Dual Tractor Control

C. L. Hill
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C. L. Hill, Agricultural Engineering Department, Purdue University

Part time additional tractor power can be obtained by hitching any two tractors together in tandem. With such an arrangement, one operator controlling both tractors has as much pulling power at his command as he would with a larger tractor.

Use of tandem tractors could be a boon to the many farmers who have expressed a need for more farm power. Since the average Indiana farm has three to five tractors, dual operation should involve little extra expense outside of that for larger plows and discs.

The same problems involved in operating single tractors are present in the tandem tractor unit, but they require different solutions. These are such problems as controlling the clutch, throttle and hydraulic system of the second tractor.

The photographs on the following pages illustrate a method of controlling the throttle and foot clutch of a trailing tractor with a single acting hydraulic ram. This system allows the operator to control both tractors from the lead tractor without turning or reaching for any lever or knob. Figures 2 - 6 also show the attaching frame, ignition cut-off safety switch and the manual switch.

Tractors hitched in tandem provide more power and less work for the operator. As pictured here, a farmer can do two normal operations at one time with a tandem unit.
Figure 1. During plowing season, the rear tractor would normally remain hitched to the six-bottom plow. When disconnected, its front end can be supported by a jack or wood blocks. Disconnecting the hydraulic lines and removing the drawbar pin unhitches the front tractor. It is then free to be used for any field work requiring its normal power, such as pulling a disc as shown here.

Figure 2. Hitching the two tractors for double pulling requires only a few minutes. After the plowing season is over, the front wheel pedestal of the rear tractor can be rebolted, making both tractors available for cultivation, haying and general farm use.
Figure 3. The drawbar of the front tractor is reinforced by channel iron (1). Extra support was added to hold the weight of the second tractor by bolting a second bar to the swinging draw bar (2). Bicycle tires (3) protect the hydraulic lines.

Figure 4. The operator controls the clutch and throttle setting of the rear tractor from the front tractor with a single hydraulic control lever. The hydraulic line (1) operates the small cylinder which is shown here extended six inches. Then the cylinder is extended, the foot clutch is disengaged. A two-way cylinder could be used for clutch control. Note that the spring (2) is tight and the chain (3) is slack. The slack chain indicates that the engine is throttled down to idle speed.
Figure 5. The clutch is engaged by opening a valve which causes the spring tension (1) to retract the cylinder. The travel of the clutch pedal tightens the chain (2), opening the throttle. The desired RPM setting is obtained by hooking the spring in the chain at the appropriate point. The pulleys circled in chalk guide the throttle chain. (See Figure 3 for the connection of the throttle chain to the governor control arm.) The framework for the rear tractor is also illustrated.

Figure 6. Jackknifing is the greatest hazard with tractors hitched in tandem. In case the tractors should jackknife, an ignition switch is mounted under the white spring bumpers on either side to automatically turn off the rear tractor engine. When jackknifing, the tire of the front tractor bumps one of these switches, thus opening the primary circuit of the ignition system. The cable leads were spliced into the primary circuit at (1). A second ignition switch, manually operated, was (also) wired in series and mounted on the front tractor within the operator's reach.
Figure 7. A larger disc may be the object for doubling up with two farm tractors. The maximum use of the tractor hydraulic systems and cylinders on the farm can make tandem power most productive. The higher tractor in front affords good visibility to the rear.

Figure 8. Note that steel pipe has been used here for hydraulic oil lines. This reduces the cost of the installation by two-thirds.

Figure 9. This view illustrates methods of support for oil lines and a manual throttle control rod. To reduce engine speed the operator must turn and pull the rod.
Figure 10. The frame for a trailing MM "ZB," represents the basic trailing tractor frame for any tractor whose front wheel pedestal is not removable. (1) is the drawbar pin, and (2) is an attaching tie bolt or bracket to hold the front end down on the frame (See (1), Figure 11). Bolts which connect the frame under the rear drawbar are at (3). The hydraulic cylinders are a substitute for other mechanical linkages.

Figure 11. The trailer frame is attached to this tractor with a bracket (1). A mechanical linkage operated by hand lever (2) depresses the foot clutch. The pivot bolt for the "mechanical foot lever" is at (3).

