An Inventory of Agricultural Water Technologies and Practices in ZIMBABWE

I. GENERAL	Technology 1= name	Technology 2 =name	Technology 3 = name	Technology 4 = name	Technology 5 = name	Technology 6 = name	Technology 7 = name
1. Name of water technology or practice	Dip Kits	Treadle pump	Rope and Washer	Bucket pump	Bush Pump "B"	Water Seeding (Rainwater harvesting) Half	Low cost gutter technique using waterproof shade
1.0 Detailed description of technology or practice (give technical description, refer to Annexes 1 & 2; attach an illustation/picture if technology is not in the lists)	Drip irrigation uses low-cost plastic pipes laid on the ground to irrigate vegetables, field crops and orchards. This technology was developed as a low-cost system called bucket kits, which use standard plastic buckets and lengths of hose that could be cut to the appropriate lengths. Small holes in the hose allow water to drip out and keep the base of the plant wet without wasting any water.	The treadle pump is a low-lift, high-capacity, human-powered pump designed to overcome the shortcomings of the manual lifting devices. The treadle pump can lift five to seven cubic meters of water per hour from wells and boreholes up to seven meters deep as well as from surface water sources such as lakes and rivers	The system consists of a plastic tube immersed in the well water and discharging on to container on the ground surface. A rope with rubber washers placed 30 cm apart is wound on a windlass at the well top. By rotating the windlass water is pushed up the tube and discharged into the collector container.	The bucket pump is a modernised version o the traditional bucket and windlass. The pump consists o three basic units, The pump stand including footings and windlass, bucket and chain and PVC casing	The Bush pump is the most commonly used handpump in Zimbabwe. It operates on a lift pump principle the reciproacting action being transferred from pump head to the cylinder through a series o galvanised steel pump rods running inside a steel pipe.	A new innovation developed by Mr Phiri form Zvishavane.The main source of water is a rock catchment, which is situated a few meters away from his homestead.The different applied systems used to harness run-off water are all in-situ types which includes a half moon, sand traps, dead level contours and conservation tillage all of which are techniques for increasing water infiltration into the soil.	This new technique was developed by Peter Morgan and uses plastic sheeting or canvas material, the most suitable being "waterproof shade cloth" which is resistant to degradation by the sun and thus has a longer life than ordinary plastic sheeting.
1.1 Source of technology (Indigenous or Imported)	Technology imported	Yes the technology is imported. It was invented in the late 1970s by Gunnar Barnes, a Norwegian engineer working for Lutheran World Federation in Bangladesh	The Rope and Wash pump was invented in Nicaragua but was developed in the UK in the 1982 .	Developed in Zimbabwe by Blair Research Laboratory in 1983	Indigenous, developed in Zimbabwe in 1933	indigenous developed by Mr Phiri in 1960	Developed in Zimbawe by Peter Morgan 1998
1.2 If imported, any modifications done (Yes or No)	Modifications were done to suite local conditions, size of the bucket would be changed to suite the different scenarios	Yes. In the mid-1980s, Daniel Jenkins of the United States Agency for International Development (USAID) developed a PVC version of the treadle pump capable of delivering water under pressure. In 1987, Appropriate Technology International engineer Carl Bielenberg modified the Jenkins version so that it could be manufactured in the small metal workshops typically found in Africa.	Technology was modified so that local available materials are used in the construction	No	N/A	No	Modification done
1.3 Provider of technology[b]	Currently in Zimbabwe the use of drip kits is initiated by NGOs and donor agencies such as USAID and DFID.	ITG, Zimbabwe	NGOs and Mvuramanzi Trust.	Produced in mass by V& W Engineering, Harare	V& W Engineering and others firms	Mr Phiri	NGOs such as Mvuramanzi Trust ,
1.4 Who developed/designed the technology package[c]	In Zimbabwe NGOs designed the packages	An artisan was approached in Masvingo to produce a pressure pump for an NGO, CARE	NGOs and Mvuramanzi Trust.	Blair Research Laboratory	Governmeny of Zimbabwe	Mr Phiri	Peter Morgan
1.5 Who installed the technology package[c]	NGO trained local staff some by IDE	Communities and individuals who would want to take up the technology	Mvuramanzi Trust	National Action Committee	District Development Fund (DDF) and other organisations	Mr Phiri	Peter Morgan
1.6 Source of water (surface, groundwater, harvested rainwater, wastewater, etc.)	Mainly groundwater	mainly groundwater	Groundwater, mainly family wells	groundwater	groundwater	surface, harvested rainwater	harvested rain water
1.7 Is the technology used for more than one use (multiple uses)? (Yes/No)	No	yes	Groundwater, mainly family wells	No	Yes	yes	yes
1.8 If yes, what are they?	N/A	family gardens and domestic uses	Yes	N/A	watering livestock, family gardens	grow cash crops, soil moisture retention	drinking, family backyard garden
