



# Compact Tractor

## *Selection, Use and Safety*

Compact utility tractors (also called “compact tractors” or “grounds maintenance tractors”) (Figure 1) are designed for homeowners with small acreage as well as for small farms, landscaping and very light construction. The American Society of Agricultural Engineers (ASAE) defines a compact utility tractor as:

**a small agricultural tractor equipped with a 540-rpm PTO and a three-point hitch designed for Category I implements only. These tractors generally have a mass less than 4,000 lb; have less than 40 PTO hp; and are primarily designed and advertised for use with mowers and light-duty material handling equipment. (from ASAE standard S390.3)**

These tractors usually have water-cooled diesel engines with two, three or four cylinders. They may have 4-wheel drive. They may have agricultural bar-tread tires, turf tires or industrial bar-tread tires. Mower deck width is generally 48 to 72 inches. Mowers may be center mounted or rear mounted. Mowers are optional, and tractors may be sold without mowers. These tractors have a standard 540 rpm power-take-off (PTO) at the rear and often another PTO at the front or center. They have a power lift for implements. They accept a wide range of implements, including small farm implements, front-end loaders and small backhoes. The smaller tractors in this class are sold primarily for lawn mowing; the larger merge into the farm tractor category.



Figure 1. Example of compact utility tractor

Subcompact tractors (Figure 2) fit between garden tractors and compact utility tractors in an additional category that is used by some companies. Subcompact tractors are about the size (power and dimensions) of garden tractors but are built like compact utility tractors with water-cooled diesel engines, PTOs, three-point hitches, remote hydraulics and heavy construction.



Figure 2. Example of subcompact tractor

## Size and Cost

As expected, the bigger and more powerful tractors cost more than smaller tractors. Also, the larger tractors sometimes have more features. The larger manufacturers offer two or more lines of subcompact and compact tractors with several models in each line. There may be “small frame” and “large frame” tractors within each model line with two or three horsepower sizes within each frame size. The result can be a bewildering array of models from which to choose. Some will be tempted to select the least expensive tractor; on the other hand, some people may be tempted to buy the biggest, most powerful tractor. For most people, neither extreme is the best choice. You need to decide what specifications and features you really need based on the way you intend to use the tractor.

**Turf or Farm Use** One of the first decisions to make is whether you will use the tractor primarily for mowing and other turfgrass maintenance or for more general farm chores. If your primary need is mowing a lawn, you will probably want a smaller compact or subcompact tractor with turf tires and either a mid-mount mower deck or a rear-mount finishing mower. You will

probably not need front-wheel assist. You might also want a hydrostatic transmission to facilitate maneuvering while mowing. On the other hand, if you want the tractor primarily for farm work, including rough mowing, you may want a larger but more basic tractor with a gear transmission and bar-tread tires.

**Loader Use** Front-end loaders are popular but expensive options on compact tractors. Many who buy a small tractor with a loader find that they seldom use the loader. The loader is a nuisance to leave on the tractor and reduces visibility and makes it harder to maneuver. If you really need a loader, consider getting front-wheel assist for both improved traction and increased front-axle load capacity. If you will use a loader extensively, you might consider either a shuttle shift or a hydrostatic transmission to ease the frequent direction reversals.

**Size Within a Product Class** As noted, manufacturers often offer two, three or even four similar models with generally identical chassis but differing engine power levels. Commonly, these tractors will all have the same engine block but provide increased power levels either through turbocharging or by simply turning up the fuel pump. In many cases there is very little real difference between some models in a given line except for engine power level, but there will be a price difference. For many compact tractor owners, maximum power is not a major concern since the tractor is unlikely to be used for long periods at full power for heavy-duty operations such as primary tillage or chopping silage as farm tractors are. If your needs are more for strength, durability and reliability, buying the smallest tractor in a given frame class can be a good value. You will get an overdesigned frame and drivetrain as well as an underloaded engine. Both should help achieve long, trouble-free performance.

## Overturn Protection

All current models of compact and subcompact tractors have two important safety features: a rollover protective structure (ROPS) and a seatbelt. These two safety components can go a long way toward protecting you in case of an overturn - if you use them!

**The Theory** A ROPS (Figure 3) is designed to provide a safe “envelope” for the operator in the event of an overturn. ROPS are very carefully designed and manufactured, in many



Figure 3.  
Rollover protective structure (ROPS) on compact tractor



Figure 4. Seatbelt used with ROPS on compact tractor

cases using special alloy steel, to protect the operator from being crushed in rearward, sideways or other overturns. The ROPS may deform somewhat in an overturn but will still provide a protected envelope for the operator.

**Seatbelt** It is critical that the operator remain in that protected envelope. That is the job of the seatbelt (Figure 4). A ROPS cannot do its job if the operator is thrown out of the protected envelope. To attain any significant protection from a ROPS, you must wear your seatbelt. A common excuse for not wearing a seatbelt is that the belt hangs down and gets dirty. If you always wear it, it won't have a chance to hang down and get dirty!

**Folding ROPS** Some ROPS can be folded down to provide access to low buildings, for working under trees or for hauling the tractor. The tractor is **not** designed to be operated for any significant time with the ROPS folded. A folded ROPS offers no protection. Restore the ROPS to its effective position as soon as the low clearance situation ends.

**One Caution with ROPS** When mowing or otherwise operating under trees, be especially careful of low limbs if your tractor has a two-post ROPS, the most common kind on compact utility tractors. Running under a low limb can cause you to be pinned back against the ROPS by the limb. This is not an argument against ROPS; when operating under low limbs without a ROPS, you could be knocked off the seat and run over. Just recognize the danger and watch out for limbs.

