Analysis of technical capacity, socio economic and climatic conditions

Presented by

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Small-scale irrigation potential by practices and technologies

Communal sub-category

- Approximately 16000 hectares of equipped irrigation land in Zimbabwe is in the communal irrigation subcategory.
- 10 000 hectares is in use (remainder requires rehab)
- In the long term, 97,500 ha will be developed in this category

***Small scale private*:** Individually run schemes of less than 2 ha.

- The individual farmer is responsible for water supply to the farm and all farm operations.
- These farmer investors are driven by a strong profit motive and are predominantly located in peri-urban areas or in close proximity to urban areas

Small scale community: Groups of farmers sharing the same water pump and delivery line.

- Usually, there is one pump station and delivery line. The scheme area is below 50 ha and each farmer has a land holding averaging 0.5 ha.
- The farmers are normally in one block and water supply can be gravity fed or pumped.
- These groups tend to be better organized in operation and management of their systems.
- Investment in the group schemes are mainly from government and NGOs.
- Project identification is usually top down (by either government or NGO) and these group schemes form the bulk of the communal and old resettlement schemes.
- The existing schemes of this type are contributing significantly to agricultural production for the country and in food security for their areas

- **Garden category**
- ***Urban / peri-urban:*** Farmers land holdings are a few hundred square metres.
- The land is in urban or peri-urban areas, close to markets.
- Individual farmers invest in the development of the schemes mainly for income generation with vegetable production dominating.
- Water supply is mainly from shallow or deep wells, and water distribution is by buckets or motorized pumps.
- The area under garden irrigation is not known but there are estimates ranging from 20 000 – 50 000 ha.
- Farm households have on average about 0.2 ha.
- Gardens are a major source of fresh produce that is sold in urban areas.
- If the estimated area under gardens is utilized, this category will have between 100 000 – 250 000 households.
- Gardens are mainly done by female farmers with most of it being family-run farm businesses with hired labour.

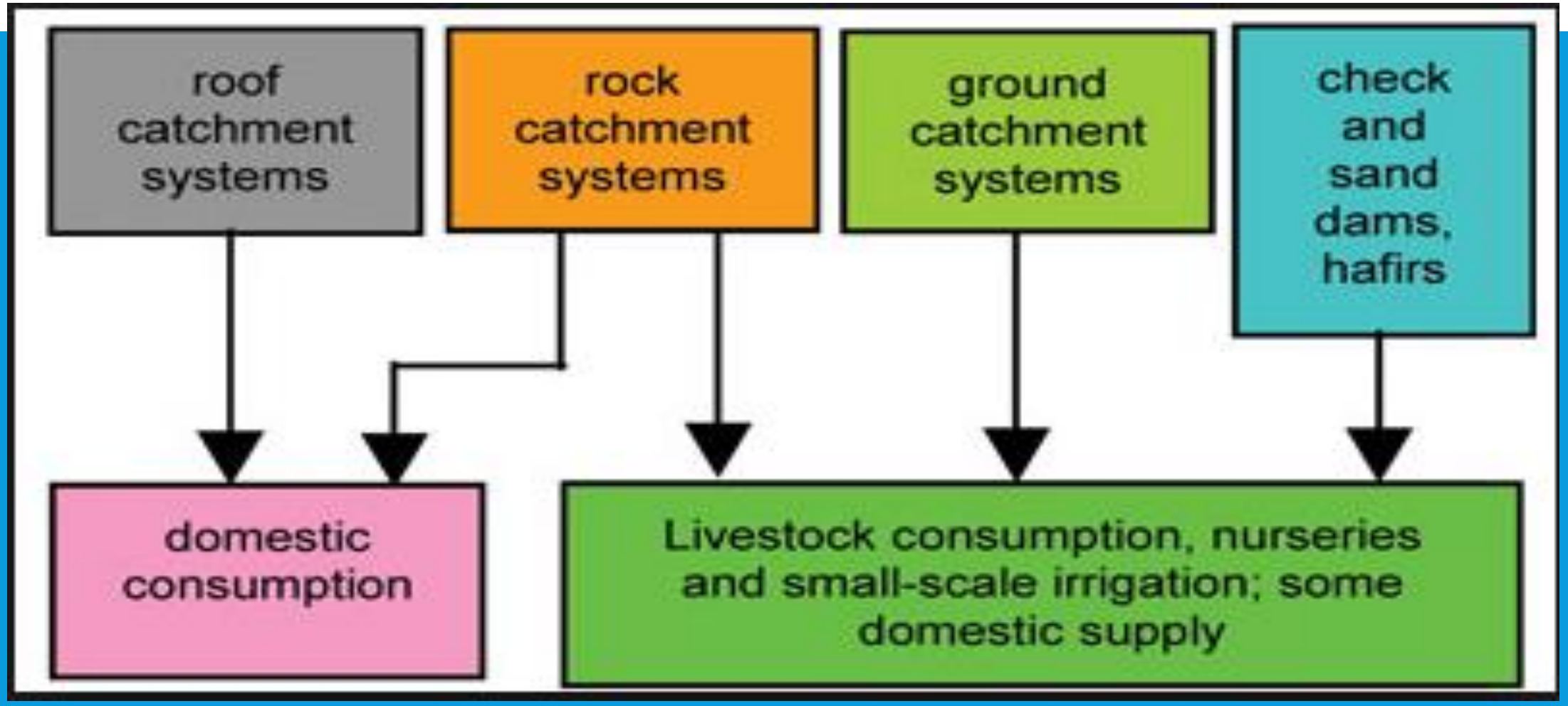
- Water supply is from boreholes and small streams and utilizes electricity, diesel or petrol powered pumps to irrigate using sprinkler or drip irrigation systems.
- The schemes mainly produce horticultural produce for sell in the nearby urban areas. Household investors are driven by a strong profit motive.
- These investments have not received public sector support. Some of the investors borrow money from banks, supported by their urban property title to land.
- ***Rural gardens:*** Rural gardens are similar to urban/peri urban gardens with the main differences being the types of crops grown due to distance to markets for fresh produce and the technology used for irrigation.
- Since the rural gardens are generally further away from urban markets the crops grown are mainly for household consumption, with a little surplus for the local market.
- The gardens are mostly irrigated manually; especially bucket irrigation, using water from streams and shallow wells.
- The investment levels for these gardens are very low.
- Planning issues to consider for gardens are improving access to finance, and provision of extension and other technical support services.

