ulcers is somewhat difficult to detect. Often they appear quite gaunt and pass a stool that is quite dark and sometimes has free blood. Usually, the most practical solution is to remove this type of animal from the pen and treat individually. On a herd basis, changing to a coarser grind often solves the problem.

Should I develop a rodent program?

Definitely yes! Reports indicate that rats eat 40 pounds of food yearly and contaminate or spoil at least three times that much. In addition, they may cause fires, carry diseases, destroy buildings (Fig. 11) or ruin insulation, and even kill small pigs. Rat and mice control programs should involve three basic steps:

1. *Killing rodents.* Involves the use of anticoagulants such as warfarin. Follow manufacturer's instructions when using this type poison. Fumigation by a commercial operator may be suggested in acute cases.

2. *Cleanup.* Don't provide rats and mice with free food and lodging.

3. *Rodent-proof.* Make it nearly impossible for rodents to gain admittance.

This is a year-around program but a necessary one. Please note—a cat is not considered part of a rodent program. Cats carry disease as well as lack the efficiency they are generally given credit for.

MOVEMENT AND HANDLING OF PIGS

Since building costs are high, must I sacrifice potential pen area for alley space?

One of the gravest errors a producer can make is in not giving high priority to a successful "traffic plan." Traffic plans should take into consideration the necessary pig movement under all conceivable conditions.

Since pigs produced in confinement are slightly more difficult to move than those grown on pasture, special considerations are worthwhile.

Many producers find that loading hogs on the level rather than going up a loading chute is important. Thus, some type of a loading dock level with the floor of the truck is generally recommended. The loading dock should be easily accessible to the trucker and not require tractor power to pull the truck in or away from the dock. Further, the truck should not be allowed into the area where pigs other than those going to slaughter may make contact with the vehicle. Extra time spent loading, moving pigs or idling on the truck is directly converted into lost dollars via shrinkage or death loss.

Pigs can also be successfully loaded or moved by using a "portable pig pen." This device can be mounted on a tractor by means of a three point hookup and raised and lowered hydraulically. Under this system, pigs can walk on and off on the level.

Alleyways designed strictly for pig movement need not be wider than 2-3 feet. An alley that is too wide generally adds to the problem. Loading a few hogs at a time is generally more successful than emptying the pen or filling the alleyway.

Why do modern pigs, confinement reared, present a problem in handling?

Several factors are involved in the handling differences of modern day pigs versus their ancestors. A basic factor is the change from drylot or pasture to confinement. Since pigs raised in confinement are pampered, the movement from pen to slaughter is the greatest stress in their lives. Confinement reared pigs, because of lack of exercise, have reduced stamina. Thus, it has been said that confinement reared pigs could well be labeled, "fragile—handle with care." Consider the following when preparing to ship confinement reared pigs.

Sort early—at least 24 hours in advance of movement to allow pigs to quiet down.

Avoid punishing pigs with electric prods, clubs, slappers, etc. These devices have much less effect on confinement reared pigs than on other pigs and only aggravate the problem.

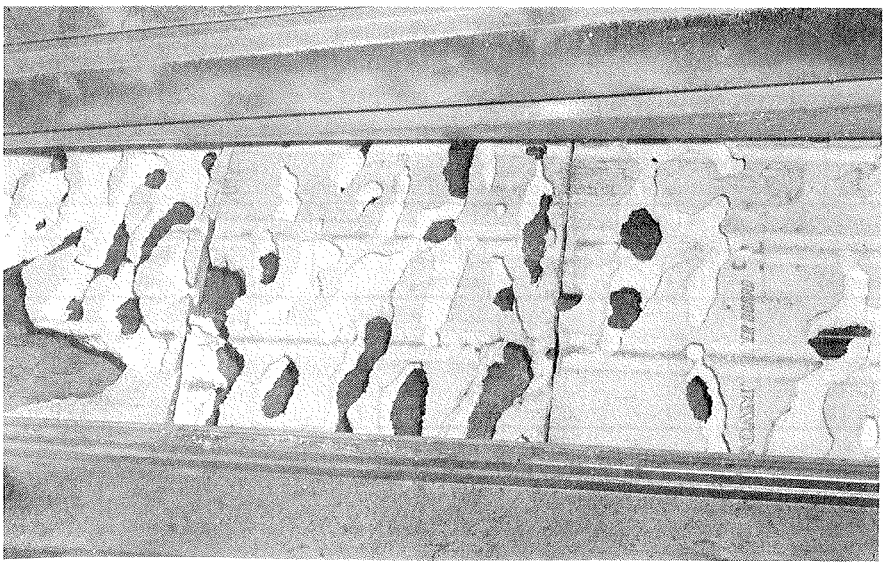

Fig. 11. Rodent damage to insulation behind metal sheeting in an environmentally regulated unit.

Sort and drive pigs with lightweight panels. Panels should be wide enough to block driving alley.

In warm weather, load during the cool hours of late evening and use water to cool hogs during loading. When wetting down pigs on a truck, avoid wetting only one area. The pigs will fight for a position in the wet area.

Bed with sand in summer and straw in winter.

Do not allow pigs from different pens to mingle in the alley.

Load at once. Hogs from different pens will fight the same as pigs from different farms if given a chance.

