Costs of Producing for an Identity-Preserved (IP) Grain Market: A Case Study

By Dr. Cole R. Gustafson

Abstract

Demand for identity-preserved (IP) crops produced by Northern Plains farmers is increasing. Buyers are willing to pay a premium for grains that can be guaranteed to possess a unique characteristic.

IP crop production often requires several unique management practices. These include greater investment in segregated storage facilities, more meticulous production, isolation, added cleaning/sorting, documentation, greater testing, additional marketing, and risks of liability. To illustrate the economics involved, a case study on producing certified wheat seed for sale to other farmers is used as an example of IP grain production. Many of the concepts and specific practices of certified seed production are applicable to most IP crops raised.

Demand for IP Crops Increasing

Demand for identity-preserved (IP) crops produced by Northern Plains farmers is increasing. Buyers are willing to pay a higher price (a premium) for grains that can be guaranteed to possess a unique characteristic. These special attributes may include a specific varietal/cultivar composition that relates to physical attributes such as seed color (white wheat) or metabolic factors (high oil, protein, phytochemicals). Some market outlets provide premiums for specific cultural practices (organic). Genetic modifications (GM) may encourage new IP markets for varieties with inserted genes and likewise demand for genetically pure non-GM varieties.

There are several reasons why premiums for IP crops are increasing. First, grain processors have found that farm commodities, once thought to be homogeneous, are much more heterogeneous than previously thought with respect to quality, traits, and other characteristics. Protein, oil, starch, and organic matter vary greatly by variety, region, and production method. More importantly, they have learned that producers can control many of these trait and quality levels with management. Therefore, processors are willing to pay management premiums to farmers for this expertise Grain processors then utilize these special products in their processes, which enables them to reduce manufacturing losses (Wilson) or secure a market premium for a unique differentiated product. Processors have developed exacting methods and equipment to maximize efficiency in the production of a consistent quality product. The uniformity available in an IP crop provides stability at the processing level and fewer adjustments, such as

Dr. Cole R. Gustafson is professor, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo. The author gratefully acknowledges the contributions of David Kraenzel, Tom Sinner, Tom Teigen, and Dale Williams, several certified seed producers who provided key financial and production information.

blending and recipe changes, required to achieve consistency. Processors want their product to look and taste the same today, tomorrow, and next year in order to build market acceptance.

Food safety concerns among the general public, especially in foreign countries that import products raised in the Northern Plains, are also motivating greater IP. As risks of product contamination and liability increase, food manufacturers desire assurance that their ingredients meet specified quality levels. Complete assurance only occurs when traceability and source verification maintain the identity of individual growers through the point of eventual sale to consumers.

Consumer preference and trade policies have stimulated greater demand for IP grain products. In particular, biotechnology has altered the genetic composition of several crops. Consumer acceptance of these crops and market products varies greatly by region and country. These differential levels of demand offer arbitrage opportunities to farm markets who can assure IP of their grains.

Another important reason is the move from one or two government buyers in foreign countries (e.g., Mexico) purchasing most of a product, to many private buyers wanting to differentiate their brands to consumers.

Finally, technological advances have lowered the cost and provided increasing sophistication of quality/trait testing. Tests that previously could only be conducted in laboratory settings are now commonplace in elevators and farms. In addition, greater precision enables buyers to more keenly distinguish between product lots.

Developing an IP Strategy for Production

Producers must carefully analyze premiums offered in the marketplace to assure that the added costs of producing and marketing an IP crop are covered. North Dakota farmers have an advantage over producers in other regions of the United States because they have experience with crop segregation at marketing. Many small grains have historically been sold to buyers on the basis of variety, for example. However, many of the new opportunities for IP grain production will involve smaller quantities and greater levels of specificity than past markets have required. This implies that individual producers will have to devote more effort to identifying and preserving market opportunities.

Although grain production methods for each specific IP market do vary, there are several general practices that apply to all. These include greater investment in segregated storage facilities, more meticulous production, more field isolation and stance, added cleaning/sorting, greater testing, additional marketing, and risks of liability. To illustrate, the economics of producing certified seed for sale to other farmers is used below as an example of IP crop production. Many of the concepts and specific practices of certified seed production are applicable to most IP crops raised.