- Generally, with the area equipped for irrigation expected to increase, in the future, there is need for sustainable alternative sources of irrigation water .
- RWH provides the solution

General description of the rainwater harvesting

- **What is Rainwater?**
- Rainwater is water that falls on a roof or other hard, impervious non-pedestrian, non-vehicular surface and is captured, filtered and stored.
- Storm water is rainwater that has made contact with the ground, sidewalks, parking lots and other surfaces that can contribute contaminates.

- **What is a Rainwater Harvesting System?**
- Rainwater harvesting is the capture, diversion and storage of rainwater for a number of different purposes including, but not limited to, irrigation.
- Rainwater harvesting may also include land based systems with man-made landscape features to channel and concentrate rainwater in either storage basins or planted areas.


roof catchment systems
rock catchment systems
ground catchment systems
check and sand dams, hafirs
domestic consumption
Livestock consumption, nurseries and small-scale irrigation; some domestic supply


Flow diversion / canal intake
Concrete weir
Sedimentation basins
Overflow/ outlet for flushing basins
Water for downstream users only during very large floods
Main channel to the fields


Catchment
Conveyance
Storage
Power supply
Pump
Distribution

Advantages of rainwater harvesting

- Relatively cheap materials can be used for construction of containers and collecting surfaces
- Construction methods are relatively straightforward
- Low maintenance costs and requirements
- Collected rainwater can be consumed without treatment, if a clean collecting surface has been used
- Provides a supply of safe water close to homes, schools or clinics, encourages increased consumption, reduces the time women and children spend collecting water, reduces back strain or injuries from carrying heavy water containers
- The water is free – only cost for collection and use the end use of the harvested water is close

to the source – no costly distribution systems

- Provides a water source when ground water is unavailable or unacceptable – canaugment limited supplies

- Reduces flow to storm water drains and nonpoint
- source pollution
- Helps water utilities reduce summer peak demand and delay expensive infrastructure expansion
- Reduces consumers' utility bills

Rainwater harvesting potential by practices and technologies

Roof catchments

- Rainwater can be collected from most forms of roof. Tiled roofs, or roofs sheeted with corrugated mild steel etc are preferable, since they are the easiest to use and give the cleanest water.
- Thatched or palm leafed surfaces are also feasible, although they are difficult to clean and can often taint the run-off.
- Asbestos sheeting or lead-painted surfaces should be avoided.

