LA BUVETTE®

The specialist in Livestock Drinking Solutions




Guide book for

Pasture Watering

by LA BUVETTE®








LA BUVETTE®
The specialist in Livestock Drinking Solutions

Preface

A guaranteed supply of high-quality water in sufficient quantities during the entire grazing season is vitally important for the well-being and productivity of breeding animals. However, direct access of the herd to natural pools and watercourses is a source of sanitary and environmental problems. Furthermore, hauling water becomes more and more expensive.

LA BUVETTE is offering you this guide book as a specialist in the field of livestock watering based on more than 70 years of research and practical experience... It contains valuable information and useful advice allowing you to better identify the problems involved with pasture watering systems and to help you work out the best solution(s). These are described in detail stating their advantages, limitations, installation and maintenance procedures.

A visit from a LA BUVETTE technician providing personal advice and sharing professional know-how with you can still be of added value. Our intention is indeed to offer the breeder and his animals efficient and durable solutions that are environmentally-friendly and respect animal welfare.

Have fun reading !

Jean-Philippe Bousquet

President

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1. Drinking Behaviour of Livestock on Pasture

The number of drinking every day lives in the meadow varies generally from 2 to 5 times a day on average but can go more of 10 times a day. Dairy cows tend to drink more often that nursing cows and the frequency of drinking increases with the rise of the temperature and the nearness of the water source. The speed of drinking is included between 15 and 18 liters/minute.

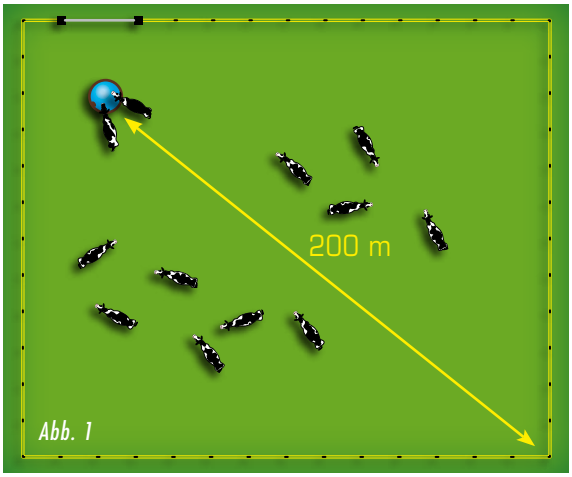


Abb. 1

When the drinkers are installed at distances close to the grazing area the animals go to drink regularly, most of the time on their own or in small groups of two or three (Fig.1).

However, when the distance is considerable (> 200 m), the animals tend to go to drink less frequently and in large groups (MAPAQ, 1999). The cows spend an average of 2 to 4 minutes around the drinker which means that when the entire herd goes to the drinker the watering system must be of the right dimensions in order to allow a large number of animals to drink quickly and simultaneously (Fig.2).

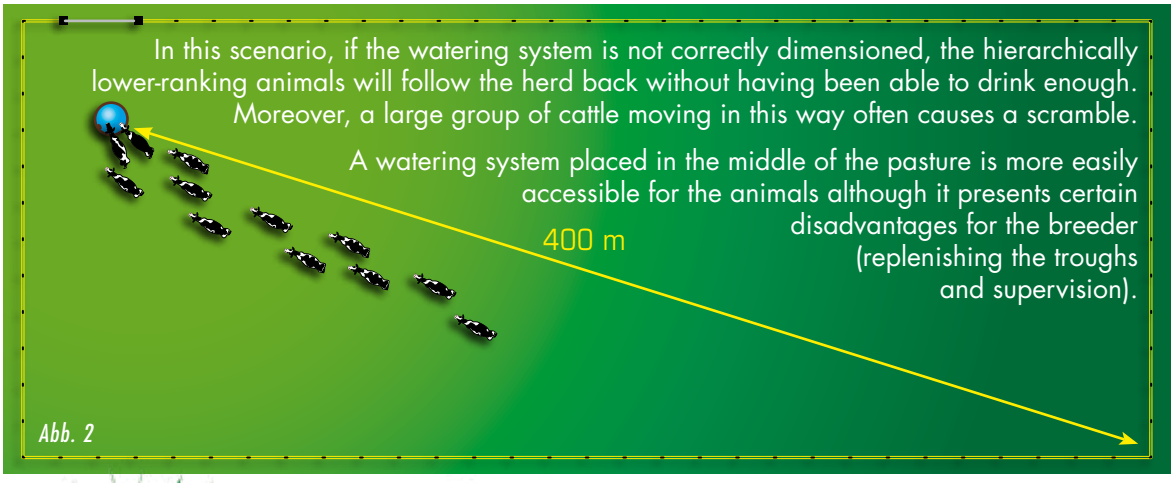


Abb. 2

1.1 Choosing the Right Location:

Ideally, the maximum distance between the watering place and the farthest end of the pasture should not exceed 200 m. When the distance is beyond 400 m, the farthest corners of the pasture are less frequently visited as the animals prefer to stay close to the drinker.

Note that this behaviour is even more strongly displayed by dairy herds. When the grass is plentiful, the grazing surface is reduced by 7 to 9% every 100 metres (Goulard, 2008).

During very warm periods (> 28 C°), the animals move less actively around the fields, gathering in the shady areas and going to drink less frequently at the watering place if it is too far away.

Nevertheless, it is not preferable to place the drinker in the shade because shady locations might become overcrowded when it is hot and hence increase the risk of accidents: crushing, trampling, etc. Dominant animals will start monopolizing the drinker and stop the others from coming to drink (Fig. 3).

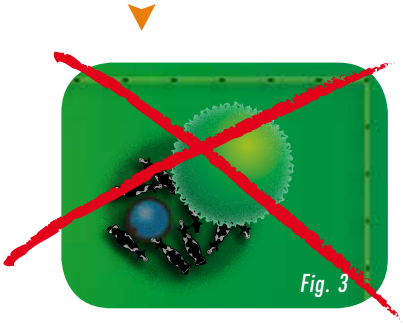


Fig. 3

For the same reason, you should absolutely avoid placing the drinker in a dead-end or a confined area. **This might reduce the water consumption of subordinate animals by 25%** (Coimbra, 2007).

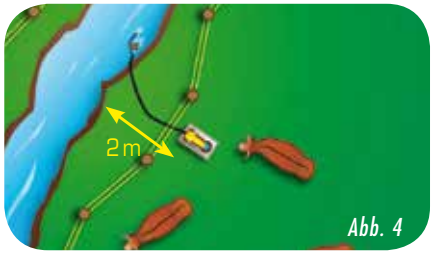


Abb. 4

When the watering system is installed in the immediate vicinity of a water source or a river, it is always preferable to maintain a minimum distance of 2 m to avoid the runoff water from picking up and transporting manure (Fig.4).

1.2 Pasture and Automatic Milking System:

Some breeders favour exclusive access to water available inside the building to encourage the cows to leave the pasture and pass by the automatic milking system.

The different experiences gained in relation to this method show that the concept behind this practice is not justified and that **the number of visits to the milking system and the milk production are not affected by the presence of drinkers in the pasture**.

The distance between the milking system and the pasture seems to be a far more determining parameter concerning the frequency of visits to the milking system (Spördnly & Wredle, 2005). On the other hand, cows with a drinker in their pasture spend more time grazing than those that have to return to the building to drink. Finally, the walks to the building demand extra energy from the cows which could have a negative effect on their milk production.

