

# DRILLING SETS FOR SHALLOW WELLS

## Why hand-drilled wells?

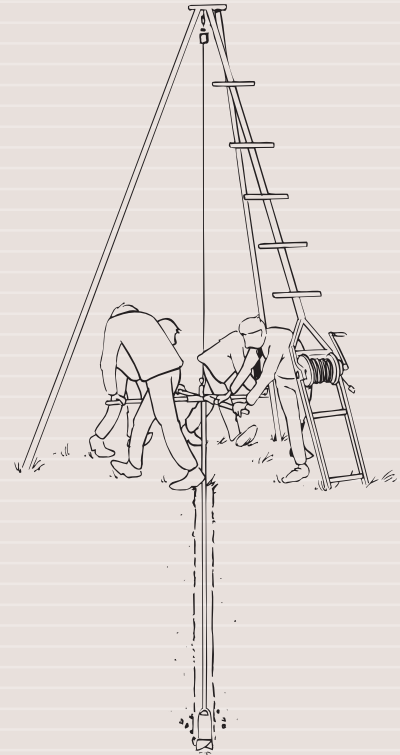
Population growth has been so rapid that, inspite of all government efforts, the water supply in most developing countries has not been able to meet demands. Over the years, little attention was devoted to water supply to rural population living in small remote villages. During the past 20 years new constructions have brought a great number of different types of sophisticated equipment, for which spare parts were not available and equipment which in fact, was obsolete by the time it was installed. The life span of much of this equipment has been exhausted and the equipment therefore has worn out or has broken down altogether. The finances, skilled labour and organizational expertise, capabilities or capacities needed to operate and rehabilitate old water supply systems, are limited. The infrastructure, i.e., communication, electrical supply, transport, fuel, roads, etc., to operate and maintain a complete pipeline water supply system, is hardly available in most developing countries.

Consequently most water systems are now out of order and where they function at all, they function poorly. Tap water is no longer suitable for drinking since the pumps regularly cease pumping as a result of interrupted power supply. These interruptions cause a vacuum in the distribution system which in turn causes poluted mud to be sucked into the system. Often rural water supply is not given adequate attention. There is no skill anymore in digging or hand drilling of shallow wells to obtain a low cost rural water supply. These days many people get their water mainly from dirty surface water, ponds, streams, etc. Disease due to consumption of non-potable water is on the increase. In order to be able to supply equipment for a low cost rural water supply, special hand-operated drilling sets have been developed and included in the Eijkelkamp Agrisearch Equipment product range. The sets are intended for use in e.g. developing countries.

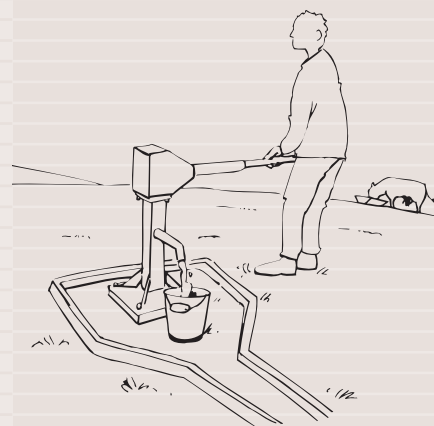


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## Hand-drilling of shallow water wells.



## Hand-drilled well equipped with slab and hand-operated pump system.



Surveying set for shallow wells

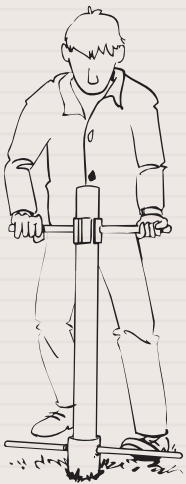


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**A hand auger is used to drill (within the tube) through a hard (clay) layer.**



**Using the tube clamps the synthetic casing tubes can be unscrewed and taken apart.**



# DRILLING SETS FOR SHALLOW WELLS



## Survey and testing

Construction of a well, be it a drilled or a dug well, must always be preceded by a detailed survey of the area in order to find the most suitable location. Before starting fieldwork, as much information as possible regarding the hydrogeological situation should be collected from existing reports, maps, etc. It is also important to gather information about: existing wells, hand dug holes or springs. The landscape features and certain types of vegetation also provide information about the geohydrological conditions in the area.