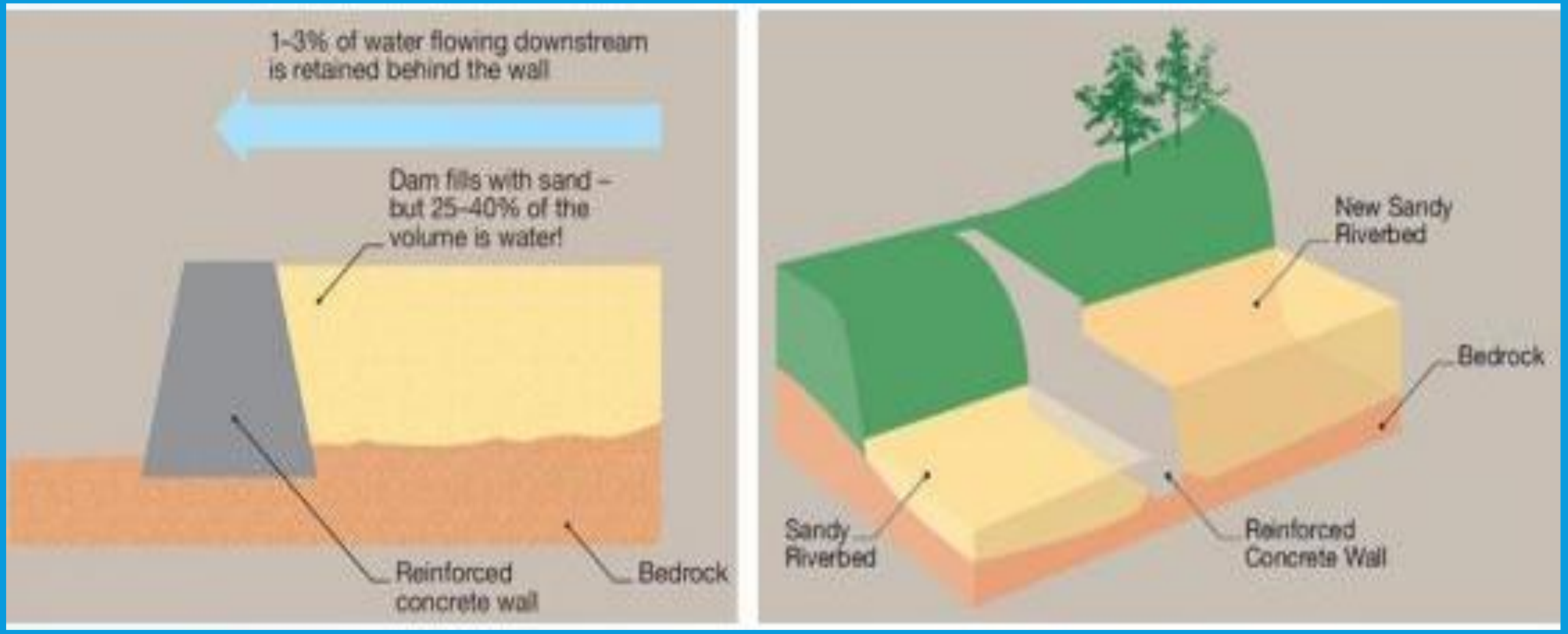
Rock catchments

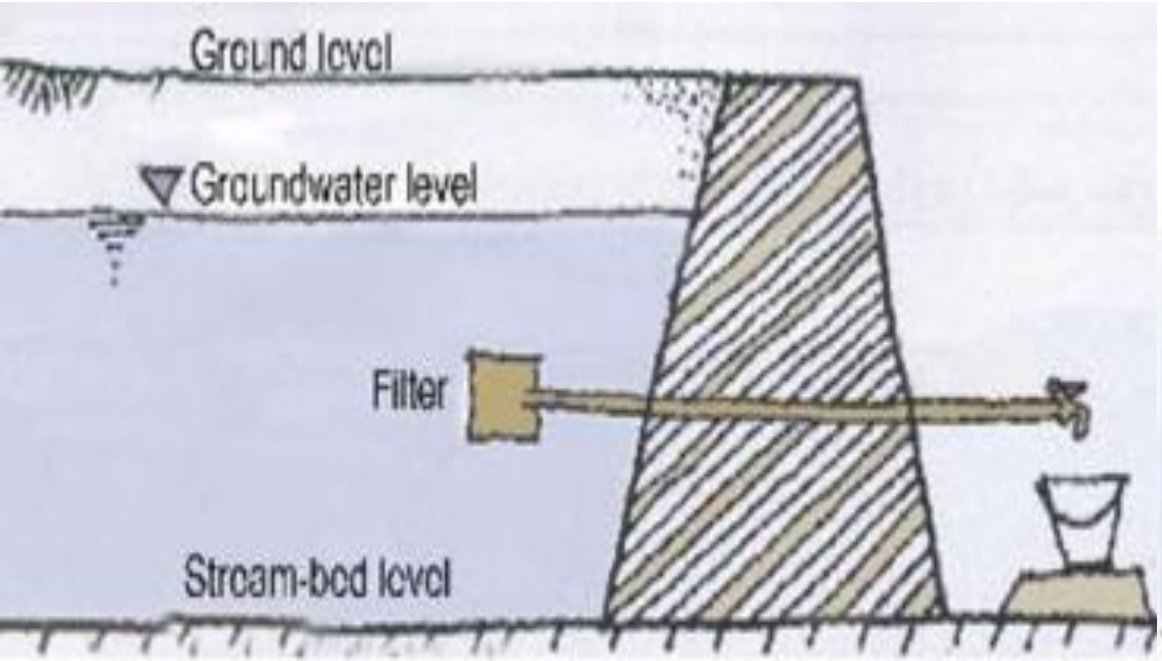
- Just as the roofs of buildings can be used for the collection of rainwater, rock outcrops can also be used as collecting surfaces. Indeed, if access to the catchment area by animals, children etc can be prevented, a protected catchment can collect water of high quality, as long as its surfaces are well flushed and cleaned before storage takes place.
- A significant proportion of water can be obtained from sloping rock catchments
- At the foot of the slopes, collecting channels drain into pipes that lead to tanks.