Growing Certified Seed, an Example of IP Production

In 2001, North Dakota farmers raised and inspected 311,182 acres of certified seed. Inspections were conducted by the North Dakota State Seed Department. Producer interest in certified seed has continued to grow over time as more differentiated crop varieties and specific end-use crops have come to market:

Year	Acres Planted	Number of Growers
1992	190,365	684
1993	222,726	874
1994	222,718	771
1995	230,248	866
1996	282,402	885
1997	262,966	900
1998	304,112	1,560
1999	220,589	646
2000	311,182	1,019

Certified seed acreage represents 1.5 percent of all total harvested cropland in North Dakota.

The purpose of certified seed production is to take registered seed of new crop varieties, increase volume, and sell the production to farmers desiring to improve the genetics of the varieties they raise for commercial (commodity) production.

The certified seed increase system is a limited generation pedigree program designed to maintain the enhanced performance and quality traits of a variety as described by the releasing plant breeder. Foundation class seed is used to produce registered class seed, which is then planted to produce the certified seed class. Seed may come from either a public university or private company. Some scarce varieties are difficult to obtain. Certified seed is recognized as genetically pure seed capable of enhancing yield and quality attributes when planted for commercial (commodity) production. Special care in production, handling, and distribution is needed to ensure identity and genetic purity. Certified seed production is governed by the State Seed Department as outlined in the North Dakota Century Code Sections 4-09-16. Eligible growers must meet certain crop rotational requirements, isolation restrictions, allow inspections, and meet quality standards for weeds/diseases. A Seedstocks Policies and Production Handbook, How to Certify Your Seed, and North Dakota Seed Certification Standards is available to familiarize growers with program policies and agronomic practices necessary for successful crop management.

The Case Study

To illustrate the economics of producing an IP crop, ten (10) certified wheat seed producers in the region were interviewed and queried about the specific additional tasks and costs incurred when producing certified seed. The practices and expenses reported below are not the average or typical level reported. Instead, they represent a reasonable aggregation and array of tasks a new IP crop producer must consider prior to production. Depending on the specific market chosen, resources available, and level of tolerance, the expenses incurred may vary from the illustrated amount.

Investment Required

The producers interviewed stated that the amount of financial capital needed to invest in IP crop production is minimal compared with other farm enterprise or value-added opportunities. In most cases, small modifications to existing equipment is all that is required (as described later). Two exceptions are smaller storage bins to hold segregated grain and cleaning equipment. The latter service is readily available commercially in most areas.

However, most producers indicated that the level of additional human capital (your time and knowledge) that is needed to initiate IP crop production is large. In addition to just acquiring basic production knowledge, considerable effort must be devoted to securing IP markets.

Securing a Market

The essence of IP grain production is the planting of a crop in a unique way (either genetic trait or production practice) for a market that offers a premium to compensate producers for the additional costs involved. Successful IP grain producers have specific markets identified before their production season. This affords them the opportunity to tailor their production and management practices in a manner that maximizes desirable end-use characteristics.

The producers interviewed indicate caution must be exercised to ensure that contract specifications are fair to both parties and that the capabilities to successfully fulfill the obligation are present. As IP contracting becomes more prevalent, increasing numbers of opportunities will be presented to producers. Given the wide variation in contracting arrangements that presently exists in the marketplace, the single most important factor influencing the profitability of an IP crop was the effort they devoted to securing a market offering the greatest return.

In addition to contract production, the other means of securing an IP market that these producers used was through private sale to either an individual or company. In doing so, they assume the risk of marketing and may or may not have a guaranteed sale at the end of the crop season. A few producers conducted market research prior to the production year to ascertain the quality and volume of the specific IP crop that they were considering producing. Advertising to farmers, commercial processors, and consumers was usually necessary. Most producers extended seasonal credit to entice sales. Although low repayment risks were reported, it is still an important factor to cost of doing business. Those extending seasonal credit all reported bad checks and defaults are a normal transactional cost of doing business.

The amount of time spent obtaining an IP market, either by contract or private sale, is a cost of production. In the example below, it is a fixed cost that will be allocated to each unit of production sold. These costs include the amount of time producers and others spend researching opportunities, compiling data on past performance of their unit, advertising, negotiating terms, completing paperwork, and developing reports.

Finally, the producers felt that specialty IP crop markets are very dynamic and change over time. Greatest profit opportunities accrue to producers who recognize market voids and provide products first. Over time, as other producers learn of the opportunity and also supply products, profit margins diminish-thus, the crop becomes a commodity. IP crop producers continually seek out new market niches.

