Hay Stack Movers for South Dakota

Ted Welchart
Farmers and ranchers whose average hay production exceeds 350 tons per year have been faced with a serious labor shortage and are in need of a means of cutting the cost of production. As a result, a new method commonly called hay sledding has been developed. Hay sledding first began in the sandhills of Nebraska. This method spread to many surrounding areas when the application of power winches made it possible to use three-plow, and in some cases two-plow tractors, for this operation.

An operator with a large hay acreage has many problems. He wants the best quality feed he can produce and he must handle it as economically as possible. Haying season during his busiest period and extra labor is not readily available. Often his hay fields are several miles from the farmstead.

Most operators agree that field stacking is the cheapest method of harvesting hay crops for winter storage. The biggest objection to this method has been the hard job of getting this hay in from the fields to the feed lot. The hay sledding method has changed this situation. It is now possible to haul all the hay stacks in the fall during the more slack season. In most cases the operator can also feed his stock in a much shorter time.

Various machines have been developed, with many operators and mechanics contributing improvements so that no one individual can be credited with their development. Many of these machines were developed independently by individuals without knowledge of the existence of similar equipment.

Independently and collectively these ideas have resulted in the development of hay sleds, many of which have been used successfully for more than 10 years. The straight hay sled, the gooseneck, tilting flatbed, bulldozers, and tract-type tractors with low-boys or runners are a few of the machines used. All of these machines are used to haul hay stacks from the field where they have been stacked to the feed yard or one or more feed storage areas. So far two types have become most popular, the gooseneck and the tilting flatbed, illustrated in this circular.

*Assistant Agricultural Engineer, South Dakota State College Extension Service*
In position to load a five ton haystack on a gooseneck hay sled. The operator is placing a steel cable around the stack and is ready to hook the cable to the I-beam behind the 14’ x 18’ platform.

The operator engages the power-take-off driven winch and the stack twists on much like moving a heavy gas barrel. Note the “spud” brace behind, positively anchoring the tractor.

Hardly a pitchfork full is left where the stack stood. Most of the hay is hauled in September or during slack season. Six or eight such stacks moved is a good day’s work.

With the cable at the base of the stack, the table is posted up so the far side rests on the ground. The cable passes in front of the table over the I-beams.

The stack now loaded the operator checks the balance. Hooking up his two-plow tractor, he is off for the feed lot. When going down hill he uses caution because of the tremendous weight.

The stack is unloaded near the feedlot. Weather permitting, stacks are hauled from the field into the feedlot and pitched off, unloaded, or spread by a grapple hook mounted on the tractor.
Gooseneck Type

The "gooseneck" hay sled is designed for the smaller operator. It works well for stockmen who have 50 to 150 head of breeding stock. It costs between $600 and $1,000 to build complete with winch, spud, and cable. It is not as satisfactory for custom hauling as the tilting flatbed because it takes longer to load and will not stand up as well under varying sized stacks. Many operators have regretted loaning these sleds to neighbors because most non-sled owners build their stacks too large to handle efficiently with this equipment.

This sled has a 14' x 18' table supported by 8" H-beams or 10" I-beams. Old truck rear axles or reinforced front axles with 8:25-20 inch tires make the most desirable running gear.

Six to 10 Stacks

Six to 10 stacks may be hauled per day depending upon hauling distance.

The best stack size is around four or five tons and never to exceed six tons. The stacks are built round, approximately 16 feet in diameter, and generally when topped out should not exceed 20 feet in height.

This sled can be operated with some two-plow tractors but three-plow tractors are preferred.

A good commercial winch with a safe working capacity of 10,000 pounds is recommended. A winch may be made using old car or truck rear ends and tractor gears, however, homemade winches are hard to remount and cannot always be depended upon. In many cases they cost nearly as much to build as a good commercial winch of equal or greater capacity. If possible the winch should be mounted so that it pulls from the center of the drawbar.

The spud anchors the tractor. It must be sturdily built so that it will not buckle when pulling on a heavy stack. It should be six or more feet in length.

Steel Cable

The cable preferred by most operators is the "pre-formed" type. If the cable should break this type is not as dangerous in backlashing.

Approximately 100 feet of % inch cable is needed on the
winch. Sixty feet of \( \frac{3}{8} \) inch cable doubled to 30 feet, is used behind the stack. The operator places the lower cable on the ground at the base of the stack. He places the upper cable 18 to 24 inches upon the stack. This location of the cable forms a wedge of hay in twisting the stack on the sled. Some operators use a \( \frac{3}{8} \) inch single cable approximately 30 feet long; however, in dry native hay a single cable sometimes cuts through the stack.

The gooseneck sled does not have much clearance and is easily hung up on sharp knolls and ditches. In such cases it is often necessary to use the winch to break it clear again.

