FINAL REPORT

Quality Assurance for
On-farm Feed Manufacturing

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Executive Summary

As animal producers strive toward greater profitability, many have implemented their own feed manufacturing operations. Personnel at the Food and Drug Administration's (FDA) Center for Veterinary Medicine (CVM) estimate approximately 60,000 U.S. farmers manufacture their own feed. The goal of on-farm feed manufacturing is to produce feed that meets the intended specifications (both nutritional and with the desired medication level) and is free of adulteration. The production of quality feed will enhance animal performance and improve the profitability of the livestock enterprise.

A set of regulations for manufacturing feed, referred to as current Good Manufacturing Practices (GMPs), are designed to prevent feed contamination and provide reasonable assurance that medicated feed additives are used properly. Everyone involved in producing medicated feed, whether at a commercial off-farm plant or with an on-farm mill or grinder-mixer, must comply with the GMPs. By definition, failure to follow GMPs during the feed manufacturing process results in adulterated feed.

Few on-farm feed manufacturers are familiar with the GMPs. Furthermore, no routine inspections are conducted for on-farm feed manufacturing operations. In Kansas, approximately 11 percent of the meat animal drug residue problems result from medicated feed. Where the contamination source was identified, 100 percent were traced back to on-farm feed manufacturing operations.

Project Goal

The goal of this project was to reduce the likelihood of contaminated meat leaving the farm resulting from a failure by on-farm feed manufacturers to comply with the current Good Manufacturing Practices. This outcome was pursued through two project objectives. The first entailed a preliminary assessment of on-farm feed manufacturers' compliance with GMPs (Phase I). The second involved development of training material (Phase II) designed to address the educational needs identified in Phase I. Training material would emphasize the rationale, methodology, and economic justification behind implementing GMPs.

Methodology

Phase I was accomplished through on-site evaluations of on-farm feed manufacturing operations. A systematic evaluation of feed processing units was developed and tested on three farms and then used to evaluate the entire population of on-farm feed manufacturers in Clay County, Kan. The data collection process gathered information pertaining to regulatory compliance, feed quality, information sources used by farmers, and their rationales for manufacturing feed. Participants received individual reports that identified operation strengths and opportunities for improvement. A county summary, also sent to project participants, included an economic analysis of all portable feed manufacturing systems and conclusions regarding feed quality and the level of GMP compliance.

Training materials were developed to assist on-farm feed manufacturers comply with GMPs. The first of these was an *On-farm Feed Manufacturers Quality Assurance Pocket Manual*. A prototype of the manual was developed and tested by project collaborators. Modifications were made based on participant recommendations. A *Feed Quality Assurance Handbook* was developed consisting of 17 bulletins addressing different cost centers in the feed manufacturing process. Most on-farm feed processors acquire information about feed manufacturing from their feed ingredient supplier. Training material was prepared in bulletin format to facilitate distribution by commercial feed suppliers to their farm customers.

Results

All farmers who manufactured their own feed (20 total) in Clay County participated in the project. Project cooperators indicated feed quality was the primary reason for manufacturing feed on-farm (60 percent listed this as the first or second priority), and cost savings occurred as the second most frequent response (55 percent listed this as the first or second priority).

Feed ingredient suppliers were identified as the principal information source pertaining to feed manufacturing issues, followed by veterinarians and Extension personnel.

Assessment of feed quality as indicated by finished feed particle size, feed uniformity, and drug content, revealed producers were manufacturing

good-quality feed. Two feed samples possessed a drug content below the minimum tolerance permitted by the GMPs, while none of the feed samples exceeded the target inclusion rate by more than 10 percent. Average feed particle size was 812 microns (a swine producer's target is 600 to 800 microns).

Record-keeping and medicated feed ingredient storage were the primary GMP compliance issues farmers needed to improve. Most participants used sequencing of feeds to avoid drug carry-over between feed batches. Follow-up evaluations were performed on several farms. In those instances, farmers had come into compliance with GMP regulations pertaining to record-keeping and drug storage.

An economic analysis of data collected for portable grinder-mixers revealed the average cost of producing feed on-farm, excluding the cost of ingredients, was $8.06 per ton of feed with a standard deviation of $3.50 per ton.