Field Selection

Field selection for IP crop production was done with considerable care. In general, selected fields offered the highest potential for production. Since overall investment in an IP crop will surpass other fields of commodity production, they desired the highest probability of success. Fields chosen were free from noxious and other weeds that may reduce quality or raise cleaning costs. In addition, the topography of the field allowed access in difficult climatic conditions because several production practices were very time-sensitive.

A cropping history was available for each parcel and kept on record. The history included previous crop, variety, fertility, weed/insect/disease problems, pesticide applications, and other pertinent agronomic practices. A four-year rotation is the minimal recommended interval between varieties of same or similar crops, whenever possible. In dry climates where volunteers can emerge two and three years later, consistent rotations of the same varieties can be an advantage. No-till can be a problem due to lack of regrowth in the fall.

Selected fields were isolated from neighboring fields of the same crop to prevent cross pollination and mixing during planting and harvest. Field boundaries were clearly defined and properly isolated. Regulations vary by each crop. Traditionally, a five foot isolation strip (mowed, planted to another crop, or uncropped) was required for many small grains. Recent concerns expressed by consumers of organic products has resulted in expanded isolation guidelines for certification of those IP crops. At present, North Dakota Department of Agriculture guidelines suggest a minimum border of 300 feet to a similar crop. In the future, eventual purchasers of IP crops may place additional restrictions on isolation boundaries products moving to specific markets.

Production of an IP crop usually restricted activities that would normally have been performed on a parcel(s) of land bordering the field selected for IP production. Thus, it is an economic cost that needs to be considered. In most cases, the crop planted to preserve quality of the IP crop was less profitable than the one that would have been planted instead.

Crop Production Activities

For the most part, crop production activities did not differ between IP and traditional crops. Thorough tillage, top variety selection, adherence to fertility recommendations, optimal seeding rates, timely planting, and constant monitoring of weed/pest problems are all required-typical attention that producers would give to their most important traditional crops.

But, since quality standards for IP crops may be higher than traditional market opportunities, several additional costs were incurred. For example, tolerances for weed seed and other foreign matter are lower for most IP crops. Fields may need to be rogued to remove undesirable or variant crop plants. In some cases, offending plants are of such harm that they may have to physically be removed from the IP field, again at additional cost. Producers routinely planned on several additional days devoted to crop monitoring, roguing, etc.

Given the value of an IP crop, breakeven analyses lead most producers to conclude that additional crop treatments (pesticides) are now economically justified.

Many IP crops command a premium because a seed variety with unique qualities or traits is required for production. This uniqueness often leads to scarce seed supplies at planting. IP crop producers frequently have to develop agronomic management strategies that maximize low seeding rates, if seed supplies are limited. Seeds in most limited supply were planted at less than one-half of recommend rates.

Operating Credit

A study of agricultural lending practices in North Dakota found few lenders familiar with the credit needs of value-added crop producers (Gustafson, Beyer, and Saxowsky). In general, credit availability and borrowing limits were constrained to those of traditional crop producers. Providing producers had a good credit history and could document their added borrowing needs, additional financing was widely available from other commercial non-farm lenders, at greater cost.

Harvesting, Handling, and Storage

If the production field was planted with contamination-free equipment and adequate isolation procedures are followed, IP crops are usually pure and free of foreign matter up to the point of harvest. The producers reported that most contamination of IP crops occurs at or following harvest when mixtures of other crops/varieties are introduced to the lot they are trying to preserve. IP crop producers must insure that harvesting, handling, and storage equipment facilities are cleaned out thoroughly to avoid mixtures of other crops and varieties. Certain foreign matter can render an entire lot worthless.

Appendix A illustrates combine modifications that were made to ease the task of routine clean-out. These modifications require only miscellaneous parts and operator time (about one day of labor).

The producers completely cleaned out of their combines before the harvest of any IP crop. Compressed air and vacuums were used to remove kernels from all crevices. Headers were cleaned, especially pans and corners of augers. Feeder houses were reversed and blown out. All augers were opened and cleaned out. Holding bins needed special attention as kernels can easily lodge in cracks under sheet metal. Cleaning occurred under all shields and covers. Sieves needed to be removed to prevent errant kernels from re-entering the machine. Finally, the machine's exterior, especially the cab was not forgotten. Crop residue on top of the cab can easily fall in a header and contaminate a crop if a quick stop is made.