1.3 Daily Water Consumption of Some Animals on Pasture*:

Even though the needs are partially met by the consumption of water-rich grass, the amount of water consumed can be very high due to the high temperatures during this period of the year.

Besides the other common variation factors (live weight, the amount of food consumed, production level), the water consumption on pasture depends in particular on the dry-matter content of the grass, the presence of shady areas, the temperature and the rainfall.

**Daily water consumption considering a diet consisting exclusively of grass.*

Herd	Average	Summer Peak
Dairy cow (35 kg/d)	55 l/d	125 l/d
Nursing cow	35 l/d	75 l/d
Grass-fed calf (200 kg)	15 l/d	20 l/d
Dry cow, in-calf cow, bullock	35 l/d	70 l/d
Heifer 350-450 kg	30 l/d	50 l/d
Milk ewe	7 l/d	15 l/d
Nursing ewe + lamb	6 l/d	12 l/d
Dry ewe	3 l/d	6 l/d
Milk goat	5 l/d	12 l/d
Dry goat	3 l/d	6 l/d
Adult horse	20 l/d	45 l/d
Lactating mare	30 l/d	55 l/d

1.4 How to Size Your Watering System? Volume/Flow/Access

The sizing of the livestock watering system depends on several criteria. These include the water needs of the herd, the number of animals that might be drinking at the same time, the flow rate of the watering system and the remoteness of the water point from the farthest end of the pasture.

It has been proven that cattle prefer to drink from large troughs (500 litres) rather than from small ones (300 litres) and that they consume up to 20% more water from large troughs (35,6 l/d as opposed to 29,6 l/d; heifers of 275 kg) (Coimbra, 2007).

In general, it is preferable to **slightly oversize the watering system** in order to guarantee the supply, to avoid crowding and creating waiting times that are too long, even in extreme conditions

The greater the distance between the end of the pasture and the drinker, the less frequently the animals will drink, however, when they do walk to the distant drinker they will move in a large group and consume more in one go.

In case of **remote** water points (more than 200 m from the end of the pasture), the watering system should allow **at least 20% of the animals** of a herd to drink **simultaneously**. In case of water points **close** to the end of the pasture, the watering system should allow **at least 10% of the animals** of a herd to drink **simultaneously**.

It is important to make sure that the flow rate of the drinker provides sufficient water for the total number of heads that can drink simultaneously from the drinker. If a large number of animals drink at the same time (at a rate of 15 l/min/cow) and the flow is insufficient, the animals might empty the trough, start moving it around and damage the water connections and supply lines.

The drinker's flow rate is the main item to be checked on pasture, as undersized supply lines or significant pressure drops can be the cause of insufficient flow rate.

- When the drinker is installed at **more than 200 m** from the end of the pasture, a good rule to remember is that the watering system must be able to **deliver half of the daily water consumption of the herd in 10 minutes**. The feasibility of this requirement depends on the water volume immediately available when the animals arrive (trough volume) and on the ability of the system to replenish the trough (flow). In general, the flow is the limiting factor. It is possible to compensate for this by increasing the available water volume.

For example, in normal weather conditions, for a herd of 30 nursing cows followed by their young (water intake of both mother + calf: 50 l/d, that is 1500 l/d divided in 2 = 750 litres to be supplied), a 600 litre trough (6 animals simultaneously), with a flow rate of 30 litres/min, is sufficient to quickly water the herd.

However, during hot days, when the cows and their calves drink 90 l/d (that is 2700 l/d divided in 2 = 1350 litres to be supplied), a single 600 litre trough with a flow rate of 30 litres/min is no longer sufficient.

In this case, there are two options:
- increase the flow rate up to about 75 l/min
- have a starting volume of 1200 litres.

- If the drinkers are installed at **less than 200 m** from the end of the pasture, the volume of the reserve can be smaller, as the animals go to drink more frequently and in smaller groups (see page 4). The watering system must be **able to supply a quarter of the daily water consumption of the herd in 10 minutes**.

For example, outside the periods of very hot weather, for a herd of 50 dairy cows in production, drinking 60 l/d, (that is 3000 l/d divided in 4 = 750 litres to be supplied), an 800 litre trough (7 animals simultaneously), with a flow rate of 15 litres/min, is sufficient to quickly water the entire herd.

In practice, it is preferable to multiply the number of drinkers rather than increasing the volume of only one. Installing the troughs at some ten metres apart reduces the risk of crowding because a larger amount of animals can drink at the same time (no waiting). It is absolutely necessary to make sure the troughs are firmly secured to the ground to prevent the animals from moving them around when they are empty (Fig. 5).

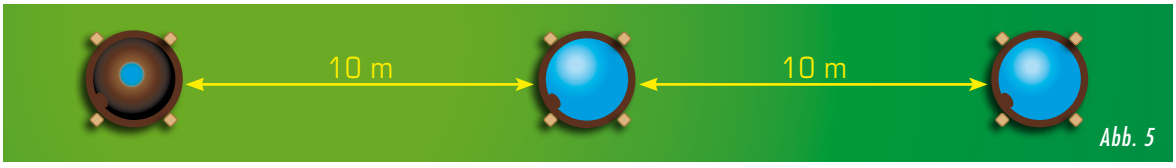


Abb. 5

Moreover, since every trough is equipped with its own valve, the total flow increases.
For example, looking at the data in the table below, we see that two 600 litre troughs have a higher capacity and provide access to more heads than one 1200 litre trough.

Quantity of water distributable in 10 minutes depending on the trough volume/flow rate/access:

Trough volume	Number of places at the drinker*	Flow rate in the trough				
		15 l/min	30 l/min	45 l/min	60 l/min	75 l/min
400 l	5	490 l	640 l	850 l	1000 l	1150 l
600 l	6	720 l	900 l	1050 l	1200 l	1350 l
800 l	7	920 l	1100 l	1250 l	1400 l	1550 l
1 000 l	8	1135 l	1300 l	1450 l	1600 l	1750 l
1 200 l	9	1350 l	1500 l	1650 l	1800 l	1950 l
1 500 l	10	1650 l	1800 l	1950 l	2100 l	2250 l

Volume available in 10 minutes

* Indicative value calculated for circular troughs accessible from all around.
One place at the drinker equals one 60 cm wide access to the water.

2. Problems Caused by Drinking Directly from Natural Pools and Watercourses

2.1 Impact of Water Quality on Animal Health:

Health problems can originate from the consumption of poor quality water: various diseases, parasitism, injuries, ingestion of toxins, etc. Even if the animal does not display any clinical symptoms of sickness, it must mobilise its immune defence system to fight the ingested pathogenic microorganisms, affecting its growth and production performances.

• Diseases:

Drinking from water points that are contaminated by faeces can cause transmission of diseases such as paratuberculosis, salmonellosis, listeriosis and leptospiroris as well as other non-bacterial diseases such as cryptosporidiosis and giardiasis.

• Parasitism:

On the other hand, humid areas (rivers, ponds, puddles, etc.) are favoured by internal parasites such as fasciola gigantea and paramphistome, one of which undergoes a phase of the development cycle in the water. After having contaminated their intermediate host (an aquatic mollusc), these parasites are excreted and deposited on the surrounding aquatic vegetation.

When animals have direct access to these contaminated water points they ingest the vegetation and contaminate themselves.

Furthermore, by trampling on the river bank, the animals create muddy areas favouring the proliferation of the intermediate hosts.

• Ingestion of toxins:

Stagnant waters can promote the development of blue-green algae, some of which produce more or less virulent toxins.