The best method for site investigations has proved to be drilling by hand of small test boreholes (diameter 90 mm).

The drilling method is a low-cost surveying method for determining the presence of water in the subsoil, in order to arrive at the best choice of potential well-sites.

## 15.01.SA Surveying set for shallow wells, standard set for borings to a depth of 20 m

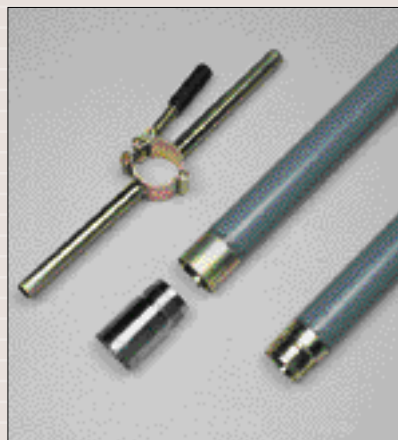
Eijkelkamp Agrisearch Equipment has developed a survey drilling set for site investigations (to find the best place for the construction of a well).

Survey drilling is started with the 10 cm auger. If the borehole collapses, which may happen below groundwater level, the casing tubes with steel screw thread sockets are lowered into the borehole and the drilling is continued through the casing tube by using the 7 cm augers or the bailer.

The standard set (with conical screw thread connection) includes, amongst other things: a tool guide, handle, extension rods, rod catchers, Riverside augers and augers for stony soils, a stone catcher, a pointed chisel synthetic casing tubes with steel socket, a casing retriever, casing tube clamps, bailers, a set of tools, various accessories and steel transport boxes.



Riverside auger, stony soil auger and stone catcher



Tube clamp and casing tubes



Bailer

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## Advantages

- The survey drilling method provides certainty regarding quantity and quality of the groundwater.
- A relatively small budget is needed.
- Places with poor accessibility can be reached.
- Trained locals can do the drilling.
- Most of the equipment can be repaired locally.

### 15.20 Test set for water wells, standard set for a depth of 20 m

When a promising aquifer has been found, a pump test lasting one hour and some simple water quality checks must be performed. This procedure greatly reduces the risk of a low yield and/or unsatisfactory water quality after construction. For this purpose one can use the aforementioned set. The test set in fact belongs to the surveying set (15.01) and provides sufficient information upon which to base decisions as to whether or not the aquifer can supply sufficient quantities and quality of water.

The set consists of equipment for bringing up

water, to determine the quantity of the aquifer: a test pump Joly Jumper, rising pipes of various lengths, a sounding device with measuring tape to determine the height of the groundwater level and a bucket.

A (ground-)water quality test set is also included in the set.

With the water quality test set field analyses of the samples are possible for: pH 0-14, nitrate, sulphite, ammonium, iron and fluoride. The analyses are executed using teststrips.

The water test set comes complete with an electrical conductivity meter, registration papers and clear instructions for users.

The complete test set for water wells can be transported in a steel box.

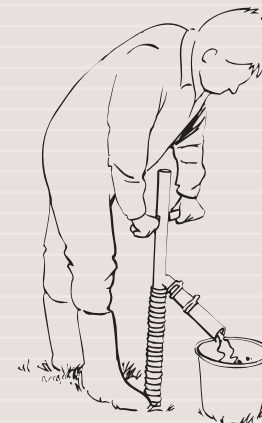
## Advantages

- Less risk of low yield or unsatisfactory water quality.
- Simple method of analysis.
- Quick preliminary analysis results.



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## Bringing up water by using the test pump.



## The field analysis needs to be executed at a protected, shadowy location.



Test set for water wells



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## DRILLING SETS FOR SHALLOW WELLS

### Water well drilling

Eijkelkamp Agrisearch Equipment has developed various sets for shallow water well drilling. The sets differ in diameter of the drilling equipment. When drilling deeper wells it may be necessary to drill in steps. Since the augers in the sets have various diameters, but the same connection it is very easy to interchange augers. A set can easily be upgraded for stepwise augering. In this way, the necessary well depth can be reached easier. The working principle of the drilling of shallow water wells is very simple: hand auger equipment is used to drill a hole. When drilling in less cohesive soils, a casing tube is sunk. After reaching the desired depth a filter pipe is inserted and filter gravel is poured around the filter pipe. To prevent contamination by surface water the rest is filled with clay (natural backfill).

