

DOUBLE MOWS BETTER

Until now, it has been mainly used in the field of Alpine grassland management and the maintenance of nature reserves, but now the classic cutter bar is emerging from its niche. Thanks to technical innovations, it has also become of increasing interest to agricultural businesses.



Double-blade mowers enable the use of small and light tractors, for example, here for daily green forage collection. The manufacturer also offers solutions for operating front mowers on tractors without a front linkage.

In order to understand why modern double-blade mowers can be a sensible option, it is necessary to take a look at the differences in mowing methods. In the 1960s and 1970s, rotary mowers became established with the two relevant designs, disc and drum mower. The principle is based on the free cut: A rotating blade cuts off the stalk, which takes on the part of the counter blade due to its own weight and bending resistance. The applied rotation speed of 60 to 80 m/s (approx. 220 to 290 km/h) is so high that the blade is held in position by centrifugal force alone. This in turn enables the assembly on the known blade holders and accordingly the easy changing and the low susceptibility to foreign objects, since the blade can move out of the way. The high effort required for the drive and the demands on the lifting equipment were made possible by the progressive development of tractors. Powerful, robust and economical mowing technology therefore became available to farms.

To sum up

- ✓ Working with the double cutter bar offers several advantages over the disc mower.
- ✓ The process costs of both systems are roughly the same.
- ✓ The investigations carried out show a clear tendency that bar mowers are more gentle on the meadow fauna than rotary mowing technology.

Looking back

Before rotary mowers, the scissor cut in the form of the bar mower dominated. In contrast to rotary mowers, the stalk does not act as a counter blade, but either a so-called rigid finger (finger mower) or a second blade (double blade). Both designs have in common that the blade bar swings back and forth with the blades (oscillates). The distance travelled by the blade is called the stroke. With finger mowers, the stroke is determined by the distance between the fingers; with double-blade mowers, it is determined by the blade pitch. The disadvantage of the finger mowers is that there is a dead centre point at the reversal point of the blade movement, which makes it prone to blockages. There is hardly any such disadvantage with double blade mowers, since the blades move towards each other and the dead centre point is bridged by the overlapping of the blades. In addition, each blade only has to

travel half the stroke and the number of oscillations can be reduced. This has a positive effect on the cutting pattern and wear. Therefore, double blade technology is also more suitable for grassland use.

advantages of double-blade mowers faded into the background. These were the lower weight and the reduced drive requirement. So the blade bar only had the one niche left where these advantages are important:

In the Alpine region and on nature reserves. A high machine weight and a high power requirement (= higher tractor weight) are disadvantageous there, be it due to the slope of the areas or their load-bearing capacity. So it is not surprising that the leading suppliers in the field of double blade mowers come from southern Germany and the Alpine region. The technical development has not stopped there either, and so modern double-blade mowers have some important contemporary innovations:

- » Hydrostatic drive (via tractor hydraulics or own oil supply and PTO drive)
- » This in turn enables the frequency of oscillation to be regulated separately (manually or electrically operated throttle valve), making it much easier to coordinate the frequency of oscillation and the forward speed
- » Foreign object safety features: One of the biggest disadvantages of the purely mechanical drive of the old double blades is eliminated here by pressure relief valves.
- » Spring relief of the cutter bar
- » Safety devices
- » High degree of flexibility thanks to the hydrostatic drive: Front attachment, rear attachment, detached construction or as a butterfly. A lot is possible. Even tractors without a front linkage can be equipped with a front double blade via a mounting plate and an EW cylinder.
- » Longer blade life (see blade bidux X from ESM, silver medal Agritechnica 2019)

Tab. 1: Messwerte im Systemvergleich der Mahdtechnik

	Scheibenmäherwerk 9,05 m AB		Doppelmesserbalken 9,00 m AB	
	Front	Heck- kombination	Front	Heck- kombination
Gewicht in kg	900	1900	400	600
Auflagedruck in kg	170	450	90	240
Leistungsbedarf kw an Zapfwelle	32	20	3	6
Je m AB	5,7		0,95	
Je t TM	1,42		0,35	
Arbeitsge- schwindigkeit	15,9 km/h		9,7 km/h	

Overtaken by technical developments

The disadvantage of bar mowers was their lack of flexibility due to the fact that they were usually tied to a tractor via the side attachment and due to the high maintenance costs as a result of the purely mechanical drive. Additionally, it was difficult to coordinate the number of vibrations and the forward speed of the tractor. A too low number of vibrations resulted in an unclean cut and blockages. Too high, in turn, promoted wear enormously. A much more serious disadvantage of the cutter bar, which is more important in practice, is the need to sharpen the blades regularly. This is relatively time consuming and requires precise grinding at the correct cutting angle. And changing the blades, unlike the rotary mowers, can not be done quickly anyway, as these are usually riveted to the beam.

Bar mowers with a new look

Bar mowers could not keep up with the increasing scope of use and the resulting demands on stability and maintenance effort. All of this, in combination with the aforementioned development in the field of tractor technology, ensured that the remaining

Unrecognisable

The result is powerful, modern mowing technology that has little in common with its predecessors from the 1950s and 1960s, apart from the basic concept. A system comparison by the Austrian Federal Teaching and Research Institute for Agriculture (BLT) in Wieselburg clearly shows where the advantages and disadvantages of modern double cutter bars lie compared to conventional mowing technology. Butterfly combinations in a separate construction were compared. As expected, the differences in weight and therefore also the impact pressure and the power requirement were very clear:

As an orientation: In the test, the disc mower combination was driven with a 110 kW tractor (150 PS), the double blade combination with 70 kW (95 PS). If you look at the range of most tractor manufacturers, there is at least one difference here from a series.

narrower runners and positioning them behind the cutter bar. It was noted as positive that the mowed material falls where it is cut with the double blade mowers. This results in a wide deposit, which causes faster (partial) drying. The disadvantage is that the mowing material of the front mower is driven over by the tractor, so swath discs are recommended at least for this.