• Injuries:

There are still other risks associated with direct access to water points: risk of injuries (going down to the watercourse) and lameness (permanent contact with mud).

2.2 Impact of Water Quality on Performance:

The animals are highly sensitive to the taste and smell of the water and poor quality can easily reduce their consumption. It is acknowledged that an insufficient water supply decreases the ingestion of dry matter, milk production and growth performance.

Dry cow dung is usually a good indicator of the degree to which your cattle is dehydrated.

• Inadequate Water Consumption:

Cattle can detect a content of 0.05 g dung per litre of water (Willms, 2002). When the concentration reaches 2.5 g/l, the water consumption is affected and as soon as it is over 5 g/l the ingestion of dry matter is also reduced. This information makes sense considering how **more than a quarter of the animals drinking from a natural water source also defecate in it.** Furthermore, when the animals walk through the water they turn up the sludge degrading the water quality even more.

• Growth Performance:

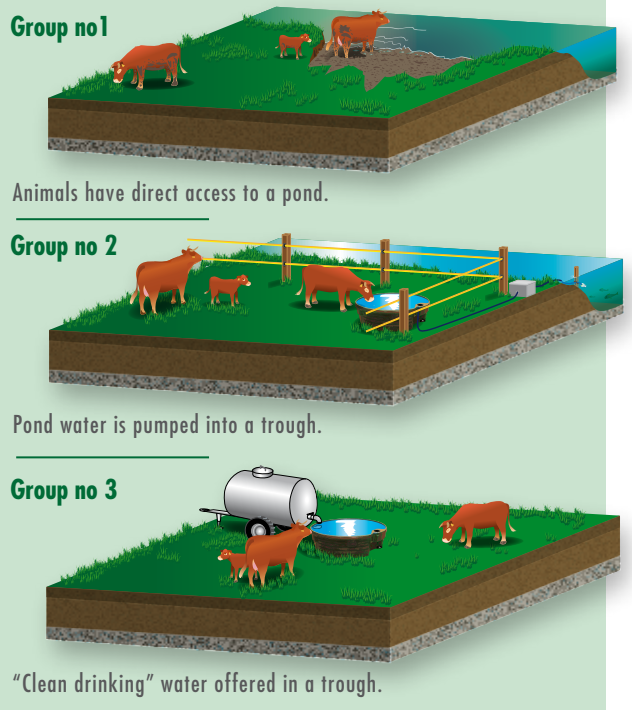
A study was conducted to determine the effect of the method of water supply on the growth and behaviour of cattle on pasture. Three groups of nursing cows and heifers were supplied with water using three different methods (Fig. 6):

- Calves whose mothers were offered drinking water had an **average daily growth rate 9% higher** than those whose mothers drank directly from the pond (1,170 g/d against 1060 g/d). Calves reared by mothers that drank water from a trough filled with water from the pond showed intermediate growth performance (1140 g/d).

- The **growth rate** of heifers with access to clean water was **23% higher** than that of heifers with direct access to the pond (790 g/d against 640 g/d).

- The animals offered clean drinking water spent **more time grazing** and less time resting than those that drank directly from the pond. The longer grazing time is certainly primarily responsible for the higher average daily growth observed.

Fig. 6 : Study on growth performances (Willms, 2002)



Other studies confirmed that by simply pumping water from a pond into a trough and distributing it from there, rather than allowing direct access to the pond, helps improve the animals' growth performance and hydration levels (less dry dung):

- +29% de GMQ average daily growth with 15 month old heifers (Bica, 2005)
- +3% average daily growth with bullocks (Lardner, 2005).

2.3 Impact on the Environment and Regulations:

• Consequences of Drinking Directly from Watercourses:

When the animals have free access to watercourses, they cause the river banks to collapse, fine matter to suspend in the water (sludge) and organic material to be dropped (dung, decomposing plant matter, etc.). These fine particles and the organic material contaminate the spawning grounds of certain fishes.

Additionally, siltation of the river bed causes a lack of oxygen and death of the organisms that live there

The disappearance of river bank vegetation promotes the transportation of undesirable substances (faeces, sediment and fertilizers) by runoff water into the river.

By defecating into the water, the animals bring organic material and nutrients (nitrogen, phosphorus) into the water, enhancing the excessive growth of algae and the eutrophication of the waterways.

• Regulations:

Unlike in other countries such as Canada and Belgium, there is no regulation in France prohibiting direct access of livestock to the waterways.

Nevertheless, several articles of the Environmental Code state that the riverside property owners have to contribute to the good environmental status of these river banks.

Furthermore, certain works associated with watering animals such as the building of dams and the cleaning and improvement of river banks are governed by these regulations.

Wanting to restore the biological quality of rivers and in order to protect these, local authorities and water boards support the installation of livestock watering systems outside the watercourses.

2.4 The Cost of Water Hauling:

When the watering system used by the breeder on pasture involves supplying water on a regular basis by means of a water tank it is interesting to know the price of such a system (it is often underestimated). This is a criterion to take into consideration when you decide to invest in a different water supply system. It allows you to calculate the return on investment in relation to the water hauling.

The main factors determining the cost of water hauling are the depreciation of the material, fuel costs and the labour costs.

The table below shows the costs per hour of these different parameters:

	Purchase price	Yearly use	Cost per hour (€/h)*	
			material	fuel
2WD Tractor (Power)				
60 CV	22 000 €	700 h	4,70	2,80
80 CV	30 000 €	700 h	6,00	3,70
100 CV	40 000 €	700 h	7,80	4,60
4WD Tractor (Power)				
80 CV	34 500 €	700 h	8,20	4,30
100 CV	45 500 €	700 h	9,70	5,40
120 CV	57 200 €	700 h	12,00	6,50
Water tank (volume)				
3000 l	2 500 €	50 h	5,40	
5000 l	3 500 €	50 h	7,60	
Labour				
Help			11,5	
Breeder			6,0	

*Following the barème d'entraide - Trame BCMA

• **Example :**

Let's consider the case of a breeder who has to take water to a herd of 15 nursing cows on pasture at a distance of 5 km from the farm:

These 15 cows followed by their young drink on average 750 l/d (50 l/nursing cow + calf) during their entire stay on pasture (1st of April – 1st of November). Provided that the trough's volume is considerably large (3000 litres), the breeder will have to fill it up every 4 days.

If the breeder has a 3000 litre water tank and an 80 hp 4WD tractor, he will have to do this job some fifty times in a year.

Since the pasture is not far away, this job will only take him one hour.

In a nutshell:

- Grazing period: 200 days
- Water hauling frequency: Every 4 days
- Number of hauling times per year: 200 : 4 = 50
- Water hauling duration: 1 hour

With these elements we can calculate the annual cost of water hauling, see table on page 12:

Total time spent water hauling during one year

50 heures

8,20 €/h

+

4,30 €/h

+

5,40 €/h

+

6,00 €/h

x

=

Cost of Water Hauling

1 195 €/an

Use the table opposite to calculate the yearly cost of your water hauling job.

3. Livestock Watering Solutions on Pasture

Every watering solution has its advantages and limitations. To determine the most suitable system for your needs and the environment, you should take several criteria into account:

- the characteristics of the pasture (dimensions, topography and remoteness)
- the herd's water needs (depending on the type of livestock, the number of animals and their physiological state)
- the technical specifications of each solution
- the desirable investment level
- the working habits of the breeder
- the technical skills of the breeder (installation and maintenance)

• Routine Maintenance of the Watering Systems:

In general, a correctly arranged watering installation requires little maintenance. However, it is important to make sure it is in good working order during its return to service in the spring and regularly during the grazing season.

