LSU AgCenter Research & Extension

Selecting and Using Lawn and Garden Tractors

Lawn/garden tractors remain popular for homeowners with large lawns. Unlike riding lawn mowers, lawn/garden tractors can do more than just mow. They can power a wide range of lawn and garden implements. You have many choices in lawn/garden tractors; size, quality and cost vary widely. Selecting the correct tractor for your use can be bewildering. This information can help you select the right tractor and help you to use it efficiently and safely.

Classification

Many homeowners with lawns of more than one-third of an acre want to sit down while mowing. They have many choices ranging from small riding lawnmowers to small farm tractors — with a correspondingly wide range of prices. What type of riding mower or tractor does a homeowner need?

The first choice is the category of riding mower or tractor needed. These machines fall into a standard classification system established by the American Society of Agricultural Engineers (ASAE). Although the terminology may be slightly different from one company to another, most manufacturers and dealers use these general categories. If you understand this classification system when shopping for a machine, you can speak the same language as the dealers and salespeople, and you can compare machines of different brands.

Riding lawn mowers (ASAE: ride-on lawn mower) are the smallest machines. These machines are designed to mow grass only. They are not designed to accommodate other implements. Many mowers in this class have rear engines, but some look like a small tractor with the engine in the front. Most riding lawn mowers are no wider than about 38 inches. The mower deck is not detachable.

Lawn tractors (ASAE: lawn ride-on tractor) (Figure 1) are the next step up. These machines are larger and more powerful than homeowner riding lawn mowers. They are designed primarily for mowing but will accommodate a limited number of other implements such as lawn carts, sweepers and snow blowers (not a big seller in Louisiana!). They may have a lift linkage for the implements. Mowing width is typically 36-48 inches. The mower deck may or may not be readily detachable.

Lawn and garden tractors (ASAE: lawn and garden ride-on tractors) (Figure 2) are designed for general-purpose lawn and garden work, but their primary purpose is lawn mowing. They generally have larger engines, bigger tires and all implements, including the mower deck, are readily removable from the tractor. Tractors in this class must provide a means of lifting an implement, but it may be a manual lift. Implements suitable for use with this class, in addition to center-mounted mower decks, include plows, tillers, cultivators, sweepers, dozer blades and snow blowers. Mower decks up to 54 inches are usually available.

Figure 1. Lawn tractor

Figure 2. Lawn and garden tractor

Garden tractors (ASAE: garden ride-on tractors) (Figure 3) are designed for general-purpose garden work. They generally have larger tires than lawn and garden tractors and may or may not have more power. They are designed to supply tractive, rotating or hydraulic power for garden implements and will handle such tools as a plow, cultivator, rotary tiller, snow thrower, sweeper or dozer blade. The tractor must have a lift system for these implements, but it can be manual. Most tractors in this class are sold with a center-mounted mower deck, but the mowers are optional, not a part of the tractor, and are readily detachable. In this class, the tractor may have bar-tread (tractor) tires or turf tires. Mower deck width may be as much as 60 inches.

Subcompact tractor is a new category between garden tractors and compact utility tractors that is not defined by ASAE but offered by some manufacturers. Subcompact tractors are about the size (power and dimensions) of garden tractors but are built like compact utility tractors with water-cooled diesel engines, power-take-off (PTO), three-point hitch, remote hydraulics and heavy construction.

Compact utility tractor (also called a compact tractor or a grounds maintenance tractor) is the final step up. It is aimed at homeowners with 5-10 acres or more. These tractors usually have water-cooled diesel engines. They may be equipped with four-wheel drive and may have bar-tread tires or turf 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 PTO at the rear and possibly another 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 backhoes. The smaller tractors in this class are sold primarily for lawn mowing; the larger ones merge into the farm tractor category.

Prices increase as you go from one class to the next. This publication deals only with those machines classed as lawn tractors, lawn and garden tractors, and garden tractors. These three classes share many similarities and are significantly different from riding mowers and subcompact/compact tractors. Here, the three categories will generally be lumped together under the label "lawn/garden tractors."

Selecting the Correct Engine

One factor that affects both the capability of a lawn/garden tractor and the price is the engine. Lawn tractors and lawn and garden tractors may have vertical or horizontal shaft single-cylinder, air-cooled gasoline engines. Garden tractors usually have horizontal shaft engines, which may be single- or multi-cylinder, air- or liquid-cooled and gasoline or diesel.