Note that if you have a tractor **without** a ROPS, you should **not** wear a seatbelt. Without a ROPS, you may have a better chance of surviving an overturn if you are thrown or jump clear. If you have a ROPS on your tractor, always wear your seatbelt. Never cut, weld or drill a ROPS.

## Quick Hitches

Many implements are available for rear mounting on compact utility tractors, including mowers of various types, tillers, angle blades, box blades, cultivators, bedders and rakes. These add versatility to your tractor, but mounting them to the tractor's Category I three-point hitch can be a hassle. A quick hitch can make your job much easier.

**The Problem** Connecting an implement to the three-point hitch on a tractor requires you to first back the tractor into an exact position relative to the implement, then dismount and pull both lower hitch arms of the tractor over the lower hitch pins on the implement. If you didn't position the tractor perfectly, you will have to move the implement or tractor to fit. Next, you have to adjust and connect the upper hitch arm and then the PTO shaft, if used. Finally, you have to adjust the sway links, which may or may not require the use of one or two wrenches. This is not a tremendous job, but it is a hassle.



Figure 5. ASAE standard category 1 quick hitch mounted on a compact tractor. Notice three points of attachment to implement.

**The Solution - Quick Hitches** A quick hitch is a device that attaches to all three hitch points on the tractor and then allows you to back up to the implement, lift and go. You shouldn't even have to get off the tractor unless you have to connect a PTO shaft. Unhitching is almost as easy; you just reach back and release one or two levers then lower the hitch. It will disconnect as it lowers. Another major advantage of quick hitches is that once you adjust the sway links, you don't need to change them again unless you want an implement to swing freely.

**ASAE Standard Quick Hitch** The American Society of Agricultural Engineers has developed a series of standards for U-shaped quick hitches. There are ASAE standard quick hitches (Figure 5) for compact utility tractors (Category 1) as well as farm tractors (Categories 2-4). ASAE standard quick hitches are designed to mate up with the three existing hitch pins on the implement, thus you have to buy only the tractor portion of the hitch; no additional parts are needed on the implement. This system works great as long as the implements conform to the ASAE standard. Unfortunately, most implements for compact utility tractors are made by short-line implement manufacturers (smaller implement manufacturers that do not produce a full line of tractors and implements) that ignore the ASAE hitch standards. This means that an ASAE standard quick hitch will not work with most small implements. You can sometimes remedy the problem with a welder and cutting torch, but most people don't want to rebuild their implements.

If you want to check to see if an implement conforms to the ASAE Cat. 1 standard, look at the following dimensions and be sure there is room around the hitch pins for the "claws" on the hitch:



Figure 6. Delta-shaped category 1 quick hitch mounted on a compact tractor.



Figure 7. Implement portion of delta-shaped category 1 quick hitch

Lower pin diameter = 1.44 inches

Upper pin diameter = 1.25 inches

Width between inside edges of lower pins = approximately 26.75 inches

Height of upper pin above lower pins (should be in a straight line; not offset) = 15 inches

**Delta-shaped Quick Hitch** Because many short-line implement manufacturers do not conform to ASAE standards, an alternative quick hitch system has been developed. This system, which is covered by an international (ISO) standard, consists of two components: a delta-shaped (triangular) male hitch component that mounts on the tractor hitch (Figure 6) and a delta-shaped female hitch component (Figure 7) that mounts on each implement. The implement component is adjustable to fit the widely varying dimensions found on small implements. You have to install an implement hitch component on each of your implements, so the cost is much higher than for the ASAE system, but, once installed, the system will work with most implements.

**Negatives with Quick Hitches** One negative to a quick hitch system is the cost. An ASAE Category 1 quick hitch will cost about \$200; a delta-shaped hitch system will cost \$300-\$500 for the tractor component and then about \$150 per implement. A second negative is that any quick hitch will move each implement back several inches. This puts more load on your

tractor lift system and can make your tractor harder to steer by reducing the weight on the front tires.

A quick hitch system will make attaching implements to your tractor much easier. An ASAE standard hitch is inexpensive and works well - if your implements are all built to ASAE standards. The delta-shaped hitches are more versatile, but also more expensive. Remember that even with a quick hitch you will still have to get off the tractor and connect the PTO shaft, if your implement uses the PTO.



Figure 8. Drawbar on compact tractor



Figure 9. Drawbar mounted to 3-point hitch. Note: this setup is unsafe and NOT recommended.

## Other Hitches

Not all implements attach to the three-point hitch of a tractor. Many simply attach to the tractor drawbar, and others attach to specific brackets on the front or other location on the tractor.

**Drawbar Hitching** Compact tractors are provided with a drawbar (Figure 8) for trailing implements. If using trailing implements, always hitch to the provided drawbar, *not to a drawbar mounted to the three-point hitch!* The problem with a drawbar mounted to the three-point hitch (Figure 9) is that the hitch can be raised to an unsafe height by the operator or pushed upward by the implement since most tractors exert no downpressure on the three-point hitch. The higher the hitch

point, the more susceptible the tractor is to rear overturns. You should never hitch to a high hitch point or pull with a chain attached to the axle or anywhere other than the fixed drawbar. On many tractors, the drawbar can be moved to the side or allowed to swing from side to side by moving or removing pins. Moving the hitch point to the side can allow offsetting an implement. Allowing the drawbar to swing can allow implements to trail around curves better, but it makes backing difficult.