This is the simplest solution to control the vibration frequency. This inconvenient solution is directly attached to the device, with movement also having to be made by ear. The electrical adjustment option via terminal with a display of the vibration frequency is therefore recommended.

The cutter bar in action

Working with the double blade is very pleasant due to the reduced noise level. However, it requires more attention, as the ends of the bars are difficult or impossible to see, especially in higher grass. In addition, care is required in order to drive with the optimum number of vibrations and thus reduce wear. There are also strongly varying data regarding the service life of the blades. These range from almost 15 to 100 hectares. In addition to the driving style, essential factors are also the existing conditions and the nature of the area itself. Stones, molehills or wild boar damage are poison for a double blade mower. Dull blades not only affect the quality of work, but also the overall performance, as it cannot be compensated for by increasing the speed. Manufacturers now have solutions ready for blade sharpening in the form of fully automatic grinding stations. Once clamped, the grinder moves the blades down, guided by a sensor. However, these stations are associated with costs with a net investment of around 8,000 Euro. Here, too, the

Tab. 2: Verfahrensvergleich

Bei Ø Schlaggröße 2 ha...	Scheibenmähwerk 9,05 m AB	Doppelmesserbalken 9,00 m AB
Flächenleistung ha/h	6,7	5,1
Arbeits erledigungskosten EUR je ha		
Traktor	11	7
Mähwerk	13	16
Arbeit (Lohnansatz)	4	54
Gesamt	28	28

In addition to these pure measurement values, the quality of work was also assessed. What was noticeable in the case of the double-blade mower was that narrow strips of the crop remained. The cause here lies in the skids and stalk dividers of the front mower, which press the grass down, especially on the side where the drive is located. This can then not be detected by the following rear mower. The effect has already been reduced by using

Wieselburgers collected some data. The time for removing the six blades of a 9 m combination is around 20 minutes. Another 5 minutes are added for placing the blades in the station. The actual grinding time (ø 80 min.) is in turn strongly dependent on the degree of wear and therefore the grinding strokes required. This time can, for example, be used in parallel for the maintenance of the mower and tractor. For those who shy away from this investment, there are still semi-automatic machines that take the lead in grinding the right cutting angle. A second set of blades is recommended so that you can react quickly. Grinding can then be relocated to periods outside the peak of the forage collection.

Conclusion from a technical-rational point of view

The question remains of how much needs be invested. The 9-m double blade combination tested by BLT is in the manufacturer's lists for around 28,000 to 30,000 Euro net, depending on the equipment. This means that it is on a comparable level with conventional mowing technology. The costs of doing the work are at a similar level between the two systems, due to the lower area coverage of the double blades. If the process costs are about the same, why switch to a double-blade mower? The technology is particularly interesting for pure grassland farms if you consider the complete tractor-mower package. Since it is no longer necessary to keep the tractor horsepower in the previous range, this can be taken into account when making replacement investments. Smaller, less powerful tractors can then be used here. Economic advantages can therefore be expected in the medium to long term. These effects do not arise in the case of mixed farms, as the tractor horsepower is usually needed for other work. Looking into the future should be exciting. Rising diesel costs or possible electric drive concepts could give the double cutter bar a significant boost.



A smooth cut without fraying – this is a significant advantage of the double-blade mowers but requires that you take care of your blades.

The ecological X factor

In addition to the technical-rational consideration of the systems, there is also the ecological aspect, since the blade bar technology is considered to be particularly gentle on the meadow fauna. Since the 1980s there have been several studies on the subject, the results of which were evaluated by the Bavarian Academy for Nature Conservation and Landscape Management (ANL). In the case of amphibians in particular, the losses of 11 to 13% injured or damaged ones with cutter bars are lower than those of the rotating mowing technique without (17%) and with a crop processor (21%). In addition to the mowing technique, the cutting height also has a major influence here. For insects there are currently only indications. This is mainly due to the fact that the effects on the mobile, mostly flight-capable adult animals, as well as on the immobile larval stages (e.g. caterpillars) must be examined. For many insects, the problem here seems to be in the design of conventional mowing technology. Due to the protective cover and the protective cloths, it is hardly possible to move upwards. In addition, the blades rotating at high speed create a suction. The cuttings also form a stream of material, since two drums or disks always rotate in opposite directions. Therefore the risk of being injured is higher for insects. The risk also increases if forage conditioners are used. With cutter bars, on the other hand, the cuttings fall where they are cut, and flying insects can move upwards.



The cutter bars are held on top of each other by spring pressure and slide on each other. It is therefore important to ensure that the contact surfaces are clean during maintenance. Combinations of smooth and corrugated blades have proven effective in practice.

Conclusion from an ecological point of view

The investigations carried out show that bar mowers are more gentle on the meadow fauna than rotary mowing technology. From an ecological point of view, the question should be posed regarding in which areas the use of cutter bars makes sense at all. In large, intensively used but relatively species-poor ryegrass meadows or on species-rich, more extensive grassland? Often these are areas that are also subsidised within the framework of agri-environmental and climate measures (AUKM). However, the use of bar mowers directly as a hectare-related subsidy in the corresponding program sections is somewhat the exception in the German funding landscape. Ultimately, however, it is essential that the technology fits (economically) into the business concept.