1.9 If yes, how is the technical design adapted compared to the design for single use?	N/A	no need to change design	Domestic, productive uses	N/A	need to think about the design because the initial design meant to provide drinking water rather than productive water	this allows water to be used for various activities	This allows water to be available during the dry seasons especially for drinking
1.10 What is seen as advantages of multiple use systems as compared to the design for one single use?	N/A	The pump will be able to meet the productive uses of water to meet their livelihood needs as well as meet the domestic needs.	Treadle pumps are mostly used for irrigation of small vegetable gardens. Water is pumped from shallow wells, streams or small dams into a tank and then piped to the crops.	N/A	The pump will be able to meet the productive uses of water to meet their livelihood needs as well as meet the domestic needs.	competition among the uses	N/A

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1.0 Detailed description of technology or practice (give technical description, refer to Annexes 1 & 2; attach an illustation/picture if technology is not in the lists)	Drip irrigation uses low-cost plastic pipes laid on the ground to irrigate vegetables, field crops and orchards. This technology was developed as a low-cost system called bucket kits, which use standard plastic buckets and lengths of hose that could be cut to the appropriate lengths. Small holes in the hose allow water to drip out and keep the base of the plant wet without wasting any water.	The treadle pump is a low-lift, high-capacity, human-powered pump designed to overcome the shortcomings of the manual lifting devices. The treadle pump can lift five to seven cubic meters of water per hour from wells and boreholes up to seven meters deep as well as from surface water sources such as lakes and rivers	The system consists of a plastic tube immersed in the well water and discharging on to container on the ground surface. A rope with rubber washers placed 30 cm apart is wound on a windlass at the well top. By rotating the windlass water is pushed up the tube and discharged into the collector container.	The bucket pump is a modernised version o the traditional bucket and windlass. The pump consists o three basic units, The pump stand including footings and windlass, bucket and chain and PVC casing	The Bush pump is the most commonly used handpump in Zimbabwe. It operates on a lift pump principle the reciproacting action being transferred from pump head to the cylinder through a series o galvanised steel pump rods running inside a steel pipe.	A new innovation developed by Mr Phiri form Zvishavane.The main source of water is a rock catchment, which is situated a few meters away from his homestead.The different applied systems used to harness run-off water are all in-situ types which includes a half moon, sand traps, dead level contours and conservation tillage all of which are techniques for increasing water infiltration into the soil.	This new technique was developed by Peter Morgan and uses plastic sheeting or canvas material, the most suitable being "waterproof shade cloth" which is resistant to degradation by the sun and thus has a longer life than ordinary plastic sheeting.
1.11 What are the disadvantages of multiple use systems?	N/A	Competition among users. In the case of a communal pump one user may want water for irrigating their garden at the same time that aniother user wants it for domestic purposes. In times of scarcity this may result in a big conflict.	Makes it possible for the rural poor to carry out activities to sustain their livelihoods.	N/A	Over working the pump resulting in frequent breakdown	Rural areas, dry and has low rainfall	rural areas that are dry and has low rainfall
2. Specific location/address & distance from main urban center (km)	Promoted in all communal areas of Zimbabwe	Promoted all over Zimbabwe.	All over Zimbabwe	promoted all over Zimbabwe	All over Zimbabwe	still localised	All over Zimbabwe
3. Main source(s) of income in site	small gardens	family gardens and domestic uses	family gardens		N/A	cash crops, bananas,pigeon peas	N/A
4. Other source(s) of income in site					N/A		N/A
5. Type of user (community or individual households)	individual households	individual households			community	individual household	N/A
6. No. of benefitted households; average size of households	6 - 10 people per household	6 - 10 people per household	Both	6-10 people per households	250 individuals	N/A	Individual households or Institutions
7. Total size for all beneficiaries (ha) -note average size per beneficiary	0.1 ha	0.01 - 0.1 ha per household	na		N/A		N/A
8. Profile of beneficiaries (if mostly ultra poor, poor, non-poor or mixed)[a]	poor	Rural poor people targeted but some rural rich who showed interest were encouraged to buy the treadle pumps.		mixed	mixed		mixed
8.1 Was project/program area selected based on available data on comparative incidence of poverty? (Yes/No)	No. selection of site was dependent on project area for the active NGO.	NO	rural non-poor.	recommended technology for use in the Zimbabwe Rural Water Supply Programme	The most commonly used handpump in Zimbabwe		N/A