The time spent cleaning (about eight hours/clean-out) was viewed as a required cost that also was budgeted for.

Even with thorough physical cleaning, producers remarked that it is impossible to remove every contaminant. Therefore, they recommended that the first fifty bu. of crop harvested be discarded and sold as common commodity. The lost revenue from this disposal also needs to be considered in the final pricing of an IP crop.

Conditioning

All IP crops were conditioned to meet highest standards possible. Conditioning is done for two purposes: to remove foreign matter and to size the kernels into uniform lots. The most frequent equipment used are air screen cleaners and gravity table separators.

Common industry standards for small grain certified seed are:

Factor	**Tolerance**
Pure Seed	99.0% (minimum)
Total Weed Seeds	10 per pound (maximum)
Other Varieties	3 per pound (maximum)
Other Crops	3 per pound (maximum)
Inert Matter	1.0% (maximum)
Prohibited Weeds	none
Objectionable Weeds	1 per pound (maximum)
Germination	85% (minimum)

Current specifications and quality standards are published by the North Dakota State Seed Department.

Testing

As a routine part of the conditioning process, representative samples were collected from each lot and retained for a minimum of two years. Depending on specifications outlined by IP buyers, testing of each sample, especially for disease and/or foreign genetic material, may also be required.

If the IP crop produced was intended to be sold as certified seed, additional testing was necessary. Part of the sample taken above was submitted to the North Dakota State Seed Department for germination testing, purity analysis, and final certification (Sinner). Samples of each lot must be retained for two years. Testing results must be retained for three years after the last sale has been transacted.

Given heightened consumer interest in biotechnology and crop production, several methods are available to detect the presence of biotech content in IP crops. A pre-emergence treatment and germination test for determining the presence of the Roundup Ready gene has recently been developed by Iowa State University and approved by Monsanto. Seeds are embedded in a 2 percent solution of Roundup formulation, germinated, and evaluated. Seedlings with Roundup Ready genes develop normally.

A more sophisticated technique, called the polymerase chain reaction (PCR) can be used to detect specific foreign material inserted into the plant's DNA. In PCR, DNA fragments are separated on a gel and the size/intensity of the DNA band produced is examined. The test is only available commercially and not readily adaptable on-site. The test takes from 2-10 days and costs $200-$400 per test. The test can detect 0.1 percent biotech content in a sample.

A third method for detecting biotech content is the protein-based enzyme-linked immunosorbent assay (ELISA). The ELISA test analyzes for a specific antibody reaction that marks the presence of biotech material. The test takes two days at a cost of $70 per test.

Again, all of these testing costs are included below when computing total costs of producing an IP crop.

Legal Disputes

As with any commercial transaction, legal disputes do arise with the sale of IP crops and certified seed. Contamination and lack of seedling performance are the most frequent complaints. When a dispute arises, producers can petition a hearing before the North Dakota Seed Arbitration Board (Knutson). It is a voluntary process that yields a nonbinding settlement recommendation. Although disputes arise infrequently, it is a cost of business that certified seed producers plan for.

Additional Costs of Production and Sale

These producer interviews and prior studies of certified seed production (Spilde) provide cost estimates for small grains that may be useful for planning purposes. Since every farm operation differs and each IP crop opportunity is unique, estimates for an individual IP crop should always be determined. These costs of production should be considered additional to the costs normally incurred for commodity production:

Item	**Planning Cost ($/bu.)**
Extra seed cost	.20
Additional chemicals	.15
Isolation cost	.10
Roguing	.10
Equipment clean out	.40
Conditioning	.80
Clean out (loss of market value)	.20
Packaging	.75
Lab/testing/certification fees	.10
Warehousing	.30
Insurance and handling	.15
Transportation	.20
Risk (lack of sale)	.25
Management (additional attention)	.75
Interest (6 mo. @ 10%)	.23
Total	**$4.68**

Extra seed costs represents the added costs producers must pay above commercial seed prices for the specific seed they require. In this example, registered seed must be purchased to produce certified seed. Additional chemical costs are the expected additional expenses needed to control weeds and pests in the IP crop. Fewer weed/pest damage and foreign material increases quality/yield and lessens conditioning expenses later.