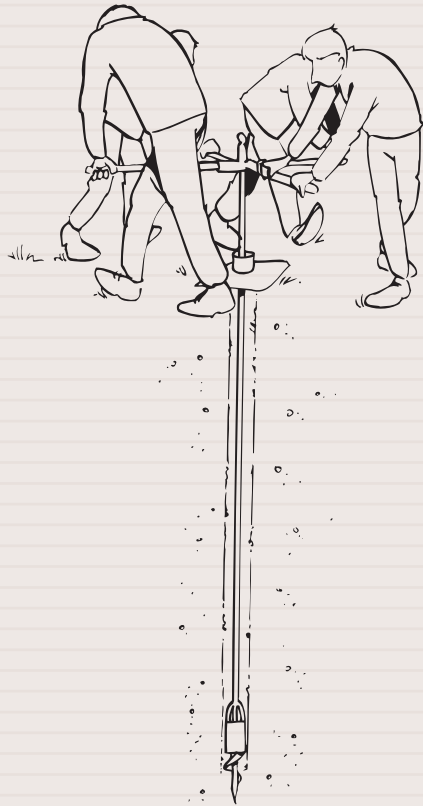
The casing tubes are subsequently removed. The water well is completed by placing a slab and installing the hand-operated pump.

### 15.02.SA Water well drilling set, standard set to a boring depth of 20 m

The set is developed and used for the construction of hand-drilled wells in soils without very hard layers and with sufficient aquifer recharge, permitting small diameter wells. A maximum depth of approximately 20 meter can be reached. The maximum space for the filter is 108 mm diameter. Where the soil becomes less cohesive, the casing tubes are used to prevent collapsing of the auger hole. When reaching sand below groundwater level the bailers are used. When a layer of clay is reached again, bailing is stopped and drilling is continued inside the casing. If necessary, a tripod with winch may be used.

The standard set (with square 30 mm connection) is equipped with, amongst other things: a tool guide, crosspiece and kelly, handles, various extension rods, rod catchers with cleaning point, Riverside augers, an elongation piece for Riverside and

**In cohesive soils augering can be done without the use of casing tubes.**



Water well drilling set (15.02 SA)

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bucket auger, chisel auger, stony soil augers, stone catcher and pointed chisel, bailers, synthetic casing tubes with steel screw thread sockets, casing retriever, a notched casing shoe, casing head, casing clamps, a sounding device with tape to measure the groundwater level, a shovel and pickaxe, various accessories and steel transport boxes.

## Advantages

- ❑ Low cost, easily operated equipment.
- ❑ Very complete set.
- ❑ No highly qualified personnel required for operation and maintenance.
- ❑ Especially suited for rural water supply in developing countries.
- ❑ Less dangerous and troublesome than hand-dug ring wells (the whole process takes place above the ground).
- ❑ By using optional items the set can be used for upgrading water wells to latrine holes with a diameter of 45 cm.