8.2 If yes, indicate the poverty status of the project area relative to all other regions of the country		na	no	N/A	N/A		N/A
8.3 Were particular populations or groups targeted within the project area (e.g., based on baseline socioeconomic surveys or participatory poverty assessment, etc)? (Yes/No)	yes	Yes	na	No	Country wide		No
8.4 If yes, indicate the poverty status of the beneficiaries relative to the non-beneficiaries in the project/programme area	Child headed households, elderly couples, HIV/AIDS affected families and widows.	Poor but not necessarily sickly people.	na	N/A	N/A		N/A
8.5 Indicate the proportion of women beneficiaries	not clear	not clear		N/A	N/A		N/A
9. Month & year technology was introduced	Most were introduced between 2000 and 2003	Since late 1990s		1983	1933		1998
10. No. of years of adoption	3 - 5 years	3 - 6 years		N/A	N/A		5 years plus
11. Is technology still in use (Yes or No)	Most are still operational	In some cases yes.		Yes	yes		yes
12. If not anymore, why? (STOP here for this technology)	N/A				N/A		N/A
13. Type of technology (water capture such as small dams, rainwater harvesting OR distribution/water use such as treadle pumps, drips, etc.)	Distribution	distribution	Distribution	drinking water	drinking		rainwater harvesting
14. Describe the counterfactual or the old technology (practice) the new water management technology/practice replaces.	Flood irrigation was what was traditionally used.	People used the rope and bucket system for irrigating their gardens.		N/A	N/A		N/A
14.1 Is the change partial or complete?	There wasn't a change but an adoption of the new technology. Users of the drip kits in the rural areas do not abandon their traditional gardens, rather they take drip as a parallel activity.	Only partial, most families use a combination, others operate the treadle pump whilst the others irrigate with their buckets.	The Rope and Wash reduces irrigation labour when compared to the Bucket and Can system. The system also helps to increase area under irrigation and consequently production.	N/A	N/A		N/A

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14.2 If the change is partial, describe the elements of the old system that were preserved and those that were discarded	N/A	People still use the bucket.	The two systems work parallel to each other and depend on the size of the land under irrigation and resources per household.	N/A	N/A		N/A
II. Profitability of the TECHNOLOGY							
a. The new technology or management practice (Note: prepare an enterprise or partial budget)							
15. What is the estimated and actual life of the technology? (in years)	5 yrs estimated, 3-7 yrs actual depending on O&M		Was donated but individuals can have tham installed on request if they can afford the cost.	5-10 years	10-15 years		5 years
16. Was technology given out for free?	During the pilot period the technology was donated by donors.	In most NGO supported schemes and research driven pilot areas, the technology was given for free. In some areas users were encouraged to buy their treadle pumps.	Was donated but individuals can have tham installed on request if they can afford the cost.	Donor and Government support	No communities provided labour and local materials		Its an innovation
17. If NOT totally free, what is the capital cost of technology (reference YEAR of cost estimate; separate costs for equipment/tool/parts, pipes for conveyance into farm, installation, water source development)	Purchase costs under the LEAD program were estimated around USD30 000 in 2002.		The rope pump (rope and washer pump) is very suitable because its designed is to pump water from traditional family wells, rivers or small ponds for irrigation purposes. The Rope and Pump can be manufactured by the users which makes installation cost affordable, and repairs and maintenance is very simple and can be done by the family.	USD 1000 (1995)	USD 2500 (1995)		N/A
18. Cost of operation & maintenance per ha (indicate what items are included-- cost of pumping in terms of fuel, energy/electricity, labor costs; maintenance and repair costs, etc.)	Operation costs are usually higher by about 20% to 50%. The cost of a 10 m x 10 m drip kit ranges between USD$25 – USD $36		Yes	N/A	N/A		
18.1. Does the new technology reqiure more or less labour than the old technology?	Mostly family vegetables (cabbage, tomatoes, etc.)		Can be made using locally available materials and is affordable for the rural poor. O & M can be done by the local rural population.	N/A	N/A		
19. Crops produced (indicate main crops vs. secondary crops)	Mostly family vegetables (cabbage, tomatoes, etc.)	Mostly vegetables	It is culturally acceptable	N/A	N/A		
20. Changes in crops grown (into what & when) & reason for new crops or switching	Crops are fairly standardised		It's affordable, and adaptable to different situations like pumping from vertical wells or inclined to pump from rivers or ponds	N/A	N/A		
21. Indicate how many croppings per year (1, 2, or 3)	2 - 3	2 - 3	No degradation of the environment has been noted.	N/A	N/A		