Cylinders: Single-cylinder engines are less expensive and are used when less power is needed. Multi-cylinder engines are more powerful and operate smoother (less vibration). Multi-cylinder engines are also more complicated, more expensive and have more parts to maintain.

Vertical or Horizontal: The smaller engines used on smaller and/or cheaper tractors are typically vertical-shaft (Figure 4). This means the piston moves back and forth in a horizontal direction, turning a vertical crankshaft. Since the crankshaft is vertical, the mower deck can be directly driven with a belt. More powerful engines usually have a horizontal crankshaft (Figure 5). This design can make the tractor driveline more direct, but usually requires more power transmission components for the mower deck.

Air- or Water-Cooled: Small, low-power engines are air-cooled. The engine block has cooling fins over which a

Figure 3. Garden tractor

Figure 4. Vertical-shaft engine.

Figure 5. Rear view of horizontal-shaft engine.

fan blows air to remove engine heat. This cooling method is inexpensive and effective on small engines, but you must keep the cooling fins clean to prevent overheating. Liquid-cooled engines (Figure 6) are more expensive. They use a mixture of water and antifreeze circulating through the engine block and then the radiator. The liquid absorbs engine heat, then air blown through the radiator removes the heat from the liquid. Liquid-cooled engines maintain more consistent temperatures, thus may have longer service life with less maintenance than air-cooled engines.

Gasoline or Diesel: Gasoline engines use spark plugs to ignite the fuel:air mixture. Diesel engines do not have spark plugs; they use heat generated by high compression of the air in the cylinders, which ignites the fuel:air mix when the fuel is injected into the cylinders. Diesel engines are more expensive, heavier and noisier. On the other hand, they have longer service lives and burn diesel fuel. In many areas, you can buy untaxed diesel fuel for off-road use, which is considerably less expensive than gasoline. Diesel fuel is also much safer to work with, since it is not as easily flammable under most conditions. Fuel cleanliness is more important with diesels, so don't buy a diesel tractor unless you are willing to maintain a fuel supply separate from other garden equipment and keep the fuel very clean.

Selecting a Transmission

Throughout the range of tractor sizes, you have a choice in transmissions. Three primary transmission systems are used in lawn/garden tractors. Mower decks are designed to operate at a constant speed - typically full engine speed. Any adjustments in vehicle speed have to come from the transmission, not by varying the engine speed.

Belt transmissions are the simplest and cheapest and are found on some of the smaller lawn/garden tractors. Belt drives can work quite well on lower-horsepower tractors and provide an inexpensive way to vary speed on the go. In some cases, a fixed-speed belt drives a 3-, 4-, or 5-speed gear transmission. In other cases, a variable-speed belt drive is used. The variable-speed belt drive may be used in combination with a gear transmission or be the only transmission. Belts have the advantage of not needing a separate clutch; the belt can be slackened to provide clutching. Variable-speed belt drives (Figure 7) are obtained by moving one side of a sheave in or out, thus changing the pitch diameter of the sheave. The second sheave is normally spring loaded, so it responds in a direction opposite to the control sheave. Thus, as the operator moves the speed control lever, one sheave is, in effect, made smaller while the other sheave is made larger. This causes the transmission ratio to change and thus slows down or speeds up the tractor. Variable-speed belt transmissions are normally controlled by a lever and should be changed only on the go. Belt drives are generally used only on smaller lawn/garden tractors. They were popular in the past but are less common now.

Gear transmissions (Figure 8) are similar to manual transmissions on cars. A gear transmission on a small tractor generally provides three to five forward speeds, plus reverse. A gear transmission may be connected to

Figure 6. Water-cooled engine – arrow points to radiator.