## 15.05 Water well drilling set, standard set to a boring depth of 15 m

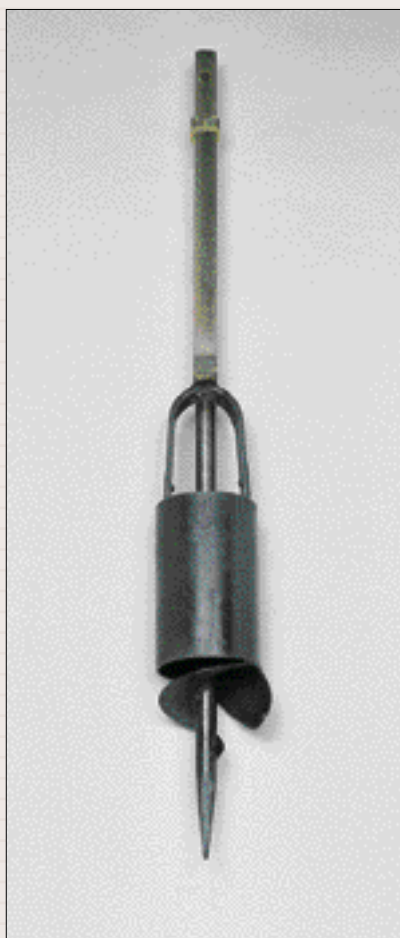
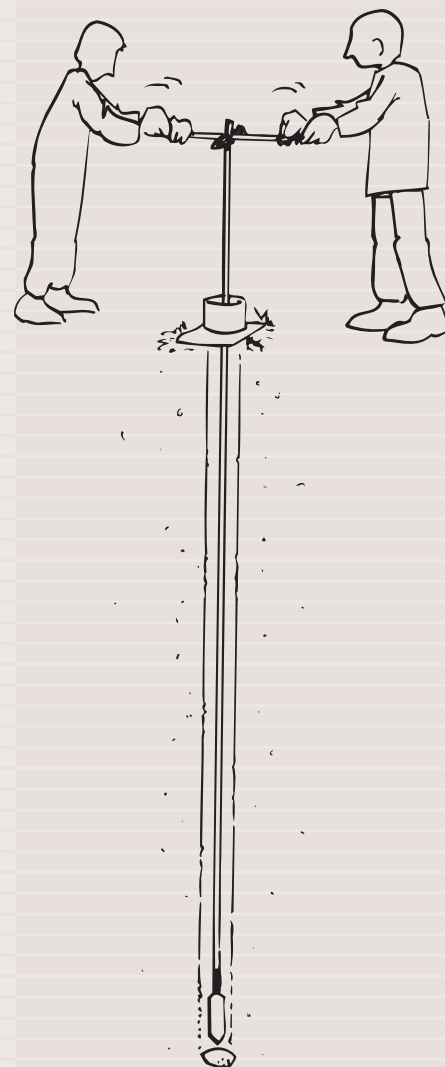
The set is developed and used for the construction of hand-drilled wells in harder soils with sufficient aquifer recharge, permitting small diameter wells. The maximum space for the filter is 140 mm diameter. Four people can work together while drilling a shallow well using this equipment.

The standard set (with square 40 mm connection) is equipped with, amongst other things: a tool guide, crosspiece and kelly, handles, various extension rods, rod catchers with cleaning point, Riverside augers with side flap for unloading, chisel augers, flight augers, a stone catcher and pointed chisel, synthetic casing tubes with steel screw thread sockets, pulling cap for casing, a notched casing shoe, a casing head, casing retriever for lost casing tubes, a casing tube clamp, bailers, a sounding device with tape to measure the groundwater level, a shovel and pickaxe, various accessories and steel transport boxes.



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**Two people are using the pointed chisel to crush a stone under the casing tube.**



Chisel auger



Square connection



Pointed chisel



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# DRILLING SETS FOR SHALLOW WELLS

## 15.07 Water well drilling set, standard set to a boring depth of 10 m

This standard set is heavier than the 15.05 set. The maximum space for the filter is 200 mm diameter. A tripod with hand winch is an indispensable aid when using heavier drilling equipment. Augering is started with augers with a diameter of 18 cm. Reaming tools are used to widen the bore hole to 30 cm. The casing tubes used in this set are made of steel with a steel screw thread socket.

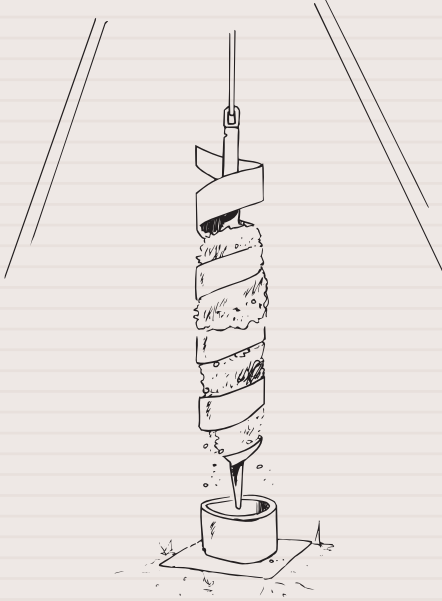
The standard set (with square 40 mm connection) is equipped with, amongst other things: a tool guide, crosspiece and kelly, handles, various extension rods, rod catchers with cleaning point, a winch connection piece for extension rods, a heavy Riverside auger (long design) with side flap for unloading, a chisel auger, a flight auger, a reaming tool, a stone catcher and pointed chisel, steel casing tubes with steel socket, pulling cap for

casing, a notched and a smooth casing head, casing retriever for lost casing tubes, a casing tube clamp, bailers, a sounding device with tape to measure the groundwater level, a shovel and pickaxe, various accessories, a stackable container and steel transport boxes.