In winter, all or part of the watering system (depending on the material concerned) must be protected from frost and floods.

Throughout the entire grazing season and especially during the heat of summer, the big troughs have to be cleaned regularly to avoid the growth of algae and the proliferation of bacteria.

3.1 Aquamat™ Pasture Pumps:

• Operating Principle:

While pushing, the animal activates a diaphragm drawing the water through the tube. A non-return valve prevents the pump from running dry. Releasing the mechanism, the water flows into the small bowl under the push lever.

With its rearward inclined bowl, it's natural for the animals to learn to push the lever with their muzzle when they want to drink the water from the back of the bowl.

AquamatTM pumps water up to a depth of 7 m (or a length of 70 m) and can be installed everywhere: in a watercourse, pond or well.

The Aquamat mechanism is very light to operate, which makes it also suitable for horses and calves from 6 months onwards. However, the pasture pumps cannot be used for sheep.

One push pumps up 0.5 litre of water. Taking this small volume into account, **this watering system is especially well-suited to animals with a modest need for water.**

In the case of young, growing animals, at least 1 pump for 15 animals is needed and for adults (nursing cows, dry dairy cows) at least 1 pump for 10 animals should be provided. The same proportions apply to horses.

For nursing cows followed by their young, a special model is available featuring a small built-in bowl next to the trough allowing the calf and the adult to drink simultaneously. The consumption of water and fibrous food by an unweaned calf enhances rumen fermentation, which in turn helps to develop its rumen (Gottardo, 2002).

• Learning Process:

When starting up a pasture pump, you always have to pump up water with your foot to help the animals find the water more easily.

When a herd uses the system for the first time it is a good idea to check whether the animals know how to operate it. Do this by drawing a stroke with a marker on the spot where the animals push on the lever. If several animals have the tip of their muzzle coloured, they know how to use the pump. The others will imitate those who already know.

To protect the pump and help the animals learn, you can install wooden barriers next to and behind the pump to guide their access to it from the front (Fig. 7).

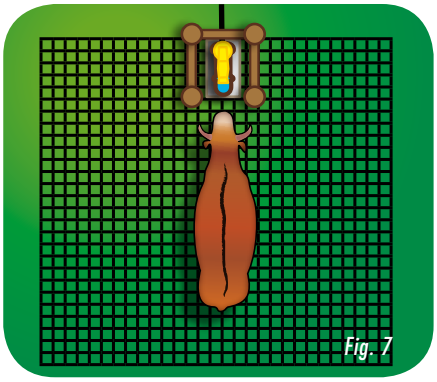


Fig. 7

• Installation Advice:

To guarantee the pump functions properly, it is important to fix it securely to the ground. This makes it easier for the animals to use the pump and it also prevents them from moving it around or turning it upside down.

The fitting between the pump and the suction pipe must be out of reach of the animals, otherwise the animals could damage it by trampling on it.

▲ You can raise the pump some thirty centimetres to make it easier for the animals to use.

In practice, you can install a fixed or a mobile system for moving from one pasture to the other if needed.

If a fixed system is used the pump can be fastened directly to the ground by means of large metal rods, bolted to a concrete base or attached to wooden stakes driven into the ground.

If using a mobile system the pump must be fixed to a sufficiently heavy and stable base that cannot be moved by the animals. Wooden, concrete or metal sleepers are usually perfect for this.

The strainer must be submerged to a sufficient depth in the water to anticipate a decrease in the water level at the location from which the water is drawn (river, pond or well) during the season, but should not be installed directly onto the bottom, since it might clog up more easily and the water supplied to the animals will then be filled with sediments.

Anyway, clogging of the strainer is an element that should be checked regularly. In case of a watercourse carrying along many particles or a pond covered in dense aquatic vegetation, it can be useful to mount the suction strainer in a perforated concrete or PVC tube to reduce the risk of a clogged strainer.

If the size of the herd requires the installation of several pumps, it is recommended to **place them some ten metres apart** to decrease aggressive behaviour and allow the subordinate animals to drink easily.

Recommended minimum set-up: ▼

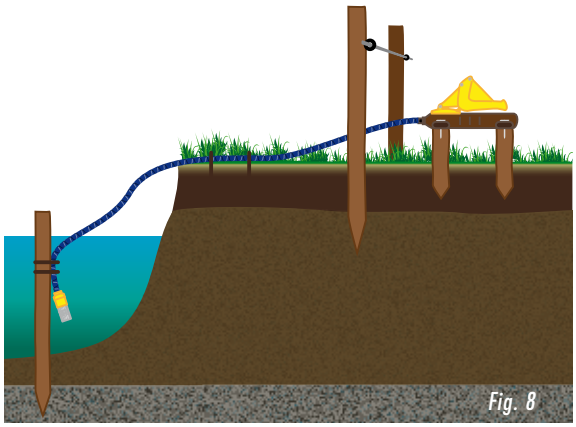


Fig. 8

• **Maintenance:**

The Aquamat does not require any specific maintenance. It can operate under mild frost conditions. However, the pump must be drained in winter and the water lines must be emptied. In areas prone to flooding it is preferable to disassemble the material.

In case of frequent draining of the pump and if the non-return valve is operational, it might be necessary to replace the rubber suction diaphragm.

3.2 Wind Power Systems

• **Operating Principle:**

The wind turns the blades of the wind turbine. Subsequently, this movement is transmitted to a mechanical piston or diaphragm pump that supplies the drinker or the tank with water from a drilled well, a river or a water point.

Before considering the installation of such a system, you should make sure that the pasture where you would like to install a wind turbine is sufficiently exposed to the wind (no high vegetation or buildings).

Their installation being subject to certain land planning regulations, means you should first check these out with the local authorities.

The water pumping installations driven by wind power have to be correctly secured to the ground. The ideal set-up is a concrete base to which the trough, the water tank and the wind turbine are fixed.

The system works only a few hours a day. Therefore, it is best to choose a pump with a high pumping capacity. A flow rate of 600 litres/hour might be sufficient for a herd of heifers and nursing cows.

For a herd of dairy cows, the pump should deliver at least 1000 litres/hour.

The hottest days often being the least windy, a wind power system **might not work when the herd is most in need of water**. Therefore, it is necessary to keep a large buffer volume.

• **Maintenance:**

As a rule, a wind turbine consists of numerous moving parts requiring regular maintenance. A thorough revision of the wind turbine (bearings, transmission) and of the pump (clogging, valves, seals, etc.) should be considered once a year.

3.3 Solar Drinkers and Pumps

a) Solar-Flow™ 900 / 1500 L Drinkers:

- **Operating Principle:**

A submersible pump is powered by one or two solar panels recharging one or two batteries. A level sensor is activated as soon as the water level in one of the troughs lowers when the animals drink from it. When the pump is not operating, the electrical power generated by the panels shall recharge the battery.

The immersion pump can be installed in a (drilled) well, a river or a water point. It can pump up water from a depth of up to 20 m to 50 m depending on the model. The flow rate produced varies, running from 160 to 360 litres per hour and decreases in relation to the greater depth from which water has to be pumped up.

The high pumping capacity makes this watering system **particularly suitable for animals in need of substantial quantities of water.**

The Solar-Flow 900 L model pumps up to **2200 litres/day during the high season**, which is sufficient for the needs of a herd of 15 nursing cows and their calves. The 900 litre volume trough rapidly meets the needs of the animals.