Extension bulletins were prepared to address educational needs of producers pertaining to feed quality assurance, processing efficiency, and compliance with the GMPs. In-service training was conducted for Cooperative Extension Service agents in Kansas and for commercial feed manufacturers and veterinarians on a national basis. Commercial feed manufacturers and state grain and feed association personnel are distributing materials to their respective customers throughout the midwestern United States.

Project Outcomes

In response to this project, Clay County farmers have reduced the likelihood of producing pork with violative drug residues through better record-keeping, sequencing, and mixer cleanout. Because the material was designed for distribution by commercial feed manufacturers, it has found ready adoption both in and outside the United States. All of the bulletins have been translated into Chinese, and some of the bulletins have been translated into Spanish. The project has been expanded to other Kansas counties, and commercial companies have adopted the methodology used in this project to assist their on-farm feed customers improve their compliance with GMPs in the United States.

On-farm feed manufacturing represents the largest portion of hog feed produced in the United States. Reports indicate on-farm feed manufacturing accounted for 50 percent of the hog feed market on nonintegrated farms in 1972. By 1981, the on-farm feed manufacturing market share increased to 80 percent, and in 1992 it was reported to comprise 85 percent of the farm feed market (Anderson, 1981: Marbery, 1992).

On-farm feed manufacturers are required to follow the same FDA regulations as commercial feed mills (Title 21 CFR Part 225). These regulations are referred to as the current Good Manufacturing Practices (GMPs). The GMPs outline procedures for processing feed that help ensure meat, milk, and eggs produced from animals receiving medicated feeds contain no violative drug residues. The Federal Food, Drug & Cosmetic Act states a medicated feed will be considered adulterated if the methods or equipment used for its manufacturing, processing, packing, or holding are not in compliance with GMPs.

The FDA has determined that a lack of sequencing, flushing, and cleaning of mixer equipment accounted for 25 percent for sulfamethazine violations (Augsburg, 1989). Improper mixing and incorrect inclusion rates of medicated feed articles also were found to be major contributors to tissue residue violations. A collaborative effort by FDA, USDA, the Cooperative Extension Service, and industry was conducted to educate producers in methods to avoid violative tissue residue. This resulted in a decrease of sulfa violations from 13 percent prior to 1978 to about 5 percent between 1980 and 1987 (Augsburg, 1989). The most current statistics available from USDA indicate violative tissue residues due to sulfamethazine were less than 1 percent in 1993 (Domestic Residue Databook).

The GMPs highlight the importance of proper receiving, storage, proportioning, mixing, equipment cleanout, and record-keeping procedures. Although on-farm feed processors are required to comply with these regulations, they are not subject to routine inspections. Furthermore, the paucity of information regarding regulatory compliance and quality of finished feed processed on-farm hinders Cooperative Extension Service personnel, veterinarians, and commercial feed suppliers from addressing the educational needs of these producers.

In response to this dilemma, the following project was conducted to help identify the educational needs and regulatory compliance of on-farm feed processors.

Goals and Objectives

There were two project objectives. The first objective was to assess the current level of GMP compliance by on-farm feed manufacturers in Clay County, Kan. This information would enable the project team to identify educational needs and develop training material that appropriately addressed on-farm feed manufacturing practices. Project participants in Clay County also would receive assistance, in the form of technical recommendations and training, in complying with the GMPs.

The second project objective entailed the development and distribution of Extension educational material pertaining to on-farm feed manufacturing. The distribution of this material would occur through a train-the-trainer format with collaboration from state and national producer and feed manufacturer trade associations.

The desired outcome of this project was to see on-farm feed manufacturers comply with the GMPs, thereby helping ensure a safe supply of meat, milk, and eggs in response to learning more about feed quality assurance techniques.

This information transfer would occur directly from Extension personnel, veterinarians, and feed ingredient suppliers who received training in feed quality assurance techniques and through the direct distribution of multimedia Extension training material.