Isolation cost is the lost profit on the acreage bordering an IP crop plot on which producers are not able to raise a crop. The total value of the lost acreage is divided by the amount of IP crop bushels sold to place the value on a per unit basis.

Roguing expenses are the value of labor necessary to physically remove weeds, foreign varieties, and other unwanted plants from the plots. Likewise, equipment clean out is the value of labor needed to completely clean out a planter, combine, storage, and handling equipment.

Conditioning expenses are the operating and ownership costs of using the equipment to clean an IP crop. Costs include investment, labor, repairs, electricity, and other operating costs. The value listed here is similar to that charged by commercial conditioners. Clean out costs are the loss in value of material cleaned out from an IP crop during conditioning. Normally, it would be sold with the crop at market prices, but now has minimal feed value.

Packaging identifies the costs of boxing/bagging the product for sale. Increasing volumes of certified seed are being purchased bulk, so this cost would be negligible. However, other IP crops may have very specific and expensive packaging requirements.

Lab testing and certification fees are the monies needed to test the quality of an IP crop and certify that it does meet the quality criteria specified. Certification fees are based on a fixed per acre charge.

Warehousing fees are the costs of storing an IP crop from harvest until eventual sale. Most certified seed will be sold by early spring of the following crop year, but a small portion may remain unsold if demand is low. Costs in this example are based on a small 2,000 bushel hopper bin with expected storage of eight months.

Insurance and handling are costs of protecting and moving an IP crop on site. Transportation costs represent the expenses of hauling the IP crop to an eventual purchaser.

Risk is the value of unsold IP crop remaining at the end of the season, divided by all of the bushels that were sold. It may be unsold because it spoiled, went out of condition, or lacked demand from purchasers.

Management is a general charge representing the amount of time necessary to secure a market for IP crop sales and the additional attention required throughout the growing and processing seasons.

Interest is a return to the additional capital invested in your IP crop. It is derived assuming a 10 percent interest rate and six months of average investment.

For many of the cost items (seed, roguing, lab fees), little variation existed in producer responses, primarily because few scale economies exit. Greater variation was observed in conditioning, packaging, and management expenses where costs ranged from zero to 5x the acreage shown. Use of newer and more sophisticated equipment as well as greater time allocation resulted in higher costs. These expenses on a per bushel basis are also very sensitive to yield. Yields realized by these producers ranged from 60-100% of conventional yields on their farm.

Conclusion

This case study describes the array of additional activities and expenses that producers of an IP crop could reasonably expect to incur. Data for the case study was obtained from in-depth interviews of existing certified seed producers in North Dakota. Producers contemplating production or expansion of an IP crop are advised to review these items, but determine economic costs for their own individual situation because of the wide variation in location, resource availability, managerial ability and IP tolerance requirements.

References

Foundation Seedstocks. "Seedstocks Production Handbook" internal document, Plant Sciences Department, North Dakota State University, Fargo, September 1996.

Gustafson, Cole R. Informal phone conversation with North Dakota certified producers. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo, September 2001.

Gustafson, Cole R., Ronald J. Beyer, and David M. Saxowsky. "Credit Evaluation: Investigating the Decision Processes of Agricultural Loan Officers." *Agricultural Finance Review* 51(1991):55-63.

Kraenzel, David G., and Denise McWilliams. "Improving Farm Income Through Specialty Farm Products: A General Introductory Fact Sheet" SFP-001, NDSU Extension Service, North Dakota State University, Fargo, March 2001.

Knutson, Jeff, informal conversations, North Dakota Department of Agriculture, Bismarck, September 2001.

Sinner, Tom. Informal conversations, North Dakota Seed Department, Fargo, ND, September 2001.

Spilde, Leroy A. "Grower Premium on Increase Contracts," Internal memo, Plant Sciences Department, North Dakota State University, Fargo, December 1, 1995.

Teigen, Tom. Informal phone conversation, Agricultural Experiment Station, Agronomy Seed Farm, Casselton, ND, September 2001.

U.S. Department of Agriculture. "Economic Issues in Agricultural Biotechnology" AIB 762, Economic Research Service, Washington, DC, February 2001.