**Dedicated Implement Attachment** Mid-mount mowers, front-end loaders and a few other implements like front blades, rotary brushes and snow blowers typically mount to the tractor using dedicated, specialized attaching points. In the case of loaders, a subframe is normally mounted on the tractor, then the loader can be mounted or removed from the subframe while the subframe remains on the tractor. Mid-mount mowers are usually designed for a specific tractor model and are provided with special mounting brackets. It is now common for both loaders and mid-mount mowers to incorporate systems for quick attachment and removal (after initial installation). These systems are not standardized, but are specific to each manufacturer and model.



Figure 10. 540-rpm PTO shaft on compact tractor

## PTO Considerations

All compact tractors have a rear PTO (Figure 10), and many have a front or mid PTO. Rear and front PTO speeds are standardized at 540 rpm. Mid PTO speeds are not standardized and vary among manufacturers, so a mid-mount mower specific to that tractor model must be used. There are three classes of PTO drives.

**Transmission-Driven PTO** Older or less expensive tractors may have a transmission-driven PTO. When the PTO is driven from the transmission, the PTO always runs when the clutch is engaged and does not run when the clutch is disengaged. Since the PTO is connected solidly to the transmission, a PTO implement can actually drive the tractor. If, for instance, you are using a rotary cutter and step on the clutch, the engine will be disconnected from the transmission, but the angular momentum of the rotating mower blades will still drive the transmission and thus keep the vehicle moving – even though you apply the

brakes. Many accidents have occurred when a tractor with a transmission-driven PTO and a rotary cutter couldn't be stopped at the end of a field. To compensate for this problem, overrunning clutches are installed on some compact tractors with transmission-driven PTO shafts, and an external overriding clutch can (and should) be added to the PTO shaft if none is provided internally.

**Live PTO** A live PTO is driven by a two-stage clutch. Depressing the clutch pedal halfway disengages the transmission clutch but leaves the PTO operating. Fully depressing the clutch pedal disengages both the transmission and the PTO. This is safer and more convenient than a transmission-driven PTO.

**Continuous Running (or Independent) PTO** Safer and more convenient than the first two classes is a continuous running PTO. In this case, the PTO is controlled by a completely separate clutch operated mechanically, electrically or hydraulically. It is completely independent of the transmission clutch and either can be operated without the other. It is more expensive and found primarily on larger compact tractors.



Figure 11. Remote hydraulic outlets near operator's foot



Figure 12. Remote hydraulic outlets extended to rear of compact tractor

## Hydraulics

All compact tractors have hydraulic systems, but not all have remote hydraulics. If you plan to use your tractor with a loader or with any implement that has a hydraulic cylinder or motor, you will need remote hydraulics. Adding remote hydraulics to a tractor without them can be expensive, so consider hydraulics with your initial purchase.

**Location of Remote Outlets** Larger farm tractors always have the hydraulic outlets at the rear, near the hitch. Compact tractors, on the other hand, typically have the remote outlets near the operator's foot (Figure 11) to accommodate front-end loaders – the most common hydraulic implement on compact tractors. If you plan to use rear-mounted implements that use hydraulics, you will need either extra-long hoses or a rear remote kit from your dealer (Figure 12).

**Pressure and Flow** The capacity of a tractor's hydraulic system is determined by both flow and pressure. Most compact tractors have similar maximum pressures, so flow is the determining factor. The greater the flow, the faster and better the hydraulics will operate. This is important if you will be using a hydraulic motor and is also important to assure that you have adequate flow to your power steering while using the three-point hitch or other hydraulic functions.

**Open- or Closed-Center Systems** The hydraulic system on a tractor will be either open center or closed center. With an open-center system, the pump has a fixed displacement delivering a constant output. When no hydraulic functions are in use, the oil is still pumped but is bypassed. When you actuate a valve (or turn the steering wheel) pressure builds up to the level needed (up to the maximum of the system), then drops back essentially to zero when the hydraulics are not being used. With a closed-center system, the pump has a variable displacement and pumps only the oil needed. It will maintain maximum pressure at all times, but change displacement to deliver the needed flow (up to the maximum) when you use the hydraulics. Closed-center systems are better than open-center systems and are found on larger, more expensive compact tractors. The open-center systems on small compact tractors are functional, but not quite as efficient and capable as closed-center systems.

## Steering

Some compact tractors have power steering as a standard feature, some have optional power steering and some have only manual steering. Even a small compact tractor will be much easier and enjoyable to use if equipped with power steering.

## Tire Choices

**Tread Type** You have three choices in type of rear tire tread: agricultural bar-tread (Figure 13), turf (Figure 14) and industrial bar-tread (Figure 15). Agricultural bar-tread tires offer the best traction in soft soil, but they may damage turfgrass and will wear faster when driven on pavement. Turf tires offer flotation and minimize damage to turfgrass, but they offer limited



Figure 13. Agricultural bar-tread tires



Figure 14. Turf tires



Figure 15. Industrial bar-tread tire

traction for pulling implements in soft soil. Industrial bar-tread tires offer somewhat of a compromise; they have wider, shallower and less aggressive lugs than agricultural tires, but better traction than turf tires. Industrial tires are normally used on construction equipment such as backhoes, but they are becoming increasingly popular on compact tractors as a compromise tread. With front-wheel assist, the front tires will normally have the same tread as the rear tires. With two-wheel drive, ag bar-tread rear tires will generally be matched with three-rib front tires, while industrial bar-tread or turf rear tires will be matched with turf-type front tires.



Figure 16. Front wheel assist (FWA) on compact tractor

**Size** You may not have much choice in tire size; some manufacturers offer no size options. Other manufacturers offer more than one tire size on some models. For both traction and flotation, you are generally better off with the tallest tires available. Tire diameter is more important than width. If you can get tall, wide tires, they will offer the best flotation, but a tall, narrow tire is preferable to a short, wide tire for virtually any purpose.