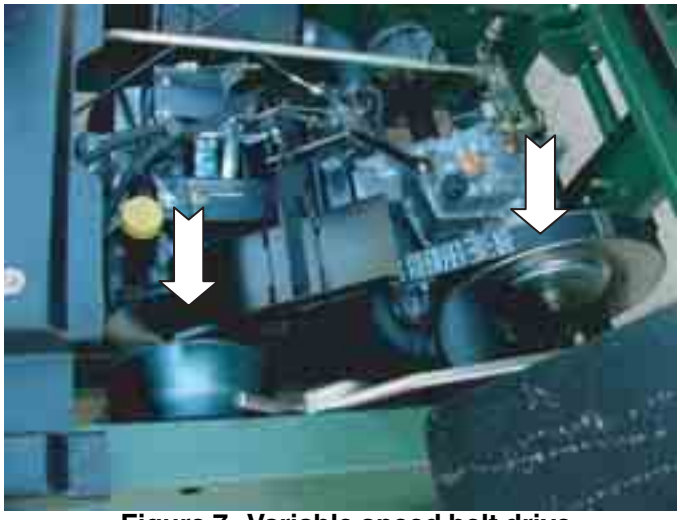

Figure 7. Variable speed belt drive. Arrows point to variable sheaves.

Figure 8. Gearshift lever on gear transmission on lawn tractor.

the engine by a mechanical clutch or by a belt drive, which can be slackened to provide declutching. On most small tractors, the gear transmission is integrated with the axle and differential into something called a transaxle. Mechanical transaxles tend to be durable and trouble free. Unless coupled with a variable-speed belt, they do not offer incremental speeds between the gear selections. With a gear transmission, you get low cost and high reliability, but give up infinite speed control. When a gear transmission is combined with a variable-speed belt drive, you get a variable speed drive with low cost. Gear transmissions are controlled by a lever and a clutch pedal must be depressed before shifting.

Hydrostatic transmissions (Figure 9) offer the most flexibility in speed control, but they come with a price. Hydrostatic transmissions are more expensive than other types and have lower efficiency. You will burn more gallons of fuel doing the same mowing job and will probably also need a more powerful engine for the same size mower. Hydrostatic transmissions also require more careful maintenance. Hydraulic oil and components must be kept squeaky-clean! Hydrostatic transmissions consist of an engine-driven hydraulic pump supplying oil under pressure to a hydraulic motor that drives the wheels. The displacement of the pump can be increased, decreased to zero or reversed, thus providing a range of forward, neutral and reverse speeds. It is also possible to reduce the displacement of the motor to provide the equivalent of a high gear, but this is seldom done.

Hydrostatic transmissions offer the ultimate in tractor control, but they are expensive to buy and operate. Hydrostatic transmissions make turning and maneuvering a mower much easier. Hydrostatic transmissions may be standard with some brands and models. Hydrostatic transmissions can be controlled by a hand lever or by one or two foot pedals. An increasingly common design uses one foot pedal for forward and a second pedal for reverse. A cruise control is sometimes provided with a hydrostatic transmission so that the operator can remove his or her foot from the pedal while mowing.

Power to Mowers and Other Implements

A mower deck can't cut grass unless it is connected to the tractor engine. This is usually done in one of two ways, with some possible permutations.

Belt drives (Figure 10) are the simplest and cheapest drive systems. With a vertical-shaft engine, it is sometimes possible to drive the deck directly from the engine shaft with a belt. Older designs used a mechanical belt release to disengage the drive, but they usually added a brake that automatically engaged when the belt was disengaged. Most current tractors use an electrically operated clutch/brake. When a switch on the tractor is moved, the clutch is engaged and the brake disengaged. When the switch is moved the other way, the clutch is disengaged and the brake engaged. One advantage of belt drives is that the belt will slip if the mower blade hits an obstacle, thus protecting the rest of the drive train.

Shaft drives (Figure 11) are used on the larger, more expensive machines. Shaft drives require one or even two right angle gear boxes, as well as two universal joints. They are more expensive but will handle higher loads.

Figure 9. Pedals to operate hydrostatic transmission.

Figure 10. Belt drive to mower deck.

Figure 11. Shaft drive to mower deck.

This makes them well suited to larger mower decks. Although they cannot slip like a belt, protective slippage under overload is still available since most decks have a belt or belts running from the shaft-driven gear box to the blade spindles.

The larger lawn/garden tractors also provide means of transferring power to implements other than mower decks. This includes rear implements such as rotary tillers and front implements such as snow blowers.