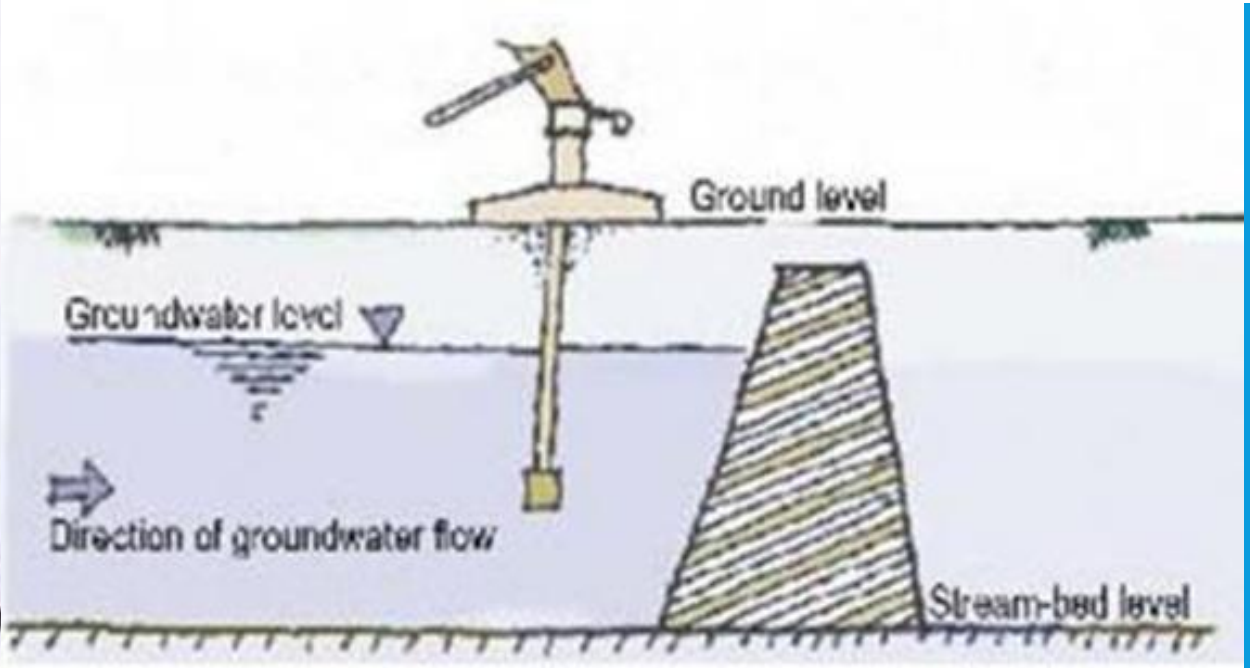
Ground water dams

- They are small dams built above ground and into the riverbed of a seasonal *sand river*
- Sand accumulates upstream of the dam, resulting in additional ground water storage capacity
- Obstructs the groundwater flow of an aquifer and stores water below ground level.
- The topographical conditions govern to a large extent the technical possibility of constructing the dams as well as achieving sufficiently large storage reservoirs with suitable recharge conditions and low seepage losses
- Suitable for rural areas with semi-arid climate in order to store only seasonal available water to be used in dry periods for livestock, minor irrigation as well as for domestic use.