Materials and Methods

Clay County is located in the North Central crop reporting district of Kansas and has a hog and pig inventory value of $3.074 million (Kansas Ag Statistics, 1995). This ranks fourth in the state, which has a total hog and pig inventory value of $91.8 million. Clay County was selected for this case study because of its proximity to Manhattan, Kan., where the main campus of Kansas State University is located; the close working relationship between the Extension agent and swine producers; and the presence of a manageable number yet diverse group of on-farm feed manufacturers. Every hog operation in Clay County where feed is processed on-farm was included in the study.

A survey of feed production units and conformance to GMPs was developed after visiting and inspecting three cooperators' farms (Appendix). This survey was tested at these locations prior to its use at 17 other operations in the county.

Feed uniformity (mixer performance) was evaluated using procedures outlined by the American Society of Agricultural Engineers (ASAE, 1990). Ten representative samples were collected from portable grinder-mixers by subsampling at even time intervals during feed discharge. Stationary mills were sampled at 10 representative locations using a Seedburo grain probe (Chicago, Ill.). Salt assays were performed using Quantab titrators (Elkart, Ind.), and the coefficient of variation percentage (CV%) was calculated.

Corn and sorghum test weights were determined using procedures outlined by the Federal Grain Inspection Service (FGIS, 1990, 1993). Grain moisture was measured using the air oven method described by the American Association of Cereal Chemists (AACC, 1994a). Drug assays and particle size analyses were performed on a composited feed sample collected for evaluation of mixer performance. Drug assays were performed by a commercial lab following the Association of Official Analytical Chemists (AOAC) methods (Ragheb and Smallidge, 1990). Particle size was measured by following the ASAE (1993) method of determining and expressing fineness of feed materials by sieving. Soybean meal and protein supplements were analyzed for total nitrogen content using the kjeldahl method (AACC, 1994b).

Hammermill shaft speed was measured using a Fisher brand tachometer (Pittsburgh, Pa.); this value was used to calculate hammer tip speed in feet per minute. Screen size opening and hammer width were measured using a screen gage and caliper, respectively. A stopwatch time study was performed to collect time-motion data. These data were used in two technical reports (Herrman et al., 1997a and b).

Evaluation of producer changes occurred in an informal format since all had received a comprehensive report on their feed-manufacturing operation and GMP-compliance issues were discussed during the survey. During subsequent contact with project participants by the county Extension agent through on-farm visits or conversation, information regarding changes was gathered.

Results and Discussion

Participant Profile

Eighteen of the 20 study participants used a portable grinder-mixer to manufacture feed. The quantity of feed manufactured varied from 1.5 to 200 tons per week. Three operations produced breeding stock, one purchased feeder pigs, and one occasionally sold feeder pigs. Sixty percent of the participants manufactured feed using a grain, soybean meal, and base mix ingredient system; 20 percent batched feed using phosphorus, calcium, and premix with their grain and soybean meal; and 20 percent used a supplement (a combination of protein, minerals, and vitamins) and grain to prepare feed.

On average, participants had been manufacturing feed for 20 years. Study cooperators provided reasons for manufacturing feed in order of priority (Table 1). Feed quality (35 percent) received the highest response for processing feed on-farm, followed by cost (25 percent), and convenience (25 percent). Grain quality was the principal reason study cooperators indicated their feed was superior to commercial feed.

Table 1. *Reasons for Processing Feed On-farm*

Reason	First	Second	Third	Fourth
Cost	25%	30%	40%	0%
Quality	35%	25%	0%	5%
Convenience	25%	15%	20%	10%
Value added	5%	20%	5%	0%
Dispose of grain	0%	0%	0%	15%
Sanitation	10%	10%	5%	10%

Feed-processing Quality Assurance Program

Most study participants conducted some routine quality tests of feed ingredients. Seventy-five percent of the study cooperators reported they inspected incoming ingredients visually, measured test weight and moisture of grain, or smelled the ingredients to detect off odors. Only 20 percent reported that they performed assays on finished feed or soybean meal, and no one evaluated finished feed for drug content. Particle size analysis and mixer performance testing had been performed on 35 percent and 30 percent of the farms, respectively.