Figure 12. Front wheel removal is all that is necessary to allow the supporting frame installation. The chain (1) is an additional linkage between the tractor and the tandem frame. Hand lever (2) operates the two-way hydraulic control system of the trailing tractor to lift and lower the plow.
Figure 13. The tandem frame bolts to the draw bar at (1). Two-way hydraulic power from the lead tractor controls the hand clutch and throttle at (2). The hand lever connecting rod fastens to the hydraulic power control lever of the trailing tractor at (3) for plow control. An anhydrous ammonia tank is mounted on this tractor for nitrogen plow down.

Figure 14. A new tractor and an older one combine forces to give the plow power for this farmer. Note the removal of fenders and tractor seat for better rear vision. Tandem operations from the rear tractor is quite readily achieved where the units to be used are suitable. Chief considerations are that the front tractor have "Power Steering" and the rear tractor have at least a two and a one-way hydraulic control system.
Figure 15. This farm owner pairs two identical tractors or switches to another model tractor when soil conditions are right. This lead tractor is then freed for discing while the two in tandem are plowing.

Figure 16. A double-acting ram pulls the clutch pedal forward on this diesel, and at the same time activates the two springs connected to the throttle control. Therefore, by declutching, the operator idles the tractor. On this unit, a rope is required to shut off the diesel quickly. Electric cut-off devices that can be made automatic are available from manufacturers of stationary engine safety devices.
Figure 17. The operator realizes a number of advantages when all tractor drive wheels are on the land when plowing. (See Mimeo AE-56, "Hitching A Plow for Level Tractor Operation.") No special problem exists when hitching a plow to a tandem unit in this manner. It is easier for the plowman if he uses a 5 or 6-bottom plow.

Figure 18. Plowing around the field is practiced in many areas. Ease of steering the power unit to the left or right and on curves aids in maintaining an even plow cut when tandems are hitched to operate on level land. Operation from the rear and extensive use of tractor mirrors (1) will make this field operation even easier.

Figure 19. Minimum compaction of the plow sole layer as well as plow-plant power was accomplished by this hitch of two tractors, 5-16 plow and two-row corn planter.
Some Considerations in Using Tractors in Tandem

Advantages:

1. Five to 15 percent greater draw bar power than the sum of individual tractor's power.
2. Increased draw bar efficiency means reduced purchases of weight for traction.
3. Increased operator efficiency with currently owned tractors, decreases labor requirements and relieves some labor for management.
4. Method of using tractors not ordinarily considered "plowing or diskng" tractors on the farm, thus securing greater return from such tractors.
5. Use tractors with "plain" transmission; no hydraulic system or other extras. Utilize tractors with a known trade-in value.
6. Purchase of large tools can be made without immediate capital outlay for matching single tractor.
7. Allows more timely tillage practices due to greater tool capacity. (i.e. practices plow-planting since plow capacity is increased).
8. Investment to tandemize tractors is low ($50 to $250).
9. One tractor of tandem unit can be used as a "carrier" for (1) anhydrous ammonia, (2) plow down fertilizer, (3) starter fertilizer, (4) insecticides, (5) herbicides, (6) seed.
10. Under some conditions, rear tractor can be used as power unit for a forage chopper and the lead tractor as the prime mover.
11. Fuel consumption reasonable for the power developed.
12. When breakdowns occur, service is quick. Another tractor may be substituted in many cases.
13. Experienced operator does the plowing.

Disadvantages

1. Initiative, inventiveness and ingenuity must be shown by the owner to arrive at a satisfactory operating unit.
2. Greater skill and alertness must be used to operate tandem tractors.
3. In the hands of a careless person, tandem tractors, can be dangerous.
4. "Overpowering" trailed implements leads to excess breakage.
5. Probably will encounter more frequent axle bearing failures or transmission breakdown.
6. Visibility of trailed equipment is reduced unless the operator is on the rear tractor.
7. Over-all length of field outfits increased as well as the turning radius. The outfit in Figure 2 is 47 feet long and requires 22 feet in which to turn.
8. Before rear tractor can be used in a dual operation, its front wheels must be replaced. This operation may take one hour or more.

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