The Solar-Flow 1500 L model pumps up to **3500 litres/day during the high season**, which covers the consumption of a herd of 30 nursing cows and their calves. The trough has a capacity of 1500 litres.

One of the major assets of solar pumping systems is that the panels deliver maximum power at the times when animal water consumption is the highest, more precisely when the weather is very nice. In comparison, the sunniest days are usually the least windy and this means wind-powered water pumping systems fall short of the required capacity and need a large water buffer volume.

The energy-storing batteries ensure normal water pumping even when the sky is overcast.

The 900 L model has an autonomy of 10 days supplying 1200 l/d while the Solar-Flow 1500 has an autonomy of 10 days delivering 2500 l/d.

• Installation Advice:

Before installing such a system, first ensure that the place where you want to install the Solar-Flow receives enough sun during the entire day. It is also important to consider the sources of shade that might reduce the performances of the system. Installation deep down in a very enclosed valley or near tall trees is not recommended since exposure to sunlight will often be reduced.

Make sure to tilt the solar panels to the optimum angle to maximise power output. Solar panels are most suitably positioned facing south, because this allows them to follow the entire course of the sun.

The solar pumping installations have to be correctly secured to the ground. The best solution is a concrete base plate to which the troughs and the pole holding the solar panels are secured.

As with pasture pumps, it is important to make sure the pump is submerged to the correct depth. This means sufficiently deep so that it remains submerged even in the summer when water levels decrease. However, do not station a pump at the very bottom or it may pump up mud and rocks.

When you have to drill for water, the minimum diameter should be 120 mm for optimum pump performance.

If you want to pump from surface water, it might be sensible to install the pump in a perforated concrete or PVC tube to reduce the risk of clogging by algae, aquatic vegetation and other substances. The diameter of the tube and the number of perforations must be sufficient to allow optimum pumping performance.

▲ Some breeders want to be able to move their Solar-Flow installation from one pasture to the other. To be able to do this, you should secure the Solar-Flow to a metal sheet (instead of a concrete base plate) that can be picked up by a reach stacker and put down on a load-bed for transportation.

• Maintenance:

The system does not require any particular maintenance. It can operate under mild frost conditions but the batteries are not very resistant to severe frost. For this reason they should always be removed at the end of the grazing season and stored in a frost-free place. It is also preferable to take the pump out of its water point to check for clogging, to service it if necessary and to store it in a frost-free place.

Before winter, remove and store the Solar-Flow installations mounted in areas prone to flooding, otherwise they risk being washed away by the swells.

b) Solar-Flow™ "STORAGE" Pumping Sets:

• Operating Principle:

A submersible pump is powered by one or two solar panels recharging one or two batteries. A water level sensor in the water recipient (tank or trough) activates the pump both day and night to keep the water level constant.

When water is drawn it can be directed to a trough for immediate use or stored in a buffer tank placed high-up in order to feed several troughs by means of gravity.

They have the same technical specifications and pumping performances as the Solar-Flow 900 L and 1500 L models, the only difference is that the troughs are not included in the delivery and the batteries are protected by a specially designed box.

Compared to the Solar-Flow 900 L and 1500 L models, the advantage of this solution is that it allows the creation of an actual network feeding several troughs from one buffer tank.

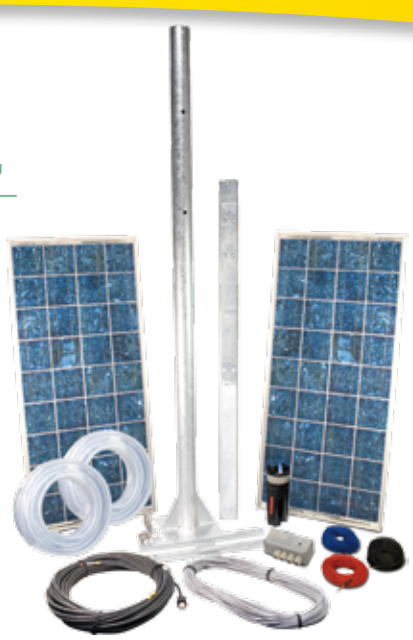
Moreover, compared to a trough, the use of a closed tank as water storage facility has other advantages: water is kept away from light which prevents the growth of algae that might clog the water lines to the other troughs and it also prevents access by wild animals and the risk of contamination of the water supply if they were to drown.

Installation example: Mobile Solar Drinker

To reconcile agricultural production and conservation of the aquatic ecosystems, the «Cellule opérationnelle rivière du Grand Rodez» (french public organization in the department of Aveyron) has installed a solar pumping system «Solar-Flow Storage», on the frame of a water tank in combination with a constant level drinker of the type called BIGLAC 55 T.

This system is easy to move, is quickly installed and started up.

c) Solar-Flow™ "SOLAR-POWERED" Pumping Sets:



• Operating Principle:

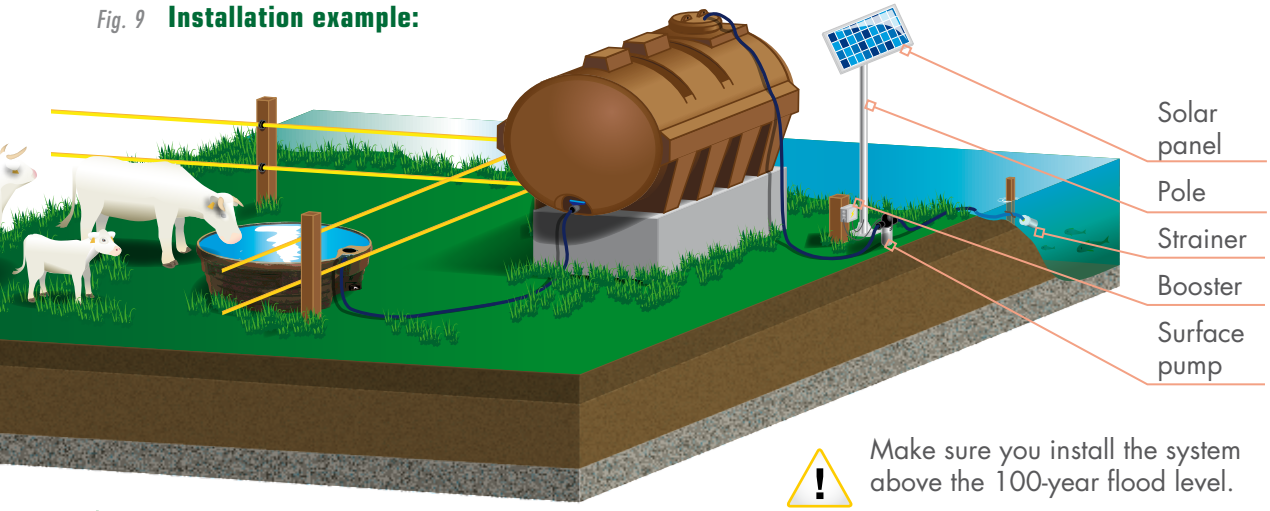
One or more solar panels provide direct power to the pump (there are no batteries) which starts as soon as there is enough light.

When water is drawn it can then be stored in a trough or a tank to be redistributed by means of gravity to other troughs later on.

A version with a surface pump is available to pump from rivers, ponds, etc. It has the capacity to fill a tank or a trough at the rate of 7000 litres per day under optimal conditions. The vertical distance between the pump and the water cannot exceed 3 metres, whereas the maximum horizontal distance is 30 metres.