Buildings, grounds, storage bins, and equipment were inspected to assess the degree to which study cooperators complied with the GMPs. All buildings provided adequate shelter for feed manufacturing equipment, 75 percent of the producers separated their feed operation from their agrichemicals and application equipment, and 30 percent of the ingredient storage rooms prevented entry of birds and rodents. Sixty percent of the producers stored their medicated feed additives in their original closed containers, and 80 percent correctly followed the label for medicated articles. Most scales (80 percent) used to proportion drugs possessed 1-pound weighing increments (none were designed to weigh less than 1 pound), and 35 percent of the producers checked their scales for accuracy.

Nine of the 20 study cooperators participated in the National Pork Producers Council's (Des Moines, Iowa) Pork Quality Assurance (PQA) program. Six of these individuals kept feed-processing records that denoted feed formulation, date of mixing, and delivery point on their farm. Of the 11 study cooperators who were not enrolled in the PQA program, only one kept records that denoted feed processing date, ration, and delivery information.

Feed and Ingredient Quality

The protein level in soybean meal or concentrate was approximately 98.9 percent of the guaranteed minimum content (Table 2). One sample (5 percent) was outside the American Association of Feed Control Officials (AAFCO) permitted analytical variation (AAFCO, 1995). Drug assays performed on complete feed indicated the average drug inclusion rate was 85 percent of the target level. Only 55 percent of the producers incorporated drugs in feed batches during the farm visits. Of those 11 farmers, two incorporated their medicated feed additive below FDA tolerances (Title 21 CFR Part 558); one of these was 15 percent of label usage.

Most of the feed manufactured on-farm possessed a good average particle size and mixing uniformity (Table 2). The average coefficient of variation across mixers was 12.9 percent, and coefficients of variation ranged between 3.9 percent and 33.6 percent. Average particle size of finished feed was 812 microns, and the range was between 581 microns and 1,075 microns. Only one farmer used a roller mill for grinding grain, whereas the rest of the farmers used hammermills.

Avoiding Cross-contamination of Feed

Producers were questioned about techniques they used to avoid cross-contamination of feed. Eighteen of the study participants (90 percent) used a medicated feed article that had a withdrawal time. When questioned about their equipment cleanout practices, all indicated feeds were prepared in a sequence to avoid cross-contamination. None of the study cooperators utilized a ground grain flush treatment following the last batch of feed containing a Category II drug, nor did any of them clean their mixer following discharge of a feed containing a drug with a

Table 2. *Summary of Ingredients and Feed Quality*

Component	Average	High	Low
Protein (% of label)	98.9	103	91
Mixing CV percentage	12.9	33.6	3.9
Particle size (micron)	812	1075	581
Drug assay	85.4	103	15

Table 3. *Information Sources for On-farm Feed Manufacturers*

Topic	Feed supplier	CES	Vet	Other
Feed ration	70%	25%	5%	5%
Ingredient price	85%	0%	0%	10%
Ingredient quality	70%	15%	0%	0%
Sampling methods	35%	20%	0%	0%
GMPs	5%	5%	0%	15%
Laboratory assays	70%	25%	0%	0%
Drug use	65%	0%	70%	25%

withdrawal time. Although sequencing may be an adequate method of preventing cross-contamination of feed containing a medicated feed additive requiring a withdrawal time, 60 percent of the producers in this study did not keep adequate records to validate that a sequencing pattern was followed from one day to the next.

Feed carryover was measured in 13 of the 18 portable grinder-mixers (two systems did not contain cleanout ports, and three systems inadvertently were not measured). The amount of feed carryover for these portable grinder-mixers averaged 18.1 kilograms (39.7 pounds) or 0.70 percent, with a high of 36.3 kilograms (80 pounds) and a low of 1.4 kilograms (3.2 pounds). In five cases, the amount of feed carryover exceeded 1 percent of the batch size. As little as 1 part per million (ppm) of sulfamethazine, or 1 percent carryover between feed batches, can cause violative tissue residues (Franco et al., 1990).