PTO shafts are the connection points for transferring the power from larger lawn/garden tractors to implements. PTO (power take-off) shafts on lawn/garden tractors are splined recesses in the rear of the tractor or splined shafts protruding from some point underneath the tractor. There are industry standards for the speed of these shafts. The recessed PTO on garden tractors turns at 2,000 rpm. It uses the recessed design to prevent connecting an implement designed for the 540 rpm PTO used on compact utility tractors. Midmount PTO shafts (Figure 12) may be specific to a given mower deck but should normally have a speed of 540 or 1,000 rpm. Implements connect to the PTO shafts using a drive shaft with two or three universal joints to provide flexibility.

Hydraulic outlets (Figure 13) are available on some of the larger lawn/garden tractors. These tractors can provide pressurized oil to operate hydraulic cylinders or motors. Hydraulic motors can power rotary tillers, sweepers and other implements. Hydraulic cylinders are used on implements needing linear action.

Electric linear actuators are used on some lawn/garden tractors, typically lawn or lawn and garden tractors. These actuators consist of an electric motor that turns a screw to provide linear motion. Electric linear actuators can do much the same job as hydraulic cylinders, without the need for a hydraulic system. The most common use on a lawn/garden tractor is providing a power lift for the mower deck.

Suspension Systems for Mower Decks

Mid-mount rotary mower decks are common on lawn/garden tractors. These decks can be mounted two ways, and the mounting method affects adjustment and operation.

Suspended Decks: Almost all lawn/garden tractors use suspended decks. Suspended decks hang under the tractor on a parallelogram linkage. An adjustable stop link limits the rotation of the parallel linkage and thus determines the height of the deck. The adjustable stop may be controlled by a knob or lever on the tractor. In operation, the deck is lowered until the linkage hits the stop and is suspended there. With suspended linkages, the wheels and rollers on the tractor are not designed to contact the ground in normal operation. The wheels and rollers are designed only to prevent scalping when uneven ground is encountered. You must adjust the height of the wheels and rollers to correspond to the height setting chosen, so the wheels or rollers are carried just above the level ground surface. If the anti-scalp wheels or rollers touch the ground all the time, they are not properly adjusted and will wear excessively. They are not designed to be gage wheels. See your operator's manual for instructions on proper adjustment.

Ground-carried Decks: The decks on most larger tractors are ground carried or ground following. The linkages on these decks look very much like the suspended linkages used on smaller tractors but are not necessarily parallelogram linkages. On tractors with ground-carried decks, the linkage serves to lift the mower deck for transport and to pull the deck along while mowing; it does not carry the weight of the mower when in use. With ground-carried decks, the deck rides on gage wheels when in use. The wheels are generally much larger than the anti-scalp wheels on suspended decks and usually have pneumatic tires, not just semi-pneumatic tires. With ground-carried decks, you will either lift the deck all the way up into the transport position or lower the linkage all the way; you do not want to carry the mower on the linkage in use. Either the front or rear linkage (or both) will pull the mower deck along while mowing, but the mower will follow the

Figure 12. Mid-mount PTO shaft.

Figure 13. Remote hydraulic outlets on tractor.

contours of the ground, independent of the tractor. Height adjustment is accomplished by moving the gage wheels and rollers up or down, typically using adjustable pins or collars. Once again, see your operator's manual for instructions on how to set the wheels and rollers.

Suspended decks are used on smaller tractors, and ground-carried decks are used on larger tractors. Both types of mower suspension can do an excellent job. You do, however, need to recognize and properly respond to the significant differences in how the decks are adjusted and used.

Hitches

Implements, including mower decks, can be attached to tractors in several ways and in several locations. Implements can be mounted under the tractor, as are most mower decks; on the rear of the tractor, typical for tillers; on the front of the tractor, typical for snow blowers; and on the tractor frame, as is done with front-end loaders. There are some standardized ways of mounting implements to the rear of the tractor.

Drawbar hitches (Figure 14) are very simple and found on everything from a lawn tractor on up. The tractor component can be as simple as a piece of steel plate turned up to form a horizontal surface with a hole in it. The implement tongue ends in a generally U-shaped or clevis structure that fits over (above and below) the tractor drawbar. A pin is then dropped through holes in all three pieces. This type of hitch is quite adequate for simple tasks such as pulling garden carts or fertilizer spreaders.

Sleeve hitches (Figure 15) are seldom used anymore, but implements are still available. They consist of a one-point hitch system in which the implement can be lifted by a manual lift arm, hydraulics or an electric linear actuator. The tractor portion of the hitch is a U-shaped steel frame with a small steel tube welded inside at the rear. The implement portion looks much like an implement drawbar hitch. It fits over the bracket and tube, and a hitch pin is then dropped through the holes in the implement hitch and the vertical tube. The entire U-shaped frame is then rotated up to lift the implement. Only implements designed for a sleeve hitch can be used.