For greater distances you should use the version operating with a submergible pump. This will allow you to pump up water from a depth of 50 metres.

Fig. 9 **Installation example:**



Make sure you install the system above the 100-year flood level.

• Installation Advice:

It is advisable to equip the storage trough or tank with a float valve connected to the pump to cut off the water supply when the recipient is full, or to install an overflow system to direct the excess water back to its source.

As there is no battery, it is important to provide for a reserve that is sufficiently large to ensure that the animals have enough water when there is no sun and this for several consecutive days.

3.4 Prebac™ Pasture Troughs

a) Prebac™ Filled with Water from the Mains:

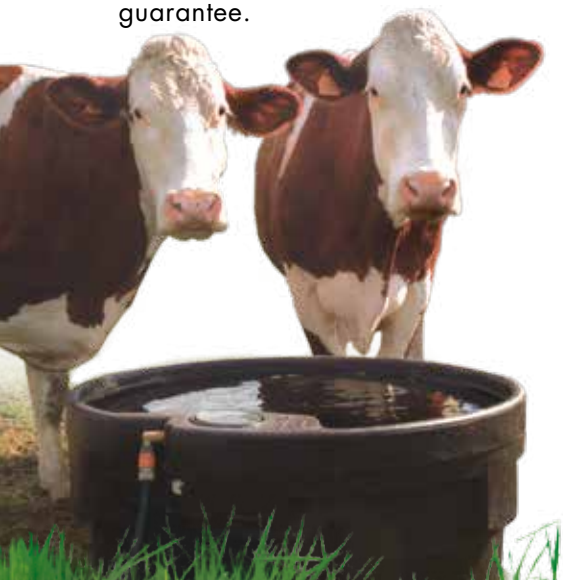
• Operating Principle :

The pasture troughs with (constant level) float valve are filled directly with water from the mains water supply. The advantage is that the water supply is guaranteed to be safe and reliable: water of good quality and in sufficient quantities. This system however is usually only installed in the pastures that are closest to the farm. At a distance of over 1000 to 1500 metres, the costs attached to installation (water lines, trenching work, etc.) can possibly be too high.

Different shapes and sizes are available. These range from 70 to 1500 litres and can be round, rectangular or oval. They can be adapted to suit all situations depending on the needs, type of herd, location, etc.

The float valve (36 l/min) is protected from the animals by integrated casing.

The Prebac troughs by La Buvette are made from UV resistant polyethylene Polychoc, are highly durable and come with an 8-year guarantee.



• Installation Advice:

The water lines have to be installed at a depth of 60 to 80 cm underground (depending on the region) to protect them from freezing in the winter and to prevent them from being crushed by agricultural machines driving over them.

The sizing and installation instructions of the troughs are the same as those used for the other watering systems (see pages 3 and 4).

If you want to install a complete water distribution network on all plots, it is important to choose the right water tube diameter(s). Indeed, the smaller the tube diameter is, the more the water flow will be restricted by friction. This causes pressure loss in the supply line followed by a lower flow rate at the drinker (in the case of drinkers equipped with a standard valve, a pressure of 3 bars at the point of consumption usually produces good flow rates). Furthermore, the longer the tube, the greater the pressure loss.

For example, with a flow rate of 15 litres per minute, the pressure loss will be 0,5 bar every 100 metres through a tube with a diameter of 25 mm, whereas it will only be 0,1 bar through a tube with a diameter of 32 mm.

		External tube diameter			
		25 mm	32 mm	40 mm	
Flow rate	15 l/min	0,5 bar	0,1 bar	0,05 bar	Pressure loss through a tube length of 100 m
	30 l/min	1,6 bar	0,5 bar	0,2 bar	
	45 l/min		1,2 bar	0,3 bar	
	60 l/min			0,6 bar	

On hilly terrain, the height difference between the starting point of the water line and the point of consumption should also be taken into account. A height difference of 10 metres corresponds with a pressure loss of 1 bar.

To avoid the risk of freezing and above all to protect the waterlines from the risk of being crushed by agricultural machines, it is best to install them at a depth of 60 to 80 cm underground.

In winter, when the drinkers are non-operational, it is best to disconnect the water circuit and to **drain** any residual water to prevent freezing and burst pipelines, fittings and valves.

b) Prebac™ Filling by Means of Gravity:

• Operating Principle:

The principle is the same as filling with water from the mains, the only difference is that the trough is filled by a an upslope water reservoir or stream.

There are two possibilities: equip the trough with a float valve operating at low pressure (< 1 bar) or do not equip the trough with a constant level valve but instead create an overflow directing the excess water to the stream.

• Installation Advice:

To obtain the best results, this type of system must be installed in areas where the slope exceeds 2% and the flow rate of the stream or water reservoir is sufficient in all seasons.

The strainer must be installed sufficiently deep (anticipating a low water level) but cannot be installed directly on the bottom (to avoid clogging).

It is recommended to not install the troughs too close to the watercourse to avoid them from being washed away in case of rising water levels (for example caused by a rainstorm).

Lacabac Float Valves

Metal or concrete troughs can be converted into constant level drinkers by equipping them with a Lacabac high flow float valve.

La Buvette offers an entire range of float valves featuring flow rates of 30 to 72 l/min, operating at standard pressure or by gravity. The versions you decide to use should be determined by the size of the drinker and the number of animals.

It is important to connect the float valve correctly and to protect the fitting attached to the water supply line because the animals tend to rub against these.

c) Prebac™ Filled by Water Tank:

• Operating Principle :

Either the tank is left on pasture all year-round and the troughs are constantly filled by low pressure float valves or the breeder regularly fills the pasture troughs.

Alternatively, these are sometimes filled by means of a motor pump drawing up water from a watercourse or a well.

The advantage of these two systems is – provided there is no negligence on the part of the breeder – the quantitative supply will be safe and secure.

However, fetching water is very time-consuming and relatively expensive for an entire grazing season (see p. 12-13).

• Installation Advice:

In the case examples involving the continuous filling of the troughs from the storage tank, the water is usually of good quality, since only a small volume is exposed to the external conditions (heat and light), while the rest remains protected inside the tank.

By contrast, when the troughs are filled "manually" by the breeder, it is tempting to install several large troughs in order to maximise the storage volume and to minimise water haulage. The main disadvantage of this practice is that the water is only partly renewed. This leads to it warming up more easily which encourages bacterial proliferation and algae growth in the troughs.

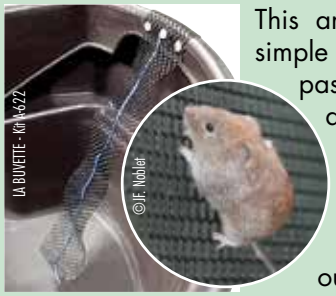
When several troughs are installed, it is preferable to place them some ten metres apart to reduce the influence of dominant animals and allow a higher number of animals to drink simultaneously (no waiting and less pushing).

If troughs are filled every 3 or 4 days it is **absolutely necessary to fix them securely to the ground**. The reason for this is that the animals tend to move and play with the trough as soon it is empty.

There are several methods for fixing a trough securely to the ground: either by means of the specially designed set guaranteeing secure fastening, which consists of metal L-brackets. One side is attached to the trough and the other side is fixed by knocking metal rods into the ground, or it can be done by using 3 or 4 sturdy wooden stakes planted around the trough to block it.

Flood risk areas: systematically disconnect and store the material before the winter, otherwise it might be washed away by the swells.