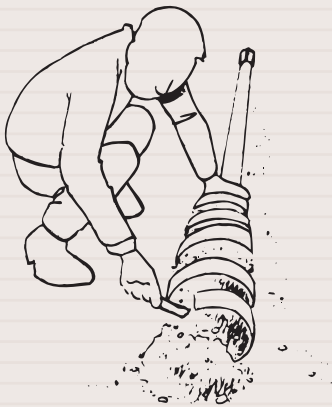
### Advantages (15.05 and 15.07)

- Low cost, easily operated equipment.
- Very complete sets.
- No highly qualified personnel required for operation and maintenance.
- Especially suited for rural water supply in developing countries.
- Four people can construct a water well, in just 1 or 2 days.
- With the optional items the sets can easily be supplemented (augers are interchangeable) for use with tripod and winch or for deeper, wider augerings.

**The flight auger is hoisted to be emptied.**



**The auger is emptied.**



Flight auger



Heavy Riverside auger with side flap

# DRILLING SETS FOR SHALLOW WELLS

## Construction of a slab

After inserting the filter in the auger hole it is important to pay attention to the finishing of the water well. Although the materials used are not included in our delivery programme we are always willing to advise you and provide you with names of suppliers for the right equipment.

A hand or foot pump needs to be installed on a stable base (concrete cover) to ensure a longer life-time.

The immediate surroundings of the pump must be protected against the adverse effects of spill water.

A muddy wet area surrounding the pump will soon cause the pump foundations to collapse. Moreover, these types of conditions provide an extremely attractive breeding ground for mosquitos and other harmful organisms. Polluted water can easily flow back and contaminate the well. It is therefore necessary to position a slab with guiding rims and a spill water outlet at the pump site.



Casing tube with notched casing shoe

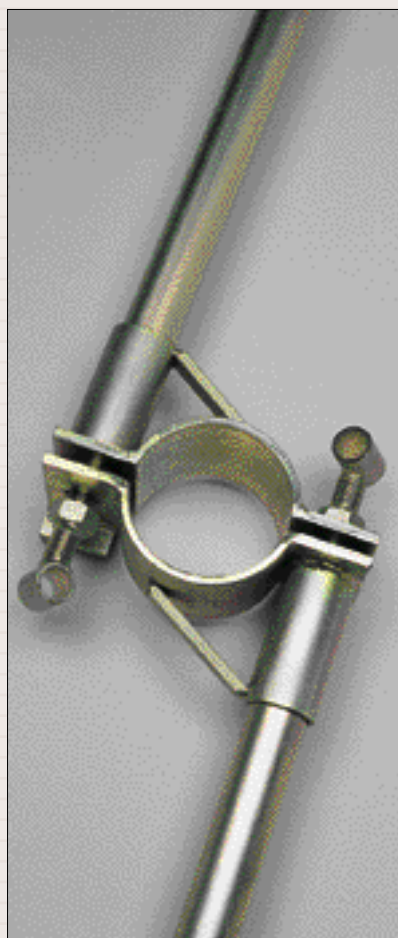
## Hand-operated pumps

Many pumps used for the rural water supply are hand-operated. There is an enormous variety in hand- or foot operated pumps.

It is generally inefficient and uneconomical for a project to have more than 2 or 3 different types of pumps installed on a large scale project.

A number of criteria have been identified for making a rational choice from the large variety of pumps available on the market.

- The pump must be reliable.
- The pump should require as little maintenance as possible.
- The construction of the pump should be such that the maintenance using only simple tools is possible.
- Pumps and spare parts should be cheap and ready available and should preferably be manufactured locally.
- The pump should be easy to operate for users including small children.