Feed Processing Information

Study participants were asked to identify their primary information sources regarding various feed processing issues (Table 3). In all cases except GMPs, study participants used their feed ingredient supplier as their primary information source. For some feed-processing issues (drug use and feed rations), study participants utilized several information sources. In several cases, such as ingredient sampling and GMPs, study participants did not seek out information because they were unaware of the need for it in relationship to feed processing and quality assurance. Two information sources identified as "other" in Table 3 represent trade magazines and the National Pork Producers Council's PQA program.

Because of the close proximity of Clay County to Kansas State University, it was assumed that a bias toward Extension personnel might occur. Either this assumption was incorrect or an even greater percentage of on-farm feed manufacturers throughout Kansas rely upon their feed ingredient supplier for technical information. Regardless, to effectively communicate information pertaining to feed processing and quality assurance programs, study results indicate the feed ingredient supplier and veterinarian should be involved as educators.

Training Material

Current Extension material pertaining to on-farm feed manufacturing was nonexistent. Quality assurance material developed by the National Pork Producers Council and National Cattlemens Beef Association were evaluated to identify information gaps and consider how new training material would augment existing quality assurance programs. The project team and steering committee met several times to discuss a strategy for developing training material. As an outcome of these discussions, the group chose to prepare a series of Extension bulletins; these bulletins would focus on single issues and provide greater depth on a specific topic.

The preparation of individual bulletins would permit distribution of one or several bulletins on a select topic that addressed a producer's educational need. Such a strategy also would permit more frequent updates of time-sensitive information and

permit a diverse group of research, Extension, and industry personnel to participate in the writing process. The following bulletins were developed for the *Feed Quality Assurance Handbook*:

- *Sampling Feed Components and Finished Feeds*
- *Evaluating Feed Components and Finished Feeds*
- *Mycotoxins in Feed Grains and Ingredients*
- *Bagged Ingredient Storage*
- *Bulk Ingredient Storage*
- *Preventative Maintenance for Feed Processing Facilities and Equipment*
- *Medicated Feed Additives for Swine*
- *Medicated Feed Additives for Cattle*
- *Hammermills and Roller Mills*
- *Evaluating Particle Size*
- *The Effects of Diet Particle Size on Animal Performance*
- *Testing Mixer Performance*
- *Rotating Drum Mixers*
- *Portable Grinder-Mixers*
- *Premixing*
- *Avoiding Drug Carryover During Feed Processing and Delivery*
- *Rights and Liabilities Arising From the Sale of Defective Agricultural Goods*

The need to develop an on-farm feed manufacturing recordbook was discovered during Phase I of the project. Since many farmers are accustomed to keeping pesticide application records in a pocket recordbook, a similar format was adopted for this project. A GMP self-audit, similar to the survey form used during the farm visits, was included in this publication entitled *On-farm Feed Manufacturers Quality Assurance Pocket Manual*.

A new employee training video was prepared detailing the GMPs within the context of on-farm feed manufacturing. This piece was the last part of the project training material to be developed.

Project Changes

Several changes occurred as an outgrowth of information gained in Phase I. The project team discovered a need for a pocket recordbook that also included a self-audit checklist of the GMPs. This booklet was developed in addition to more detailed information bulletins contained in a *Feed Quality Assurance Handbook*.

Second, it was discovered that commercial feed manufacturers and veterinarians were the primary sources of information for on-farm manufacturers. In view of this discovery, feed manufacturing workshops were conducted for these groups rather than Extension personnel. Extension personnel can perform an important function in assisting farmers in complying with GMPs; however, such an undertaking will likely require a multistate approach. Training material for this type of endeavor is now available.

Accomplishments of the Project

Through the on-farm surveys, individual reports, and county summary, on-farm feed manufacturers in Clay County became more knowledgable about the role of GMPs in their feed processing operations. Individual follow-ups revealed producers adopted many of the suggestions offered in the individual reports. Farming is a competitive business, and often there is little incentive to share information with neighbors. However, farmers who were early participants in Phase I were instrumental in convincing their neighbors to cooperate, resulting in 100-percent project participation.

The comprehensive evaluation of every on-farm feed manufacturing system in one county revealed a wide range of practices. For example, while some flagrant GMP violations were observed, it was also found that many on-farm feed manufacturers produced excellent feed.