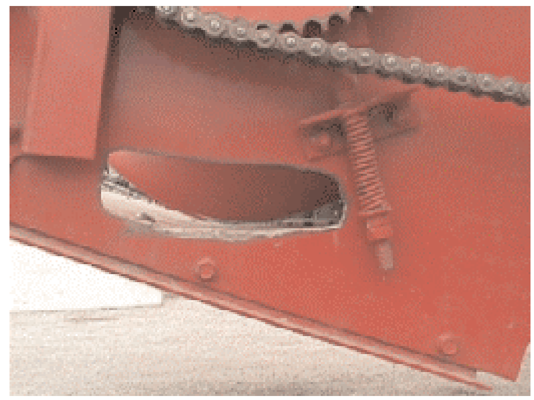
Wilson, William W., Donald Carlson, and Bruce L. Dahl. "Logistics and Supply Chain Strategies in Grain Exporting," AAE Report No. 457, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo, August 2001.

Appendix A

Shown in this appendix are combine modifications that operators harvesting IP crops typically make to ease the task of clean-out. These modifications can be made in an average farm shop and require about a day of labor.

Farmers who have made these modifications and have subsequently traded their machines in for new equipment did not report note any depreciation in value accruing from these changes.

1) Header



A hole is cut in one end of the header to blow grain out. Operators simply take an air hose, start in the far end and blow grain across the table and out the exit hole. It is difficult to blow the grain out of a header without the hole because wind in the corner catches kernels deflecting them back into the header. Vacuuming is difficult because it is difficult to reach completely around the auger.

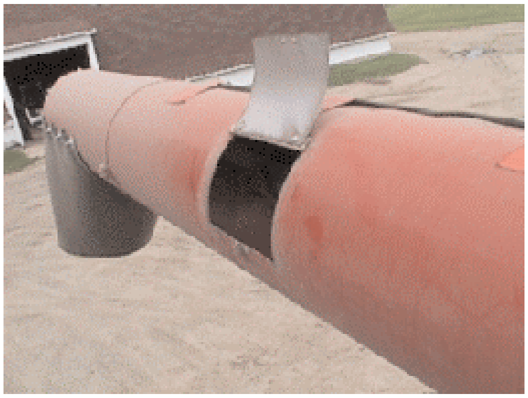
2) Feeder house

No modifications are made, but be sure to reverse and clean thoroughly. The rock trap should also be opened and cleaned.

3) Rotor

The rotor should be cleaned out from the front and sides by opening existing access covers

4) Unloading Auger



Large quantities of grain remain in most unloading augers, despite extended run-times that operators do in an effort to clean them out. IP crop harvesters cut removable doors in augers so they can reach in with an air hose to completely blowout the auger. Doors are cut and then secured with a hinge on one end and a latch on the other. During use, doors are taped shut with duct tape to completely seal the auger. Doors should be located close enough together so you can reach all points inside. Most unloading augers require at least four doors.

5) Grain Tank

Several modifications are needed to ease clean out of a combine's grain tank. First all safety shields and covers must be removed to gain access. Steps can be removed permanently if desired. Covers on augers can just rest on top of augers without securing nuts in most cases to ease removal. Adding a door to the sump of the vertical auger facilitates access and clean out. Note that this operator also added a small wood filler near the base of the sump to prevent kernels from falling into the tight bottom crevice.

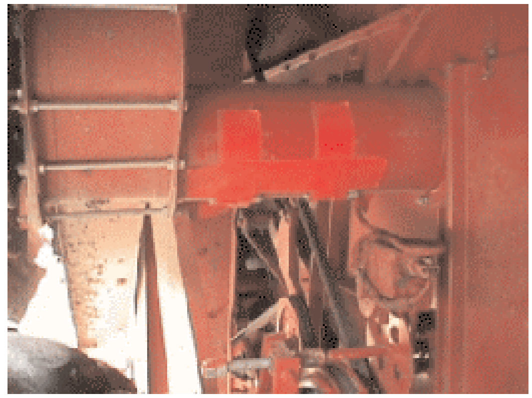
In addition, all exposed ends of sheet metal and corners should be caulked to prevent kernel lodging.

A door is also added outside the sump (exterior side of combine). The open door shows a clear view into the grain tank.

6) Horizontal auger

A door is added to the horizontal return auger. Note the door is taped with duct tape to seal joints.

6) Cab



Again, no modifications are needed. However, all crevices on top of a cab must be cleaned to prevent kernels from falling down into the header and re-entering the harvester.

7) Straw walkers/Sieves

Combine sieves should be pulled to facilitate clean out and re-entry of grain. One-way nuts and long bolts can be added to ease alignment and replacement.