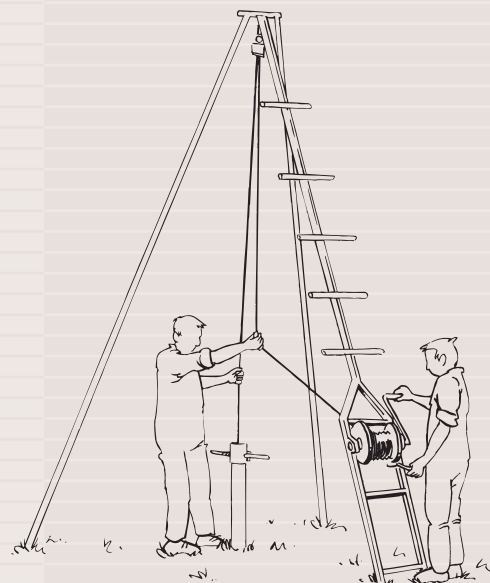


Casing tube clamp

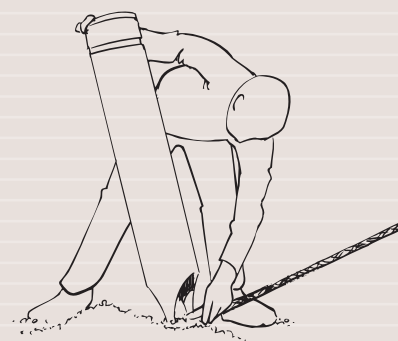


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**Using the cable attached to the tripod, the bailer is moved up and down in the casing tube.**



**The bailer is emptied.**





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## DRILLING SETS FOR SHALLOW WELLS

### Latrine drilling

For areas throughout the world in which large groups of people live together on a permanent or temporary basis, and where sanitary conditions do not meet acceptable standards of hygiene, Eijkelkamp Agrisearch Equipment has designed a light, strong, portable latrine drilling set.

The sets are ready-to-use sets for e.g. organizations whose task is to deal with disasters, etc. or for instance offer humanitarian aid, such as Unicef, UNCHR, Medicin sans frontières, Red Cross, UNDP, etc.

#### 15.12 Latrine borehole drilling set, standard set to a depth of 10 m

Based on experience with hand drilling sets for water wells, a drilling set is constructed with a basic drill diameter of 15 cm. Once a hole has been drilled to the desired depth, it is possible to widen the holes to a 45 cm diameter using reaming tools. Due to the special construction of the reamers, this procedure requires

less effort than drilling a 45 cm diameter hole.

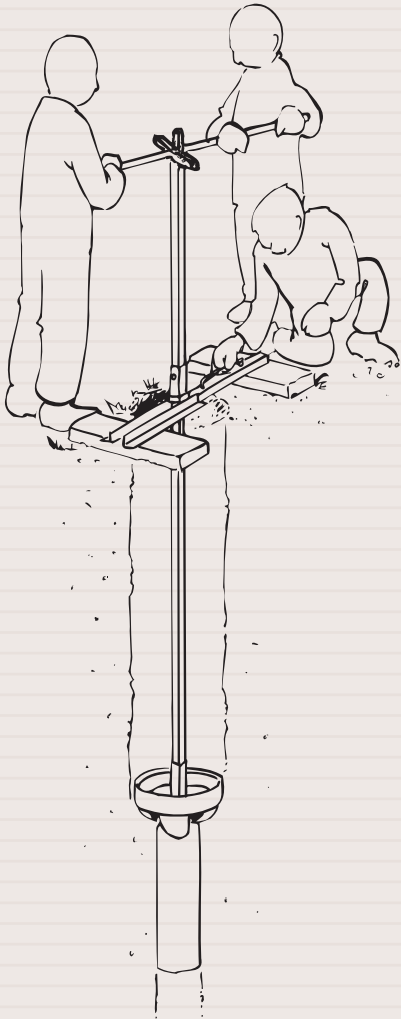
The standard set (with square 30 mm connection) is equipped with amongst other things: a crosspiece and kelly, handles, extension rods, a Riverside auger, an elongation piece for the Riverside auger, a chisel auger, reaming tools, a rod catcher and a stackable container.

#### Advantages

- Light, strong and portable set.
- A 45 cm diameter hole can be made.
- The whole set can be stored and transported in one stackable container. In case latrine pits are full, or new pits need to be added, the set is always available for use.

The fitting of a round cover over the latrine is recommended so that in the event of re-use, this cover can be rolled to the new latrine. We are happy to offer suggestions upon request however the fact that local solutions are the most likely to be used should be kept in mind.

**The rod catcher is positioned to prevent extension rods and auger from falling down.**



Latrine borehole drilling set