Three-point hitches (Figure 16) are the top-of-the-line system. They are found only on the larger garden tractors. They are nearly always actuated by hydraulics. This is the same system used on farm tractors. Garden tractors, if they have a three-point hitch, will have a category 0 hitch; compact tractors use a category 1 hitch. ASAE standards define the dimensions of the tractor hitches and matching implement components for each category. The hitches consist of two lower hitch arms that are roughly horizontal when lowered, but the outer ends of which rotate upward when the lift is raised. The third arm is not power-lifted. It is just a link fastened to the rear of the tractor and to the hitch mast on the implement. The upper link is a turnbuckle that can be screwed in or out to level the implement. Again, only three-point hitch implements can be used with this system, and category 0 and category 1 implements are

Figure 14. Drawbar hitch on lawn tractor.

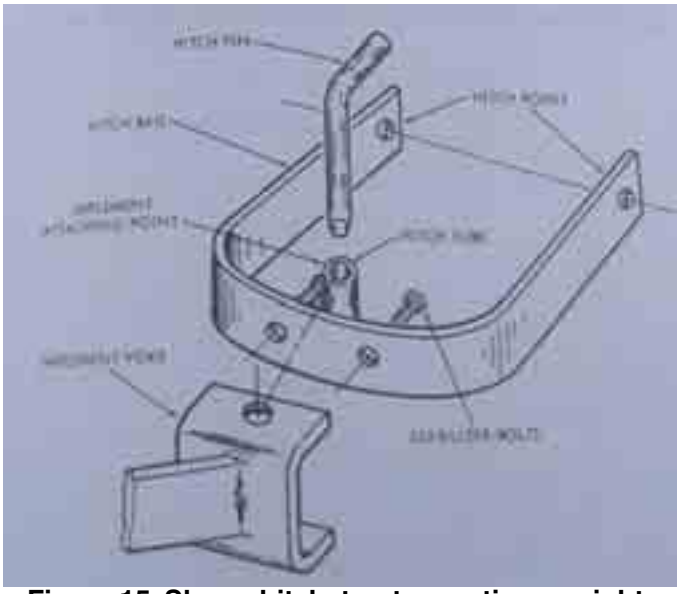

Figure 15. Sleeve hitch: tractor portion on right, implement portion on left.

Figure 16. Three point hitch on compact tractor.

not interchangeable. Most three-point hitches include sway links - turnbuckles that can be tightened to eliminate side sway of the implement. Since small three-point hitch implements seldom conform closely to ASAE standards, it is handy to be able to adjust the sway links to compensate for differences in width between the implement lower hitch pins.

Other implements are mounted on special hitches or brackets, specific to a manufacturer and model. Most center-mounted mowers on larger tractors are mounted with some kind of quick-attach system. Different manufacturers use different systems, but most allow the front bracket to be released easily from the front of the tractor. Then the front bracket can be removed from the mower, the rear bracket loosened and the mower deck pulled out to the side after the drive is disconnected.

Some manufacturers offer their own quick-hitch system for front-mounted implements such as snow blowers and blades. Other manufacturers just bolt the implements to the front of the tractor. Front-end loaders often mount onto quick-attach brackets that are first bolted to the tractor frame.

In summary, the larger the implement and tractor, the more likely an up-scale, easy-to-use hitch will be provided.

The Effects of Width and Speed on Mower Productivity

It seems obvious that a wider or faster mower will cover a lawn faster than a narrower or slower mower, but this is not always true - and seldom will the increase in cutting rate be proportional to the increase in width or speed. The effects of width and speed are interrelated, and both are affected by a term engineers call efficiency (or field efficiency, in the case of farm implements).

Efficiency: With any mowing operation - or any other tractor operation, for that matter - not all of your time is spent actually mowing. You will spend some time turning at the sides or ends of the lawn. You may slow down occasionally to maneuver around trees, bushes or other obstacles. You may have to stop for chores like emptying a grass catcher or unplugging a machine or to move the kids' toys and the dog's bones out of the way. All of these things reduce your efficiency compared with just driving in a straight line at optimum speed. With a big, rectangular lawn, no obstacles and no grass catcher, your mowing efficiency might exceed 90% (in other words, you might be actually mowing at optimum speed over 90% of the time). On the other hand, if your lawn is typical, you will have a much lower efficiency - and your efficiency will decrease with increasing mowing width and speed.