## Front-wheel-assist (part-time four-wheel drive)

Front-wheel-assist (FWA) (Figure 16) is a popular option on many compact utility tractors and is standard equipment on several models. It is also available on some lawn and garden tractors. FWA provides four-wheel-drive when engaged. FWA substantially increases the cost of a tractor but provides some important benefits. On popular 28- to 30-hp compact tractors, FWA adds \$1,100 - \$1,600 to the price. What do you get for your money?

**Increased Traction** Using FWA generally gives better traction, because all tires are pulling. This can be especially helpful when using a front-end loader, because the loader will transfer weight from the rear to the front and FWA lets you use this extra weight for traction. When pulling a tillage tool or other implement with a heavy draft load, FWA is often equivalent to

having several more horsepower on your tractor. One added benefit of FWA is that you do not have to waste tractive force from the rear tires pushing non-powered front wheels through soft soil. With FWA, the front tires pull themselves. If you are just mowing, there is less advantage to FWA, since traction is usually not limiting.

**Ballasting for FWA** With FWA, you may need more weight on the front axle than with a two-wheel-drive tractor. With two-wheel-drive, the weight on the front axle is useful for traction only when dynamically transferred to the rear axle under load. With FWA, the weight on the front axle is usable for traction even without weight transfer.

**Stronger, Heavier Front Axle** FWA front axles are heavier and stronger than two-wheel-drive axles. This means that you will need less extra ballast with FWA to achieve the same front axle weight. The stronger FWA axles are also beneficial when using a front-end loader, since they are better able to handle the weight.

**Power Turns** Without FWA, a tractor may resist turning and the front tires may slide. With FWA engaged, a tractor will pull itself around turns with less skidding of the front tires. The overall turning radius (without brakes) is generally smaller **without FWA**, but turns are easier to make **with FWA**. The ability to make power turns without skidding is one argument for using FWA, even when mowing. Some manufacturers offer FWA with turf tires.

**When Not To Use FWA** To reduce tire wear, most manufacturers recommend disengaging FWA when driving with no load or driving in high gear on pavement.

Front-wheel-assist can be a valuable option on your compact utility tractor if you use it for tillage or loader work, but it may not be worth the extra expense if all you do with the tractor is mow. If the ground is soft enough to need FWA, you probably shouldn't be mowing.

## Ballasting

You may be able to improve the performance of your compact utility tractor by properly ballasting the tractor. This will involve adding weight – or removing weight.

**Why Ballast?** Overall weight and weight distribution are important to traction, stability, safety and soil compaction. You generally want your tractor to be as light as possible to minimize soil compaction, yet still be heavy enough to do the jobs required. More weight on the drive tires will increase the tractive force available for pulling. More weight on the front will reduce the tendency to overturn to the rear.

**Weight Transfer** If you weigh the front end and the rear end of your tractor at rest, the results will be quite different from the weight distribution when the tractor is pulling a load. When the tractor is pulling a load on the drawbar or three-point hitch, weight is transferred from the front axle to the rear axle. This dynamic weight transfer is the phenomenon that can make the front of your tractor light and difficult to steer or even lift the front end off the ground. On a two-wheel-drive tractor, this weight transfer is generally beneficial in that it improves traction, but it can be a safety concern if the front tires come off the ground.

**Front-end Weights** Probably the first place to add weight to your tractor is the front end (Figure 17). Most compact tractors have some provision for adding weights on the front. In most cases, however, the weight bracket and weights are optional, not standard equipment. The weights used on the front of compact tractors are generally in the 50-pound range and are cast iron with a handle cast in. Most tractors can handle six to eight of these weights. They are often referred to as “suitcase weights” since you can lift them on and off by the handle. Once in place, they should be locked down in some manner - typically by a rod through the handle holes or other holes. Front-end weights help counter-balance the weight of rear implements when the implements are lifted. They also contribute to traction when weight transfer under load effectively moves part of the weight to the rear axle. They can contribute to traction, stability and safety, and they are relatively inexpensive.

**Wheel Weights** Cast iron weights are also available to mount on the wheels. They are more common on rear wheels, but front wheel weights are sometimes available. Rear wheel weights add weight directly to the rear axle; front wheel weights serve essentially the same purpose as front-end weights. Wheel weights are effective, but they are not as easy to add or remove as front-end weights. The tendency is to install them and forget them, thus the weights are in place even when not needed.

**Fluid in Tires** An invisible way to add weight is to put fluid in your tires. This is most commonly done with rear tires but is possible with front tires. Never fill a tire completely full; there must be room for air over the fluid. You should replace about 75 percent of the tire volume with water. The remaining air will provide the cushioning needed. A good general rule, when adding water, is to turn the tire so that the valve is up, and then add water up to the valve. A typical 12.4-24 tire will hold about 250 pounds of water or 500 pounds for the two tires. In the South, plain water is often used in tires. Further north, a solution of calcium chloride is common. The calcium chloride solution



Figure 17. Front end weights on compact tractor

provides two advantages: it weighs more per gallon, thus adding more weight, and it acts as an antifreeze. Calcium chloride solutions are very corrosive and can destroy wheel rims if used in tubeless tires. Obviously, you will not be able to install or remove fluid to match your current needs; fluid in the tires is generally left in place at all times. You can have a tire dealer install the water or do it yourself with an inexpensive hose-fitting device that allows you to bleed air as you add water. This Web site provides information on the amount of water to add for different tire sizes:

[www.tractorsmart.com/Farm\\_Tractor\\_Liquid\\_Tire\\_Ballast.htm](http://www.tractorsmart.com/Farm_Tractor_Liquid_Tire_Ballast.htm)

**Rear Weights** A cast iron or concrete counterweight is sometimes added to the three-point hitch when a tractor is used with a front-end loader. The weight will help counter the weight of the loader bucket and will help maintain traction on the rear tires. An alternative is to hitch an implement to the three-point hitch as a counter-balance when using the front loader.