Anti-Drowning Escape Ramp



This animal saving set is simple to install on most pasture troughs. It is designed to make it easy for birds, small rodents, amphibians, insects, etc., to get out of the trough.

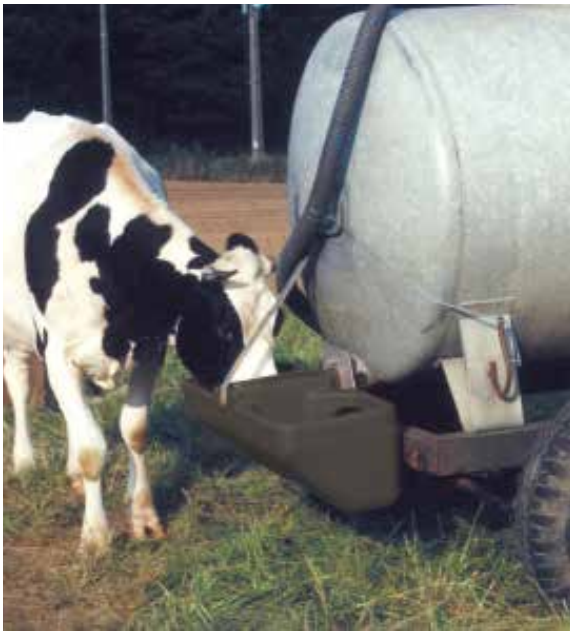
Designed in cooperation with the naturalist Jean-François NOBLET, this exit ramp preserves the hygienic quality of the drinking water.

• Drinker on Water Tank Biglac 55 T:

For small groups of animals a double access trough with low pressure valve can be fixed directly onto the tank (Biglac 55 T).

Compared with large troughs for placing on the ground, the Biglac 55 T has the advantage of requiring no handling at all: no need to disconnect the troughs when they leave the pasture to fill up the tank and the troughs do not have to be stored at the end of the season.

This drinker can also be installed on a converted slurry tank by means of an adaptor.



• Water Tank Filling:

To fill the water tank, you can use a high-flow float valve (100 l/min high-flow float valve) that closes the water supply when the tank is full.

This way, the tank does not overflow and you do not have to stay around to keep an eye on it until the tank is full.

3.5 Isothermal Drinkers: Thermolac™

- **Operating Principle:**

The drinker is filled with fresh water while the animals drink and the double wall, filled with high-density polyurethane foam, keeps it at a constant temperature (Fig. 10).

The ball, that the animals push to access the water, limits thermal exchange with the external atmosphere.

Thermolac comes with a high-flow valve for connection to the mains supply line. It can also be equipped with a low-pressure valve allowing water supply by means of gravity.

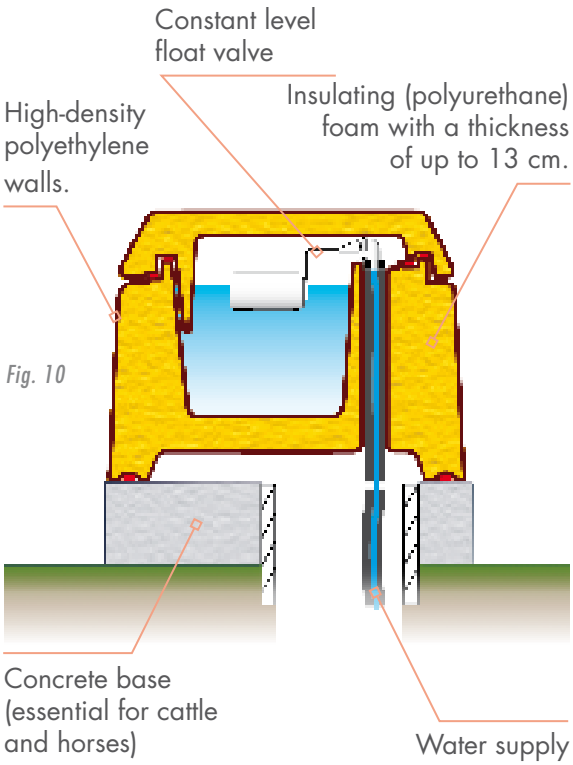


Fig. 10

This type of drinker is designed to meet specific **situations requiring an efficient external water point in all types of weather** (outdoor rearing, paddocks, etc.).

In winter, the Thermolac remains operational at temperatures as low as -30° C. In summer, they keep fresh water cool, which limits the development of micro-organisms. The ball keeps the light out of the trough preventing algae growth.

The water also stays clean as the ball keeps leaves, birds and rodents from falling into the trough and wild animals cannot drink from it.

• Learning Process:

To help the animals to learn how to use the system, you need to lower the water level in the trough (by letting the float slide along the set pin) so that the water becomes partially visible and the ball easier to push.

• Installation Advice:

Isothermal drinkers always have to be mounted on a concrete base. This ensures efficient insulation of the water supply line underneath the drinker.

To improve the drinking comfort of the animals, the height of the concrete base must be 20 cm for cattle and 20 to 35 cm for horses.

• Maintenance:

As with all constant level drinkers, the Thermolac must be emptied regularly to remove food residue that has sunk to the bottom of the trough.

It is preferable to disconnect the water supply and drain the drinker when it is non-operational during winter.

A separate water line for each drinker with water shut-off and drain valve makes maintenance and wintering easier (Fig. 11).

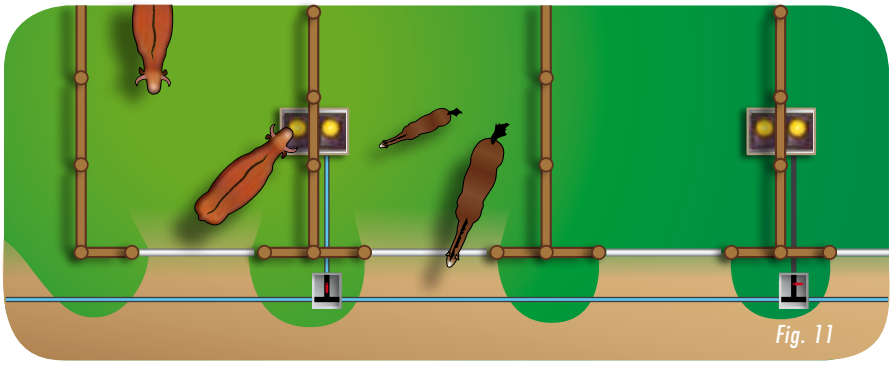


Fig. 11

Versions with Dishes: Thermolac™ B

For sheep and goats, Thermolac is available with removable dish(es).

If the drinker is used frequently these models are frost-proof to temperatures as low as -15°C. They require more regular maintenance (cleaning of the dish) and it is preferable to install them under a shelter to avoid snow from blocking access to the water.

3.6 Improvement of the Surrounding Area: Bi-Stable™ Stabilisation System

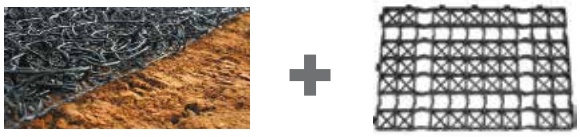
In addition to these facilities it is sometimes necessary to secure certain watering systems to the ground. It is advisable to stabilise the area immediately surrounding the water points to avoid degradation of the soil and the formation of a muddy area surrounding the watering system.

• Operating Principle:

The bi-stable (dual stabilization) system consists of two materials: a grip mat that stabilises the soil and allows abundant vegetation to take root; and a grid structure that protects the mat and provides even distribution of the animals' weight.