- They can be built with locally available material and labour
- Building the dam still requires relatively high investments, is labour intensive and specific expertise is needed
- Before starting a *ground water* project in an area, the community must be intensively involved to create a feeling of ownership, which has proven to be the key factor in successful construction and maintenance of *ground water dam.*
- Different types of *ground water dams* can be distinguished:
- **Stone-masonry dam:** A dam built of concrete blocks or stones. Local artisan can easily construct this type of dam. A stone-masonry dam is durable and suitable for any dam height. The dam is cheap when construction materials are available within the dam area.
- **Reinforced concrete dam:** A dam consisting of a thin wall made of reinforced concrete. It is a durable structure, relatively expensive but suitable for any dam height.
- **Earth dam:** A dam consisting of impermeable soil material (mostly clay or clayey soils, or black soils). This type of dam is relatively expensive to construct and it requires special skills for its design and construction. An earth dam can easily be damaged and even destroyed by underground flow. Earth dams are not popular and are seldom used (only for minor works).


1-3% of water flowing downstream is retained behind the wall
Dam fills with sand – but 25-40% of the volume is water!
Reinforced concrete wall
Bedrock
New Sandy Riverbed
Bedrock
Sandy Riverbed
Reinforced Concrete Wall





- Good examples of ground water dams in Zimbabwe can be found in In Mzingwane catchment.
- Abstraction of water from sand dams for domestic use, livestock supply and irrigation purposes

- The cost of an average *sand dam* with a minimum life span of 50 years and storage of at least 2.000 m^3 is about US$ 7.500 (2-4 meters height and 20 meters length)
- In the case study of Kenya the community covered about 40% of the overall construction costs by being involved in the construction of sand storage dams by provision of labour and raw materials through *sand* management groups

Surface dams

- Conventional dams that are constructed across rivers and capture surface flow
- Situation in which technology is most applicable - Where large urban population must be served / where large scale irrigation activities are envisaged
- Yields are usually higher than ground water dams
- The running cost is also very high - pumping often required and power required for operation
- Has a high capital cost - intake must be designed and constructed

Irrigation supply

- The method of irrigation will determine pump size and other distribution equipment needed.
- If the plan is to hand water with a hose, a smaller pump can be used.
- Irrigation of large areas with sprinklers will require larger pumps, depending on the sprinkler head and distance and slope the water must traverse.
- Trickle and drip irrigation are the most efficient systems for beds and crop production

- 7 500 litre systems for commercial crops may cost about $3,000, not including the irrigation lines.

System costs will depend on whether the following are needed:

- Gutters
- Downspouts
- Tank (Above ground or in-ground), Size, Tank material (polyethylene, fiberglass, metal, concrete)
- Pump (Rise of land to irrigation site, Lift (if water must be raised out of the tank), Run (greater distances reduce pressure), Pressure tank)

- Filtration (Leaf collection, sand filter, First flush diverter, Insect screens, Inline filters, Floating filter)
- Plumbing-pipes and fittings
- Irrigation supplies

GROWTH PROJECTIONS OF RAINWATER HARVESTING AND/OR SMALL-SCALE IRRIGATION

Functional irrigated area in Zimbabwe is approximately 135 000 ha

Surface	37,098
Centre Pivot	18,395
Sprinkler	75,488
Micro(Drip)	4,599

Conclusions and /or recommendations

- Provide selected technologies based on experiences from elsewhere to overcome natural calamities such as dry spells and droughts.
- Put in place land use classification and delineation, based on suitability that reduces risk of degradation (rain fed agriculture, irrigated agriculture, forest land, grazing land).
- Increase the volume of production and enhance productivity through proper land and water management, which may require strategic and applied research.

- Invest in rural water development as multiple use water systems to reduce poverty and improve livelihood through providing water for agriculture, livestock, domestic and sanitation.
- There is a strong need to enhance access to institutional support services such as credit and extension.
- Availing market information on input and output marketing will only achieve the desired impacts if an effective extension system is in place to guide farmers to understand the issues related to the optimal application inputs, targeted planting dates and product quality to enable them respond well to market incentives.
- Capacity building in various aspects of irrigation management

The government, in cooperation with other appropriate institutions, can have a role in the following areas:

- General delineation of responsibilities as regards the various stakeholders, including the communities;
- Financial assistance in starting up revolving funds and other alternative credit facilities for low-income groups;
- Assistance in supplying simple tools and storage tank forms etc.;
- Setting of standards on water quality, incorporating the potential in an urban context as well, and structural engineering standards;
- Preparation of manuals;
- Training support both to communities and private small-scale construction initiatives