Proper ballasting can make your tractor easier to steer, more stable and improve traction. Ballasting, however, will increase soil compaction and stresses on axles and tires, so use only the amount of ballast needed for your job.

## Transmission Choices

Many transmission options are available on compact tractors. Some are more convenient than others, some cost more than others and some affect fuel efficiency. Select the type of transmission that is best for your purpose.

**Basic Gear Transmission** The traditional transmission on tractors is a manual gear transmission. On most compact tractors, a gear transmission will consist of two stages: two to four ranges coupled with three or four gear selections within each range, for a total of six to 16 forward speeds. The better transmissions will have all the shifting within a range synchronized. This means that the actual gears stay in constant mesh, and clutches or cogs are engaged to shift, thus saving wear and tear on the gears and allowing smooth shifting without having to stop. The operator's manual will tell you whether the transmission is synchronized. Different transmissions handle reverse differently.

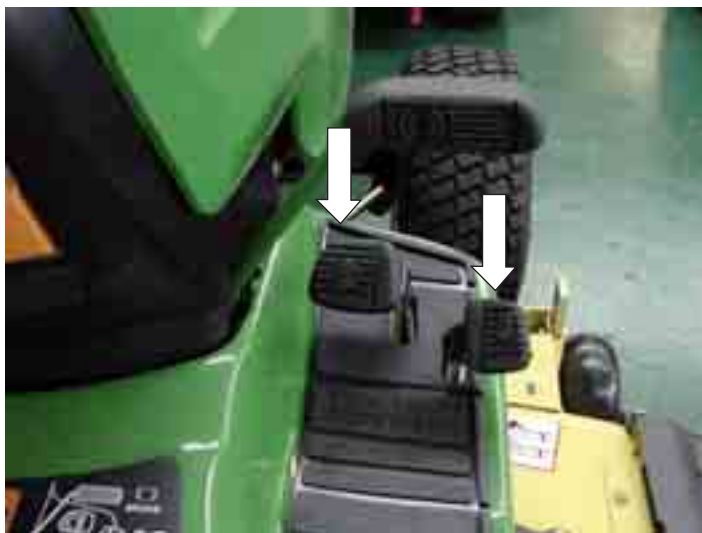


Figure 18. Two pedal control for hydrostatic transmission

On some tractors, one range will be reverse; on others, there is a reverse gear within each range. Before selecting a tractor, you should test drive it in all forward and reverse gears to be sure that the speeds are usable and useful. Be wary of transmissions that have the two speeds you will use most in different ranges, thus requiring the shifting of two levers (split shifting) to upshift or downshift. Likewise, be sure there are useful reverse speeds that are easy to shift into from the gears in which you will be operating. Be sure the shift levers are conveniently located and easy to operate. A lever on the left that has to be moved up and down may not be as easy or as intuitive as a conventional shift lever on the console.

**Shuttle Shift** A shuttle shift is a gear-shift pattern arranged in such a way that you can readily shift back and forth between a usable forward speed and reverse. This is especially handy for front-end loader work.

**Power Reverse** A step up from a shuttle shift is a power direction reverser. This will allow you to shift effortlessly between forward and reverse without clutching. You do have to use some common sense and not try to shift between forward and reverse while moving at high speed, but at low speed you can shift while moving. The transmission will modulate the shift to reduce jerkiness.

**Hydrostatic Transmission** A hydrostatic transmission uses a fluid drive, rather than a gear train, and provides infinite speed variation. With a hydrostatic transmission, the tractor engine drives a variable-displacement hydraulic pump. The oil from the pump then drives a hydraulic motor connected to the differential to drive the tractor wheels. Some tractors will have a gear transmission between the hydraulic motor and the differential to allow more than one speed range; others obtain the full range of speeds from the hydrostatic drive. Hydrostatic drives offer infinite speed control and easy direction reversal. On many tractors, the hydrostatic transmission is controlled by one or two pedals (Figure 18). On other tractors, a hand lever is used. Disadvantages of hydrostatic transmissions include higher initial cost, lower fuel efficiency (a fluid drive is less efficient than a gear train) and possibly higher repair and maintenance costs. Because of the lower efficiency, it takes more engine horsepower to deliver a given level of drawbar performance. Hydrostatic transmissions are well suited to mowing and loader work, but they are not the best choice for tillage operations.

**Power Shift** Many larger farm tractors and a few compact tractors offer power shift transmissions. These are gear transmissions (often using planetary gear trains) that use hydraulically engaged clutches and brakes to shift (similar to the way automobile automatic transmissions shift). The operator selects a gear and the transmission automatically engages that gear. Unlike an automobile, most tractor power shifts do not have a torque converter. They drive directly and have a pedal to disengage the shift mechanism, thus providing the equivalent of a clutch pedal for stopping. Clutching is not necessary for shifting or for starting and stopping. Some power shift transmissions offer only three or four power shifts within manually shifted ranges.

Choosing the correct transmission can optimize your investment and your enjoyment of your tractor.



## Ergonomics

You may spend many hours driving your tractor, so it is important for it to fit you. A well-designed tractor will accommodate you and make operation easy and pleasant. The seat should be comfortable (most seats are adjustable to fit the operator) and have armrests; the steering wheel should be located conveniently and angled comfortably; you should be able to reach the pedals without stretching; the transmission controls should be conveniently located, easy to use and intuitive; the throttle should be convenient and operate intuitively. The pedals should be comfortable to the foot with a reasonable force level and not be tiring to the legs. Some compact tractors have a flat operator's platform, and some place the operator's feet on opposite sides of the transmission case. There are advantages either way. You should be certain you can find a comfortable position.