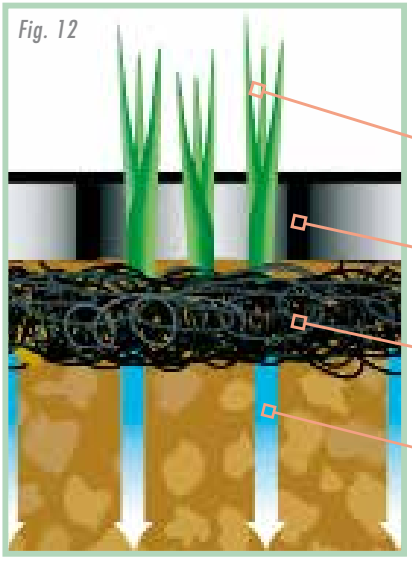
The weight of the animal is evenly distributed over the tiles under its hooves, which is a surface area of 1 m^2 (4 tiles) instead of 180 cm^2 (4 hooves x 45 cm^2).

Bi-Stable™ :



The soil is no longer compressed by the hooves but remains permeable both to precipitation water and to urine and faeces.

Fig. 12



The Bi-Stable™ stabilising mat is overgrown with grass.

The grid structure evenly distributes the weight of the animals and protects the bottom layer.

The grip mat stabilises the soil and remains permeable.

Water seeps through both layers and does not flow off towards the edges.

• Size of the Area to Be Stabilised:

For good results it is important that the protected area around the water point is large enough, irrespective of the type of soil stabilisation you use. To avoid the formation of a trampled muddy area at the edge of the stabilised area (this usually happens at the junction between the stabilised and non-stabilised surface), the animals must stand with their four hooves on the stabilised soil when drinking.

The size of the stabilised area depends on the following criteria:

- Size of the watering system
- Number of animals that can drink simultaneously
- Location and accessibility of the watering points (accessible from all sides, type of trough in the middle of the pasture; or only accessible from one or several sides, Aquamat type installed against a fence)
- Size of the animals.

An **adult cow** measures approximately 2,6 m from the tip of its muzzle to its tail. Therefore, it is a good rule of thumb to remember that you need **at least 3 metres around each access point**.

For smaller animals, such as **sheep** (approximately 1,2 m from the tip of the muzzle to the tail), you have to provide for **at least 2 metres around each access point**.

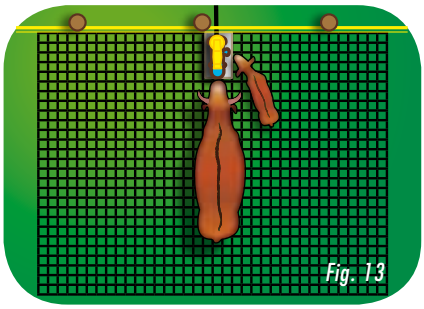


Fig. 13

In the case of a pasture pump installed "against" a fence, a surface area of approximately 30 m² is enough to protect the edges (Fig. 13).

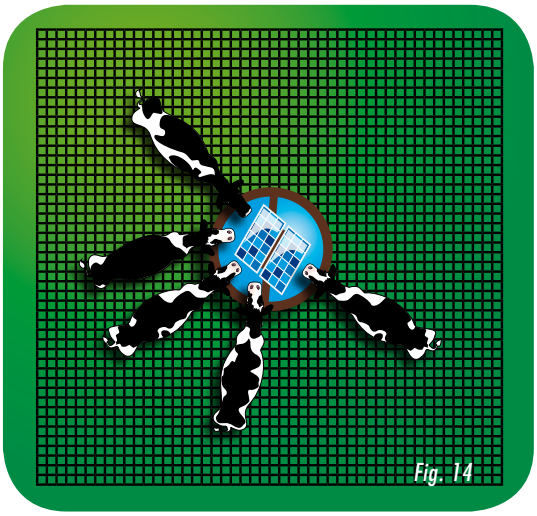


Fig. 14

When more spacious systems are involved, such as a Solar-Flow 1500 (the 1500 L model has a diameter of 2 m) where many animals drink at the same time having access from all sides, you have to consider stabilisation of approximately 60 m² (Fig. 14).

• Installation Advice:

The surface has to be sufficiently dry and prepared in accordance with the composition of the soil, these measures must be taken before installing the Bi-Stable ground covering and starting work.

▸ On Filtering (Sandy) Soil:

Place the Bi-Stable mat immediately after the ground has been levelled (provide a 1 to 3 % incline for the discharge of excess surface water). Fill the tiles with a permeable material, such as average-sized gravel.

▸ On Non-Filtering (Clayish) soil

or in regions receiving heavy rainfall (>1000 mm/year):
To enhance drainage, dig off a 20 cm thick layer of soil, then fill the space up with 20 cm of rubble size 30/5. Level the soil (incline of 1 % to 3 %). Install the Bi-Stable mat and fill the tiles with a permeable material, such as average-sized gravel.

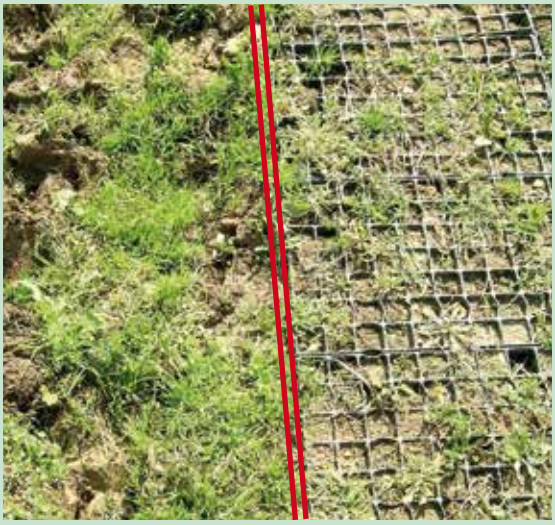
In both cases, the tiles should be filled up immediately after the ground covering has been put in place. It is desirable to mix the gravel with some soil and to create a seedbed to help the grass take root more easily.

In heavily frequented areas, such as drinking areas, it is advisable to embed metal rods at regular intervals (every 50 cm) over the entire surface of the stabilised area in order to hold the grid together and prevent the animals from lifting it up.

If possible, this type of installation should be realised at the end of the grazing season allowing the grass to take root at the beginning of the next season. Good rooting guarantees good performance of the system.

The installation of Bi-Stable™ is also recommended in other heavily frequented areas of the pasture such as the entrance gate and around feed racks.

Without: With:



There are other solutions to protect the edges:

- Sometimes concrete is cast on the entire drinking area. This however is not without risk. This entirely watertight surface causes the rainwater to accumulate at the edge of the concrete slab, creating a muddy area that will progressively degrade by being trampled on.

▼ Finally, a step will be created around the concrete slab that the animals have to take each time they go to drink.

On the other hand, concrete which is not grooved can be slippery causing the animals to slip and fall, especially through bumping into each other when they arrive simultaneously and in large numbers at the drinker.

- Other breeders opt for crushed rock (with or without first digging off the soil and installing geotextile). Though this technique allows the surface to retain permeability and is therefore preferable to complete concreting, it also has its drawbacks. A large part of the rocks will slowly be scattered all around the drinking area by the animals.

It is therefore necessary to periodically fill the stabilized area with new rocks. Besides this, for sensitive animals the rocks can be a non-negligible source of lameness. The small rocks can get stuck between the hooves and the largest and sharpest can cause injuries that might develop into an abscess.

Notes :

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