Width: It seems logical that if you trade your mower in on a new one that is 50% wider, you will be able to mow 50% more lawn per hour. Unfortunately, that's not so in most cases. As you move to a wider mower, your nonproductive time will become a greater portion of your total time, and thus your efficiency will decrease. As you increase width, efficiency decreases, and in some cases you can actually reduce mowing rate. If the additional time spent maneuvering a wider mower exceeds the time saved by the wider cut, you will actually be able to cut less area per hour with the wider mower.

Speed: The effect of speed is similar to the effect of width. Increasing speed does not result in a proportional increase in mowing rate because you still have to turn at the ends of the lawn and still have to maneuver around trees and obstacles. This nonproductive time becomes a higher percentage of total time as your speed increases, and thus your efficiency will drop with speed. In some cases, increasing width will necessitate reducing speed, thus negating the effect of a wider mower.

Width and Speed Interaction: Often, when you move to a wider or faster mower, you also move up to a different type of tractor and/or mower; therefore, it is important to look at the overall picture. Some mower configurations are more efficient than others. It is possible that one mower configuration will have a wider deck while another configuration offers higher speed or higher efficiency.

In most cases, a wider or faster mower will cut a lawn faster than a narrower or slower mower, but this is not always true, and the increase in mowing capacity will not be proportional. You have to consider your mowing conditions and type of mower as well as width and speed. The same principles apply to other implements such as tillage implements and spreaders, etc.

Quality Versus Price

We've all heard the old saying: You get what you pay for. Is that really true for mowing tractors? There is certainly a wide range of prices; in fact, you can easily pay twice as much for a lawn tractor at a major farm equipment dealer as you would pay for a lawn tractor with the same horsepower and mowing width at a discount store. What do you get for the additional money?

For a given product line, price tends to increase with horsepower and mowing width. Price also increases as you move from a lawn tractor to a lawn and garden tractor or on up to a garden tractor. Beyond these general trends is the dramatic difference in price among tractor brands. Some of the factors that lead to a cost difference among brands are:

Engine quality varies. Some engines of the same size are more reliable and designed for longer service life.

Frames and axles can tell you a lot about a tractor. Lower-priced machines generally have front axles that are formed from steel and welded, and more expensive machines generally have cast or forged axles (Figure 17). The forged axles tend to be strongest and are a good predictor of overall quality level.

Transmissions come in different quality levels, particularly among hydrostatic transmissions. Some will work more smoothly and hold up longer than others.

Overall reliability can vary a great deal. In some cases, the more expensive machines are just built better all the way through and will serve longer with fewer problems.

Figure 17. Formed and welded front axle on cheap tractor on the left; cast iron front axle on small lawn tractor in the center, forged front axle on higher quality tractor on the right.

Service should be a consideration. The less expensive machines typically have a shorter warranty, and getting repairs done under warranty may be difficult; dealers and manufacturers tend to stand behind the more expensive machines.

Parts availability can be a big issue. The more expensive machines generally come from dedicated lawn and garden or farm equipment dealers who stock plenty of parts and have ready access to even more parts. The less expensive machines are often sold by discount stores and mass merchandisers who have no long-term relationship with the manufacturer, thus future parts availability is questionable. The tractors at discount stores and mass merchandisers may carry the house brand name, but the actual manufacturer (and the entire design) can change annually, thus making parts and service availability problematic.

This whole issue becomes a question of value. You have to balance the quality features against the price for the various brands and models, and then determine *what is the best value for you.* What is right for you might not be right for your neighbor. If you have only a small lawn to mow, you might be satisfied with a low-cost tractor and mower. If you will use the mower more extensively, you might want higher quality to reduce downtime and repairs. In most cases, you will be better off with a small, higher quality tractor rather than spending the same amount on a larger, lower-quality machine.

Yes, with mowing tractors you usually do get what you pay for.