The major compact tractor manufacturers devote a great deal of effort to ergonomic design. When selecting a tractor, be sure to drive the tractor and evaluate how it feels to you, then find a tractor that fits you as well as the work you wish to accomplish.

## Mowers for Compact Tractors

Mowing grass is the most popular way that homeowners use compact utility tractors. You have many choices when it comes to selecting a type of mower. Different types of mowers serve different purposes; you should choose the correct mower for your needs. Do you want to mow a lawn or a pasture? Do you need to maneuver around many trees and obstacles? Do you plan to leave the mower attached to your tractor or remove it frequently to use other implements?

**Mid-mount Rotary Mower Deck** Mid-mount decks (Figure 19) are popular on the smaller compact utility tractors and on subcompact tractors. They tend to be more difficult to remove than rear-mount mowers, so they are more popular on the smaller tractors that are used primarily for mowing.

On some current models of tractor, it is now possible to leave a mid-mount mower in place while using a front loader or a



Figure 19. Mid-mount mower deck



Figure 20. Rear-mount finishing mower

rear-mounted implement such as a tiller. Be aware that operating other implements with a mid-mount mower in place can compromise performance of the other implements and certainly reduces ground clearance. Mid-mount decks generally provide good maneuverability and allow close trimming. Mid-mount mowers on compact tractors are usually ground-carried (they ride on the ground when in use and are merely pulled along by the tractor, whereas mid-mount mowers on lawn and garden tractors are usually suspended from the tractor with the cutting height controlled by the suspension linkage). Cutting height adjustment is made by adjusting the gage wheels up or down by moving adjusting pins or collars.

**Rear-mount Finishing Mower** Finishing mowers (Figure 20) are also called "grooming mowers." Finishing mowers have decks that are virtually the same as the decks on mid-mount mowers. They typically have three blades. Height is controlled by four gage wheels (two wheels on cheap models). These mowers vary greatly in quality with corresponding price differences. This is a case where it is very worthwhile to buy a high-quality mower with a heavy deck, four heavy gage wheels, heavy frame and heavy power transmission components. The better models use separate belts to drive the outer blades and thus eliminate the need for a back-side idler on the drive belt. This dramatically improves belt life. Finishing mowers can provide cut quality equal to mid-mount mowers. They work well for mowing open areas but are difficult to maneuver around trees or other obstacles. The mowers are easily attached and removed. Cutting height is adjusted with pins or collars on the gage wheel shafts.

**Rear-mount Rotary Cutter** A rear-mounted rotary cutter (Figure 21) is often referred to as a "Bush Hog" - equivalent to referring to all soft drinks as "Cokes". These mowers have a single blade (in the sizes used on compact tractors) and are designed for heavy, rough cutting. They are not designed to mow grass as short as is common for lawns and should not be set to cut lower than about 3 inches. They will cut light brush. They are not highly maneuverable because of their greater length. Cutting height is adjusted by moving both the rear gage wheel and the three-point hitch. They are easily attached and removed.



**Figure 21. Rear-mount rotary cutter**

**Rear-mount Flail Mower** Flail mowers (Figure 22) are often used by highway mowing and park maintenance crews because they are somewhat less likely to throw objects. On a flail mower, the blades are free-swinging and rotate around a horizontal axis. The cut from a flail mower is very distinctive and different from rotary mowers. The blades are often Y-shaped (or sometimes, half a Y), giving the mown grass a combed or ridged appearance. Some people like this effect; some do not. Control of cutting height may depend on the tractor three-point hitch, although some models have an adjustable rear roller to control height.



**Figure 22. Rear-mount flail mower**

**Rear- or Side-mount Sicklebar Mower** Sicklebar mowers (Figure 23) are no longer common but have some advantages. They are useful for reaching into ditches or up a slope while the tractor remains level. They will cut tall material without plugging. They require little power. They do not cut or shred the cut material, so the full-length clippings will be left lying on the ground. Although sicklebar mowers usually incorporate a safety break-away, they are susceptible to damage if you run them into obstacles. Sicklebar mowers have declined in popularity in the South because of their susceptibility to damage from fire ant mounds.

**Thrown Objects Safety** With a rear-mount finishing mower or rotary cutter, you should use chain guards on both the front and rear openings of the mower deck. These chain guards are often optional on smaller mowers, but they should be installed and used. Tests show that chain guards can reduce the number of thrown objects by approximately 50 percent.

With all of these choices for your compact utility tractor, there is a mower that can handle your particular needs. You must balance quality of cut, frequency of mower removal, use of other implements, number of mow-around obstacles and need for mower to handle heavy weeds and brush to find the best mower for your use. You can buy a mower of the same brand as your tractor that is made specifically for your tractor or find many choices from short-line implement manufacturers. Quality varies greatly among brands and among model lines within a brand. You are generally better off buying a higher quality mower. Cheap mowers do not hold up well.



**Figure 23. Sicklebar mower**

## Other Implements for Compact Utility Tractors

Your compact utility tractor is a useful machine, if you have the implements to go with it. The tractor by itself is of limited use. The tractor furnishes the power, but the implements allow the tractor to do useful work. There is a wide variety of implements available for compact tractors from both the tractor manufacturers and short-line manufacturers.