Arrange your traffic plan so pigs are moved a minimal distance from pen to truck.

Once pigs are on the truck, keep moving.

Can poor dunging patterns affect performance, and what can be done to correct it?

Many times poor dunging patterns can influence performance adversely. In addition, research has shown that much of the confinement odor comes from the floor rather than the pit, thus, any dunging on solid area will increase the odor level as well. The problem of incorrect dunging patterns varies according to seasons as follows:

Summer—Summer dunging patterns are influenced by air movement. Since a pig will tend to keep the area clean where it lies and will lie where it is coolest, the dunging pattern is often the opposite of the winter dunging pattern.

Faulty pen habits have less effect on performance in summer than in winter. However, one must take precautions to prevent dunging in feeders and waterers. Pigs can best be trained by wetting the desired dunging area before and during the allotment of pigs. If one waits until the pigs are placed in the pen to do this, it may be too late.

Winter—Faulty pen habits in the winter can be serious from the standpoint of performance and health. Usually by heating the desired sleeping area or making it warmer, the pigs will automatically tend to keep it clean. On a partially slatted floor with hot water or electric heat, the problem is minimal. Many producers have used infrared heaters on a zone pen basis with success. Others place one or two sheets of plywood side by side 18 to 24 inches from the floor, making a hover under which the small pig will sleep. Again the problem becomes one of a definite sleeping area as much as a dunging area since the animal tends to keep the sleeping area clean.

With a partially slatted floor design should the pen partition be solid?

In general, no! The consensus is that the pen divider be solid from top to bottom in the sleeping area or up to the slatted area. The pen divider over the slats should be open mesh or a comparable material that allows lateral air movement and "see-through" capabilities. Maximum air movement over the slats is desirable for rapid odor dissipation. The "see-through" capability has the reported effect of encouraging the pig onto the slatted area for dunging.

ODOR AND LIQUID MANURE MANAGEMENT

How valuable is liquid pig manure for crop production?

The value of liquid pig manure for crop production is generally limited. One study shows that the value of liquid manure per pig is about 50 cents per pig. Much of the value of liquid manure is dependent upon the season of year that it is applied to the crop.

What are the characteristics of manure from G/F pigs?

The characteristics of manure from G/F pigs are summarized in Table 1.

How serious are gases and odors in confined pork production?

Gases and odors are generally not a problem if ventilation equipment is properly installed and functioning correctly. However, whenever liquid manure pits are drained, the maximum ventilation capability of the building should be used to dispose of the gases as rapidly as possible.

Since some gases form at the surface of the liquid manure, it is generally recommended *not* to let the manure pits completely fill as this may force the gases into the critical animal level. As soon as the pits are drained or when using a manure pit for the first time, it is generally beneficial to add about 6 inches of water to the pit. Producers should not overlook the fact that while odors or gases may not noticeably influence pig performance or behavior, they may still cause human respiratory problems.

How deep should my manure pit be?

Experience has shown that 5 to 6 feet of depth should be adequate. Pits that are shallower and lack adequate storage may cause an odor problem since more frequent pumping is required. In winter, pits under modified open-front units should be pumped or drained as soon as the last pigs leave. This is to prevent freezing

Table 1. Characteristics of manure from growing finishing pigs.

Age (weeks)	Weight (lb.)	Waste Production[a]			
		Liquids & solids		Wet solids only	
		Cu. Ft.	Gal.	Cu. Ft.	Lb.
6- 9	40	.06	.5	.04	2.4
9-13	100	.13	1.0	.1	5.9
13-18	150	.21	1.7	.15	8.8
18-23	210	.30	2.2	.2	12.0

[a](C) 1969 Midwest Plan Service, Ames, Iowa.

Fertilizer content of a ton of manure is about: 10 lb. of nitrogen, 3 lb. of phosphorus, 8 lb. of potassium.

The above figures are median values for undiluted fresh manure without bedding.

of the liquid waste and potential damage to the pit walls.

Why is the odor level a problem in some environmentally regulated units?

Odor levels may become objectionable when an improper balance between air intake and exhaust occurs. Some buildings, with a partially slatted floor, may have odor problems in spite of good ventilation. The problem increases when pigs become covered with waste due to the fact that their warm body, when covered with moist manure, makes an ideal occasion for decomposition and release of volatile gases. The answer to this problem is not necessarily total slats but better management regardless of the amount of slatted area. Management and maintenance of any ventilation system is required for satisfactory production.

What are odor control chemicals and how effective are they?

Several products are on the market designed for odor control.

Some are designed to stop bacterial decomposition and act as sanitizing agents.

Others are designed to react with and control odorous gases within the manure pit.

Still another group of chemicals is designed to mask odors by superimposing a pleasing fragrance within the building.

Due to the unpredictable quality of air or odors and because people respond in unpredictable ways, more effective means of odor control should be considered. These include proper site selection, design, management and a basic understanding of confinement production so that potential problems can be anticipated and thus avoided.

What should I consider when selecting a building site?

Potential odor problems must be considered when choosing a building site for confined pork production. A site remote from residences or commercial operations should be considered. Odors from swine and other livestock operations have been detected as far as a mile downwind. Other factors to consider when selecting a site include overall traffic pattern, convenience, water supply, waste removal, disease control and economy.