Cost and Life

Two questions of interest to prospective purchasers are: how much do riding mowers and small tractors in the various classes cost and how long can I expect one to last? The Outdoor Power Equipment Institute (OPEI) offers some general answers to these questions. OPEI is the trade organization representing manufacturers of outdoor power equipment, including riding mowers and small tractors.

What will it cost? There is a very wide range of costs for each class because of differences in power, transmission type and overall quality, but the table shows the approximate range for some of the classes:

Rear-engine riding mowers:	$600 - $2,500
Lawn tractors	$700 - $4,000
(Lawn and garden tractors are not listed by OPEI but are intermediate in price.)	
Garden tractors	$900 - $6,000
(Although OPEI says $6,000, some cost more than $10,000.)	

Note: you can buy a cheap garden tractor for much less than a high-quality riding mower, but it would not necessarily be a wise investment.

How long will it last? Again, there is a wide range in life because of both quality of the different models and also how a given machine is used and cared for. This table gives OPEI's estimates:

Rear-engine riding mowers	6 years
Lawn tractors	6 years
(Lawn and garden tractors are not listed by OPEI but should have a life span of 6-9 years.)	
Garden tractors	9 years

In practice, hours of use is a much better indicator of machine life than years. Machines and machine components are designed for a specific life in hours of use. A given component is usually designed for a specific number of hours before failure. These numbers vary greatly among manufacturers and models. Some low-priced machines may be designed for a life of 200 hours

or less, and some higher-quality homeowner machines may be designed for 500 hours or more. Professional riding mowers may be designed for 2,000 hours. If you mow for two hours every week during the mowing season, you will accumulate 50-60 hours per year.

Safe Operation of Lawn/Garden Tractors

Now that we have discussed selecting a lawn/garden tractor, there is one more important issue to consider: safe operation of your new lawn/garden tractor. Lawn tractors, lawn and garden tractors, and garden tractors are large and powerful and can be dangerous if not used safely. A garden tractor can weigh more than 900 pounds and have as much horsepower as the farm tractors your grandfather used.

Most manufacturers are conscientious about designing safety features into the machines, but you are still the most important safety feature on the machine. Listed below are some of the hazards you may face and suggestions for safely avoiding them. Important overall recommendations are to keep all safety features properly maintained, read and follow the operator's manual and warning decals, and be safety conscious. Do not allow children to operate these machines.

Blade Contact is the most obvious hazard. Since the blade tip speed can be up to 19,000 feet per minute (that's 215 mph!), contact with a blade will cause serious injury. Stay in the seat when operating the mower deck. Keep feet and hands away from the deck. Be sure the operator presence control and blade brake are working.

Thrown Objects can be minimized by always using your discharge chute (Figure 18), mulching plate or a bagging attachment. Never operate with a discharge chute removed or tied up. Pick up rocks, trash and limbs, before mowing. Disengage the mower deck before crossing gravel or uneven ground. Keep children and pets well away from the mower when operating. Replace any damaged grass catchers, since damage might allow objects to be thrown through the catcher.

Fire is always a possibility with gasoline engines and, to a lesser extent, with diesel engines. Lawn/garden tractors pose a particular hazard because the operator's station is open (no cab) and the machines are so compact that the operator is not very far from the fuel tank. Fuel the engine only when the tractor engine has cooled down. Do not open the fuel tank cap when the engine is hot. Be careful to avoid impacts to the fuel tank or fuel lines. Maintain fuel lines and other fuel components in good condition. Try to avoid spills when refueling.

Runovers can occur if children (or even adults) ride on the mower or tractor with the operator. Never allow riders. Never allow more than one person on the machine. Keep children away from the machine when operating. Be especially careful when backing up. Also, be careful not to operate on rough ground at high speed, because the driver can be thrown off.

Obstacles such as tree branches can injure the operator or **e**ven drag him or her off the seat. Be very careful operating around or under trees, fences, picnic tables, patio furniture, gas or water pipes, and powerline guywires and anchors.

Always treat your riding mower or tractor with care and respect.

Summary

A lawn/garden tractor can be a welcome addition to your home. It can make mowing and other jobs much easier. Because there are so many options to choose from, selecting a lawn/garden tractor can be challenging. Decide what features are important to you, and find tractor models with those features. Consider quality (construction, service, parts, reliability) in your decision, and pick the machine that is the best value for you. Then, use it safely.

Figure 18. Discharge chute in place.

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