**Front-end Loader** Probably the second most popular implement for compact tractors (after mowers) is a front-end loader (Figure 24). A loader will allow you to dig, move soil or other bulk products, carry bags and other bulky items, lift equipment (using a chain), move hay bales and even do light grading. Not all compact tractors are equipped with the necessary hydraulic connections for a loader, so be sure you check on hydraulics if adding a loader to a tractor. Some manufacturers now offer front-end loaders that are much easier to attach and remove (once initially mounted) than in the past, thus making it more practical to remove a loader when you don't need it. A loader for a compact tractor may cost \$2,000 to \$3,000, depend-



**Figure 24. Backhoe and front end loader on compact tractor**

ing on size and quality. In most cases, a loader made by the tractor manufacturer will cost more, but it should fit better and will be designed specifically for your model.

**Backhoe** Small backhoes (Figure 24) are available for most compact tractors. These machines have less capacity (and durability) than industrial units and can be difficult to install but are useful for small digging projects. A small backhoe can cost from \$6,000 to \$7,000, so it is probably more practical to rent a backhoe or hire a contractor if your needs are occasional.

**Rotary Tiller** Rotary tillers (Figure 25) that mount on a three-point hitch and are powered by the tractor PTO are often used for gardens and landscaping. Tillers can be centered or offset. Since these tillers may not be as wide as the outside of the tractor tires, an offset design will allow you to till next to a fence and also allow you to till your tractor tracks on one side. Tillers vary greatly in price and quality. A rotary tiller for a compact tractor can cost \$1,000 to \$2,500, depending on size and quality. Since a tractor-mounted tiller cannot be used to cultivate your garden, a walk-behind tiller may be a more versatile choice.

**Box Blade** A box blade (Figure 26) is useful for dragging soil, gravel, etc. for short distances. It is good for digging and leveling soil. Most box blades have scarifying teeth that can be used at different depths to loosen hard soil or raised out of



**Figure 25. Rotary tiller on compact tractor**

the soil. A box blade should cost about \$300 to \$600, depending on size and quality.

**Angle Blade** An angle blade is excellent for grading driveways and shaping ditches. Some blades can be angled only about a vertical axis; others also allow rotation about a horizontal axis. Some even allow the whole blade to be offset to one side. The cutting edge should be replaceable. It can be difficult to do a smooth job of grading with an angle blade, but if you turn the blade backward and drag the angled blade backward, you can easily smooth out gravel and fill in the tire tracks in your driveway. Back-dragging in this manner can make any amateur look like an expert. An angle blade should cost from \$400 to \$800, depending on size and features. If the blade has hydraulic cylinders to angle the blade, it will cost more.

**Other Soil Tools** Several other tools such as tandem disk harrows and landscape rakes are commonly used on compact tractors.

**Small Farm Tools** Most small farm implements can be used with a compact tractor. These include manure spreaders, plows, disk bedders, cultivators, hay rakes and many others.

You can greatly increase the usefulness of your compact tractor by adding implements. Just remember to balance the cost of the implements against how much you will use them.



**Figure 26. Box blade for compact tractor**

## New vs. Used Compact Tractors

Compact utility tractors are popular for use on small acreages for mowing and operating other implements, but they are expensive. Although some imported compact tractors cost less than \$10,000, most compact tractors from major manufacturers are in the \$10,000 to \$25,000 range. Not everyone can afford to spend that much for a small tractor – or justify spending that much. Some alternatives might meet your needs.

You don't need to buy a new compact tractor. A good compact tractor that is well-cared for and used only occasionally (as is the case with many compact tractors owned by homeowners) should last 20 to 40 years, so a used tractor can be a good alternative.

## Where to Buy New Compact Tractors

New compact tractors are sold primarily by authorized dealers. You may find a few obscure import brands sold by mail order or through other non-traditional channels, but be wary of these.

**Major Tractor Dealers** A new compact tractor is a major investment that can cost as much as a new car and should last much longer. Service and parts availability for the life of the tractor are important considerations. Main-line tractor dealers tend to be stable operations with service and parts availability overseen by the manufacturers. Even if one dealership goes out of business or fails to provide good service, major brands have enough dealers that you should be able to find another within a reasonable distance. Dealer personnel (sales, parts, service) tend to be knowledgeable about their products and can help you with purchase decisions and later with parts and service needs. Furthermore, most dealers offer factory financing on tractors, if needed.

**Gray-market Tractors** “Gray-market” is the term used to describe tractors that are purchased used in another country and then imported into the United States for resale. These gray-market tractors may sound tempting in that you can often get a tractor with a well-known and reputable brand name and low hours for an attractive price. There are at least two problems with gray-market tractors. First, these tractors have no dealer support. They are not imported by the manufacturer or his U.S. distributor. Although they may be manufactured by a company that sells tractors in the United States, they may be different designs using different parts, thus parts and service may not be available from U.S. dealers. Certainly you will not get warranty service from dealers on gray-market tractors. The second problem is that gray-market imports are not designed for the U.S. market and thus may not meet safety standards or other standards for such things as PTO and three-point hitch. Gray-market tractors are *not* a bargain.

**Other Tractor Sources** You have other choices for buying tractors. Many imported tractors are sold by short-line dealers, by other local businesses and even by mail order. In most cases, the price will be considerably less than tractors from the major manufacturers in the United States. It is tempting to think that, since you will be using a compact tractor only for light duty projects and will not accumulate many hours per year, a low-priced import tractor will be good enough. You have to balance the lower cost against the problems of finding parts and service when needed, the lower reliability and the lack of features on many cheap imports. The ergonomics (operator-friendly features), hydraulics, transmission, hitch, etc. may not be as good on cheap imports.