When operating in hilly country it is necessary to be careful at all times because tractor brakes will not stop a six ton load going down hill in high gear. Hills must be descended slowly in a lower gear. Brakes have been installed on some sleds. The hay stack and sled will not tip easily but the hitch may buckle and the tractor turn over.

In case of an overload where some hay may rub on the tires, it is advisable to clean the hay out because fire may result from friction. Several operators have lost both hay and equipment.

Special precaution is necessary for those who may want to ride on the table. Never step down in front of the wheels while in motion. Only a few inches clearance between the tires and platform will not give sufficient time for escape.

The spud and winch are mounted on the hitch. Winches made from old truck rear ends are used; however, in many cases commercial winches may be more economical and easier to operate.

**Tilting Flatbed Type**

The tilting flatbed sled is designed for custom work or the larger operator. It is capable of handling 10 to 20 stacks per day depending upon the hauling distance. A five to six ton stack works best for this sled. It usually costs from $1,600 to $2,000 complete.

The power take off driven winch is welded on the implement. It is capable of pulling a stack on by hooking the cable blocks to the stack cable. By changing to the pull-off beam cable the stack can be unloaded. The table is 12' x 22' supported by channel and I-beam bed structure and chassis allowing the table to tilt in much the same manner as an implement trailer. A latch assembly secures the table to the chassis. All materials are purchased from firms handling industrial and structural equipment except the truck axle. The truck rear axle must be of the full-floating type of at least 1½ ton truck size.

A three-plow tractor or larger is necessary to handle this machine satisfactorily. A sturdy hitch and frame is essential.

The winch should have a minimum safe working capacity of 12,000 pounds. Homemade winches may be made to work but are not generally recommended.

\( \frac{3}{8} \) Inch Cable

Approximately 350 feet of \( \frac{3}{8} \) inch cable is needed for the winch and pull-off beam assemblies. About 60 feet of \( \frac{3}{8} \) inch cable doubled is used behind the stack. Two 2½ ton blocks with swivel hooks and eight, eight inch sheaves are necessary for the pull-on and pull-off beam assemblies.
The tilting flatbed hay sled is like an overgrown implement trailer. A mounted winch and beam assembly is capable of loading and unloading a five or six ton stack. With the cable hooked behind the stack and the table in raised position, the operator engages the power take off and loading begins. The cable must be kept free from the bed. The stack is pulled on until the weight distribution is satisfactory. The blocks are disconnected from the stack cable and re-connected to the pull-off beam cable before leaving the field.

The blocks are pulled out and connected to the double cable behind the stack. The lower cable is placed on the ground and the upper from 18 to 24 inches above ground. The cables form a wedge of hay while loading. This stack was unusually large and odd shaped, having been built on the crest of a sharp slope. The diameter of the stack should not exceed 16 feet.

Gates and lanes must be wide enough to accommodate this system between the hay fields and the feed storage area. The operator has unloaded the stack and is replacing the pull-off beam.
The sheaves must be mounted so that they can be replaced easily when worn out.

Table planking, tires, sheaves, cable and possibly the winch and truck axles are the only items which will wear out with extended usage. Other items may have to be welded or otherwise repaired but need not be replaced.

**Backed to Stack**

With the tilting flatbed sled a stack may be loaded from any direction. The operator backs up to the stack and uses an old hay rope around the stack to pull out the cable blocks. Releasing the winch brake he drives forward to pull the blocks out. Disconnecting the hay rope he again backs up to the stack and carries the blocks back, connecting them to the double cable used to pull the stack on.

When the stack has been pulled on to the point of balance the blocks are disconnected from the stack cable and hooked to the pull-off beam cable. If too much weight is on the tractor, the operator engages the power take off and pulls the stack back. Having the blocks hooked to the pull-off beam before leaving the field has a dual purpose; he can control the weight on the rear of the tractor and he can dump the stack in case of fire or other difficulties by simply unhooking the latch assembly and engaging the power take off. It is possible for a fire to start if hay should ball up under the tires causing excessive friction in transit in the same manner as a locked brake on a truck.

Good sized ditches may be crossed diagonally, but only with caution. This machine will not tip easily but the tremendous weight behind may turn over the tractor.

Load distribution is important. Too much weight on the rear end of the tractor will cause the front end to rise, especially in climbing a steep hill. Caution must be used in making turns as a heavy load resists the change of direction. All road bed variations, culverts, bridges, trees, traffic lanes and gates must be considered when hauling hay stacks.

**Sled Construction**

Nearly all sleds are built by order. Blacksmiths and mechanics, make a large number of sleds and some specialize in one type. If possible, observe hay sleds in operation before selecting the type needed for your operation. It is recommended that some reputable blacksmith or mechanic with the facilities and know-how in procurement of materials be contacted.

There are very few industrial cities in South Dakota and the procurement of structural steel and other iron parts may be difficult in some areas. In some cases it may be necessary to purchase these materials from iron stores and structural steel firms in neighboring states.