It was discovered that old Extension bulletins contained some inaccurate information pertaining to mixing times required for portable grinder-mixers. The survey also revealed the knowledge level of producers as it relates to the GMPs and avoiding drug carry-over.

Earlier work by the Cooperative Extension Service in the form of a drug residue avoidance program has helped educate farmers about the importance of sequencing feed batches when using a withdrawal drug. However, most farmers did not understand the link between feed production records and ensuring that sequencing feed rations were correctly performed. A second study was conducted in a different Kansas county and similar trends were observed regarding GMP compliance and feed quality.

Two of the greatest surprises in Phase I were the reasons why farmers manufacture their own feed and their primary information source. On the sur-

face, it appears illogical that farmers believe they could manufacture better feed than commercial feed manufacturers, yet they would seek advice on many feed manufacturing topics from these same individuals. This apparent conundrum is explained by the issue of grain quality; producers were suspicious of the quality of grain used in commercial feed while they were confident of the quality grain they used in manufacturing their own feed. Since commercial feed manufacturers are the principal information outlet to on-farm feed manufacturers, Extension training material should be channeled through commercial feed suppliers.

Phase II accomplishments consisted of developing and distributing new Extension material aimed at improving on-farm feed quality, regulator compliance, and production efficiency. Several trade magazine articles assisted in stimulating interest in this information in the United States and Canada. Portions of this material have been translated into Spanish for use in Mexico and the entire *Feed Quality Assurance Handbook* has been translated into Chinese and distributed throughout that country by the U.S. Feed Grains Council.

State grain and feed associations have assisted in the distribution of the *On-farm Feed Manufacturer's Quality Assurance Pocket Manual* via their members who service on-farm feed manufacturing accounts with premixes, basemixes, and supplements. On-farm feed manufacturing is now a topic presented at all Grain Science and Industry training sessions for commercial feed manufacturers. Information developed by K-State faculty is now used by some major commercial feed manufacturers as training material they share with their farmers. In addition, training material has been shared with veterinarians at several region conferences conducted in the upper midwest of the United States.

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KANSAS STATE UNIVERSITY
ON-FARM FEED MANUFACTURING
SURVEY FORM

SECTION I — IDENTIFICATION

Date of inspection _____
Firm name _____
Address _____
Telephone _____
Type medicated feed manufactured: Sale _____ Own use _____

SECTION II — BACKGROUND INFORMATION

Type of Operation:

◆ **HOGS**

% sold as feeders _____ % sold as market hogs _____ % sold as breeding stock _____
Farrow to finish _____ Number of sows _____ Number of pigs marketed/year _____

◆ **CATTLE**

Cow-calf _____ Other _____
Number of cows _____ Number of cattle marketed/year _____

Feeding System/Program:

1. Tons of feed manufactured per week _____ Hours per week making feed _____
2. Separate conveying/distribution system for medicated and non-medicated feed _____
   Delivery system type: Wagons _____ Portable grind/mix _____
3. Feed cost/pound of gain _____
   Feed conversion _____
4. Do you mix? Grain & supplement _____ Grain, protein & basemix _____
   Grain, protein, calcium, phosphorous & premix _____

History:

Length of time manufacturing feed _____

Rank the following reasons for manufacturing feed:

A. Cost of manufactured feed lower than purchased feed _____
B. Quality of manufactured feed higher than purchased feed _____
C. Convenience _____
D. Value added to grain _____
E. Dispose of poor grain _____
F. Other _____

Information source for the following practices:

Formulations _____
Ingredient price _____
Ingredient/feed quality _____
Sampling method _____
GMPs _____
Labs and analyses _____
Use of medicated feed additives _____
How to manufacture feed _____

225.12 BUILDINGS AND GROUNDS

1. Is there adequate shelter for grinder/mixer? Yes _____ No _____
2. Can drugs be separated from other agrichemicals? Yes _____ No _____
3. Do buildings minimize rodent and pest infestations? Yes _____ No _____