As a general rule, if you don't want to pay the cost of a new major-brand tractor from a major-brand dealer, you should consider a good, used major-brand tractor rather than a gray-market tractor or a cheap import.

**Used Compact Tractors** Buying an older, used compact tractor can be a viable alternative. These small, diesel tractors (at least the ones from major manufacturers) provide several thousand hours of service. A used compact tractor can do virtually anything a new one can but perhaps with fewer frills. The main drawback to a used compact tractor is that they are popular and, although less expensive than a new model, they are still a major purchase. Compact tractors from the major manufacturers hold their value well. You won't find many low prices.

**Used Farm Tractors** Another option is a used farm tractor. There are older, small farm tractors available that are similar in size to compact utility tractors, but you might want to consider a farm tractor in a larger size, perhaps 40-60 hp – or even more. Farm tractors (from major manufacturers) tend to hold up even longer than compact utility tractors. Many 50- to 60-year-old farm tractors are still in use. They are readily available, and some are reasonably priced – especially on a per-horsepower basis. Fuel consumption will be higher on the larger tractors, and the older ones will burn gasoline rather than diesel, but unless you run the tractors a lot, this will be more than offset by your initial savings. The smaller farm tractors like the venerable Farmall Cub are versatile but still command premium prices because of their popularity for both use and collecting. Even larger old tractors that are popular with collectors can be fairly expensive, but there are still many older tractors out there that are capable of operating a mower, disk, front-end loader, etc. and are reasonably priced. Generally, the better the condition of the tractor, the more expensive it will be. An old tractor that has been restored (engine, clutch, transmission rebuilt; seals replaced; steering repaired; repainted; etc.) will obviously cost more than one that has not been restored. Of course, most old tractors have been repaired over the years, and there are tractors available in all conditions — from junk sitting in a fencerow to running, but rough-looking tractors to fully restored. If you just want a tractor to use, you will be more concerned with mechanical condition than looks. You have the option of finding a tractor in the condition you desire, or buying one that needs repairs and then doing the work yourself.

**Limitations on Old Farm Tractors** There are some caveats involved in using an old farm tractor instead of a new compact tractor. Tractors are steadily improving, and a new compact tractor will offer features and convenience not always found on older tractors, such as power steering, three-point hitch, more versatile transmission, better seats and improved hydraulics. A new compact tractor will likely require less maintenance and care on your part. Many of the oldest tractors have narrow front tire spacing and are tall (they were designed for row-crop farming), thus they are less stable for loader work and may be too tall for mowing under trees. Few older tractors have rollover protective structures (ROPS).

An old farm tractor can meet the needs of many homeowners for mowing and light garden chores at reasonable cost. Using and working on an old, classic tractor can be rewarding, also. For more information on old tractors, including price surveys, consult Yesterday's Tractors on the Web at <http://www.ytmag.com>. This site has information on most brands and links to additional sources.

# Web Sites for Compact Utility Tractors

The Web is a great source of information on many subjects, including tractors. Several sites provide information and help on compact utility tractors. Most provide discussion groups where you can submit questions and get answers from other people who may have experienced the same problem or who may (or may not) be experts on the equipment. You can merely log on and read the posted information if you don't want to participate actively. Some sites provide links to sources for parts or implements for compact tractors.

As with any computer discussion group, the quality of the information provided is not guaranteed. Most who submit information to these sites are knowledgeable and genuinely interested in helping others, but there are exceptions. Furthermore, even the most sincere individuals are not necessarily right. Some of the information on these sites is biased opinion, not fact.

The sites can be accessed at these addresses:

[http://www.andrew.cmu.edu/user/kb13/TF\\_home.htm](http://www.andrew.cmu.edu/user/kb13/TF_home.htm)

This Web site covers lawn and garden tractors as well as compact utility tractors. It provides quite a bit of information on small tractors and also has many links to other related sites. This site will lead you to a wide range of information sources. It is a good starting place.

<http://jplan.com/cgi-bin/tractor/homepage.pl>

This Web site provides information on most brands of compact tractors. It includes several discussion groups, arranged by brand. This site is particularly well organized and popular. Start here if you are looking primarily for a discussion group.

<http://www.tractorbynet.com/>

This site provides discussion groups in many areas as well as a dealer locator and articles on specific compact tractor topics.

[http://www.ssbtractor.com/wwwboard/compact\\_tractors.html](http://www.ssbtractor.com/wwwboard/compact_tractors.html)

This site is sponsored by a parts supplier. The overall Web site has information on ag tractors also, but this link will take you directly to the compact tractor section. There are discussion groups on most brands of small tractors.

There is a tremendous amount of information on compact tractors on the Web – probably including the answers to your questions. Remember, though, the information on these sites can be useful (and entertaining), but accuracy is not guaranteed.

# Summary

Compact tractors are popular and useful. Tractors from major manufacturers tend to be well designed, reliable and a pleasure to use. You can choose from a wide range of sizes, prices and features as well as a wide range of implements and accessories. Determine your real needs, and then select a tractor that meets those needs in the most efficient manner.

Dick Parish, Professor of Agricultural Engineering, Hammond Research Station

**Louisiana State University Agricultural Center**  
William B. Richardson, Chancellor  
**Louisiana Agricultural Experiment Station**  
David J. Boethel, Vice Chancellor and Director  
**Louisiana Cooperative Extension Service**  
Paul D. Coreil, Vice Chancellor and Director

Pub. 2906 Online Only 6/04  
Issued in furtherance of Cooperative Extension work, Acts of Congress of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. The Louisiana Cooperative Extension Service provides equal opportunities in programs and employment.



Visit our Web site: [www.lsuagcenter.com](http://www.lsuagcenter.com)