The design of these machines has resulted from trial and error. If a piece bent it was reinforced. If it broke it was welded, and the next sled built had a stronger member. If a piece wore out the next sled was improved so that it could be easily replaced.

Sturdy construction of this equipment is largely dependent upon workmanship. Good welds are essential. It is important to note that the connection of any two pieces is only as strong as the weld.
Farming With Sleds

In areas where sledding has been used for several years, nearly everyone makes the same kind and size stack whether he owns a sled or not. He may hire someone to haul for him or he may plan to buy a sled; nevertheless he is prepared.

With both machines discussed in this circular, four to six ton round stacks are recommended. Such a stack is usually built 16 feet in diameter and about 20 feet high when topped out.

The tilting flatbed sled is able to haul larger stacks but the extra wear and tear on equipment is hardly worth it. Four to six ton stacks have many advantages. It is not necessary to haul hay as far in the stacking operation and this size lends itself well in transporting and feeding operations.

Round Stacks Best

Round stacks are made because in the loading operation rectangular stacks will not always pull on straight. With round stacks twisting is not a problem.

Most operators haul their stacks during the slack season before and after corn picking. One or several stack storage areas are selected near the farmstead so that in extreme weather conditions feeding can be accomplished without hardship.

As long as weather conditions permit some operators continue to haul from the field to the feed lot, or they may reload a stack from the storage area and haul it to the feed lot.

Because of the danger of losing the entire feed supply from fire, it is advisable not to haul all stacks into one feed area.

It must also be noted that some operators clean a field off which they want to use for fall grazing.

Wide Gates Needed

Most farm gates and lanes are built to accommodate the largest piece of field equipment on the farm but in many cases it may be necessary to relocate or enlarge all gates and lanes through which the stack must pass.

Hay sleds may be used to transport field equipment, buildings, rough feeds and many other items.
Note especially the rear sheave assembly for the "pull-off beam." It is welded to the rear cross beam. Also notice the runners connecting the extended table to the bed support.

Safety Precautions

- Caution must be used at all times, remember the tremendous weight on this equipment.
- Winches are powerful, something must give.
- Take it easy and keep control going down hills.
- Don’t allow children to ride on equipment.
- Keep your balance at all times, do not step in front of the wheels.
- Watch your helper.
- Guard against fire; carry a fire extinguisher.
- Watch for traffic on the road.
- Form correct operating habits.

Plans Available

Working plans and parts lists are available for hay sleds illustrated in this circular from: Extension Agricultural Engineer, South Dakota State College, College Station, South Dakota.

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For South Dakota

By Ted Welchert

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In position to load a five ton haystack on a gooseneck hay sled. The operator is placing a steel cable around the stack and is ready to hook the cable to the I-beam behind the 14' x 18' platform.

With the cable at the base of the stack, the table is posted up so the far side rests on the ground. The cable passes in front of the table over the I-beams.

The operator engages the power-take-off driven winch and the stack twists on much like moving a heavy gas barrel. Note the "spud" brace behind, positively anchoring the tractor.

The stack now loaded the operator checks the balance. Hooking up his two-plow tractor, he is off for the feed lot. When going down hill he uses caution because of the tremendous weight.

Hardly a pitchfork full is left where the stack stood. Most of the hay is hauled in September or during slack season. Six or eight such stacks moved is a good day's work.

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Six to 10 Stacks

Six to 10 stacks may be hauled per day depending upon hauling distance.

The best stack size is around four or five tons and never to exceed six tons. The stacks are built round, approximately 16 feet in diameter, and generally when topped out should not exceed 20 feet in height.

This sled can be operated with some two-plow tractors but three-plow tractors are preferred.

A good commercial winch with a safe working capacity of 10,000 pounds is recommended. A winch may be made using old car or truck rear ends and tractor gears, however, homemade winches are hard to remount and cannot always be depended upon. In many cases they cost nearly as much to build as a good commercial winch of equal or greater capacity. If possible the winch should be mounted so that it pulls from the center of the drawbar.

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winch. Sixty feet of $\frac{3}{8}$ inch cable doubled to 30 feet, is used behind the stack. The operator places the lower cable on the ground at the base of the stack. He places the upper cable 18 to 24 inches upon the stack. This location of the cable forms a wedge of hay in twisting the stack on the sled. Some operators use a $\frac{3}{8}$ inch single cable approximately 30 feet long; however, in dry native hay a single cable sometimes cuts through the stack.

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The power take off driven winch is welded on the implement. It is capable of pulling a stack on by hooking the cable blocks to the stack cable. By changing to the pull-off beam cable the stack can be unloaded. The table is 12' x 22' supported by channel and I-beam bed structure and chassis allowing the table to tilt in much the same manner as an implement trailer. A latch assembly secures the table to the chassis. All materials are purchased from firms handling industrial and structural equipment except the truck axle. The truck rear axle must be of the full-floating type of at least 1½ ton truck size.

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