Comments: _____

_____

225.135 WORK AND STORAGE AREA

1. Is the work area and equipment for feed **not** used for manufacturing or storing agrichemicals?
   Yes _____ No _____
2. Is the work area and equipment used for production or storage of medicated feed or components separate from agrichemicals? Yes _____ No _____
   _____ Empty bags present – used to store other material
   _____ Pesticides, rodenticide
   _____ Other contaminants: specify _____

Comments: _____

_____

225.130 EQUIPMENT

◆ **SCALES**

1. Are scales and liquid metering devices checked annually? Yes _____ No _____
2. Are there proper breaks? Yes _____ No _____

◆ **GRINDING**

1. Is particle size of ground grain known? Yes _____ No _____
   Dgw _____ Sgw _____
2. Hammer number _____ Hammer dimensions _____ Hammer wear _____
   Screen size _____ Screen condition _____
   Diameter of hammer circumference _____
   Clearance between hammer and screen _____ Shaft rpm _____
3. Roller dimensions _____ Corregation _____
   Differential speed _____ Gap _____
4. Is equipment in clean, orderly condition? Yes _____ No _____

   PERFORMANCE CHECK:
   Dgw _____ Sgw _____ Grain _____

◆ **MIXER**

1. Is mixing capability measured? Yes _____ No _____ _____ CV
2. How was the mixing time selected? _____
3. Minutes per mix _____
4. Mixer type _____ Manufacturer _____ Model _____
   Capacity _____
5. Sequence of ingredients into mixer _____

   PERFORMANCE CHECK:
   Survey results; CV _____

Equipment Description

Equipment description and dimensions	Power requirement and capacity	Age and condition	Percent use	Floor type	Original cost

225.142 FEED AND DRUG COMPONENTS

1. Are 1900 drugs present at nonregistered mill? Yes _____ No _____
2. Are drug codes recorded or compared to invoice? Yes _____ No _____
3. Have drugs passed expiration date? Yes _____ No _____
4. Are drugs used according to label? Yes _____ No _____
5. Are drugs kept in original/closed container? Yes _____ No _____
6. Are separate scoops used for each drug? Yes _____ No _____

FEED INGREDIENT LIST

Product name	Drug A.I. and potency	Cost	Quantity of purchase and unit size	Payment

INGREDIENT CHECK

1. Do you inspect incoming ingredients? Yes _____ No _____
2. How frequently? _____
   If no, why not? _____
3. Method of inspection: Visual _____ Smell _____ Lab assay _____

Feed/Ingredient Assays

Soybean meal: _____
Grains: _____
Finished feed: _____
Other: _____

225.158 ASSAYS

1. Are drug assays performed on finished feed? Yes _____ No _____
2. Is drug inclusion rate within acceptable range? Yes _____ No _____
3. Was there a follow up investigation if not in range? Yes _____ No _____
4. Were records kept for one year? Yes _____ No _____

PERFORMANCE CHECK: DRUG _____ ASSAY RESULTS _____
Inclusion _____ Drug _____

225.165 EQUIPMENT CLEANOUT PRACTICE

1. Does the grower sequence feed? Yes _____ No _____
2. Does the grower flush between medicated feeds? Yes _____ No _____
   When? _____
   How is flush handled? _____
3. Are there scheduled cleanings of the mixer? Yes _____ No _____

PERFORMANCE CHECK: Weight of cleanout material _____

225.18 LABELING

1. Do all feed ingredients delivered to the farm have labels? Yes _____ No _____

   Exceptions _____

2. Does grower toll mix feed for the neighbor? Yes _____ No _____
3. Is toll feed accompanied with a label? Yes _____ No _____

225.202 RECORDS

1. Do records show formulation, mixing date, and distribution of feed?
   Yes _____ No _____

   Exceptions _____

2. Are records kept for one year? Yes _____ No _____
3. Are there sufficient drug records for tracking in feed? Yes _____ No _____
4. Can system be validated by reconciling feed produced with pounds of drug used?
   Yes _____ No _____

   Results _____

5. Can you accurately estimate feed cost/pound of gain? Yes _____ No _____
6. Can you figure feed shrink? Yes _____ No _____
   Percentage_____

TIME MOTION SURVEY

Seconds	Activity

SWINE DIETS

1)

2)

3)

4)

5)

6)

7)

8)

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

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