22. Increase in production (in kg/ha) due to technology (including amount used for own consumption & amount sold to market)	produce mainly for own consumption. Increase in production cannot be measured since for most this is their first time to produce.		Simple to operate, maintenance required is easily grasped by village level mechanics, spares are readily available in local hardware shops within rural areas and the rope pump has a much higher delivery rate than most hand pumps.	N/A	N/A		
22. Increase in revenues (in local currency) due to technology (less amount used for own consumption)	difficult to determine			N/A	N/A		
23. Estimated & actual financial profits (gross revenues-costs of all cash inputs)	N/A			N/A	N/A		

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b. Old water management technology or practice (prepare an enterprise budget) LEAVE OUT QUESTION 24-29 IF NO OLD TECHNOLOGY WAS REPLACED							
24. What is the estimated and actual life of the technology? (in years)	N/A	Whilst a metal bucket can last two yearsthe rope hardly lasts 6 months.		5-10 years			
25. What is the capital cost of technology?	N/A	A 5m rope and 15 litre bucket would cost less than USD75 in 1997.		N/A			
26. Cost of operation & maintenance per ha (indicate what items are included-- cost of pumping in terms of fuel, energy/electricity, labor costs; maintenance and repair costs, etc.A61)	N/A	Minimal.		N/A			
27. Crops produced (indicate main crops vs. secondary crops)	N/A	Vegetables		N/A			
28. Indicate how many croppings per year (1, 2, or 3)	N/A	2 - 3		N/A			
29. Estimated & actual financial profits (gross revenues-costs of all cash inputs)	N/A	na		N/A			
III. ROLE OF INSTITUTIONS/ORGANIZATIONS							
30. Support by NGOs (specify the NGO & indicate if international or local)							
30.1 Indicate the total value of the support (in Dollars or local currency)	not availed	not provided		N/A	about 95% support of the total budget		
30.2 Is the support still on-going or withdrawn? (1. Ongoing; 2. Withdrawn)	Withdrawn in some areas.	on-going for selected districts		N/A	on going		
30.3 If the institutional support is withdrawn, is the system still functioning?	A capacity building program has been instituted wherever drip kits have been promoted in Zimbabwe to enable the communities to handle routine O&M and repair work	na		support available through DDF	yes		
30.4 If the system is still functioning, is the pace of technology/practice uptake continuing at the same or better pace than when there was NGO institutional support? (1. Same pace; 2. Better pace; 3. Slowed down)	Uptake pace is a lot slower.	The pace of uptake reduced in the areas were NGO support has been withdrawn.		slowed down	slowed down in some areas		
30.5 Give reasons for the response to 30.4	No capital funds, lack of awareness on the benefits of drip kits, cultural inertia, program initially taergeted the poor only so once they are catered for promotion is stopped.	It's mostly the failure by beneficiaries to raise sufficient funds to purchase the treadle pumps.		no more government support except for few NGOs, but most changed focus to other technologies	lack of funding		
31. Specific support provided[d]	Provision of kits, training in installation and O&M			N/A	N/A		
32. Support by government extension workers & other government agency (specify which agency & whether local or national government) (yes or no)	Govt --- Agritex often offered support in crop production	Govt support limited to crop production.					
32.1 Indicate the total value of the support (in Dollars or local currency)	N/A	na		N/A	N/A		
32.2 Is the support still on-going or withdrawn? (1. Ongoing; 2. Withdrawn)	Govt operations are paralised by lack of funds	it's om-going were funds are permitting, otherwise it is mostly withdrawn.		ongoing but slowed down			

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32.3 If the institutional support is withdrawn, is the system still functioning?	Yes	Yes. Because government support is nominal.		some			
32.4 If the system is still functioning, is the pace of technology/practice uptake continuing at the same or better pace than when there was Government institutional support? (1. Same pace; 2. Better pace; 3. Slowed down)	No	Yes. Because government support is nominal.		slowed down			
32.5 Give reasons for the response to 32.4	Govt contribution was small relative to external donor and NGO support			Govt contribution was small relative to external donor and NGO support			
33. Specific support provided[d]		Technical advice on crop production and awareness creation on issues of good nutrition, heath and hygiene issues.		N/A			
34. Support by private enterprises (specify enterprise)	Local manufacture of kits	ITG, production of treadle pumps locally.					
35. Specific support provided[d]		Local manufacture of treadle pumps.		N/A			
36. Support by other organization (specify organization - e.g. community organization) or private sector service provider (e.g. manufacturers/dealers/retailers)	Research on effectiveness by the University of Zimbabwe, Dept of Civil Engineering.						
36.1 Indicate the total value of the support (in Dollars or local currency)	USD 20 000 was set aside for MSc reseach projects in 2002 and 2003.			N/A			
36.2 Is the support still on-going or withdrawn? (1. Ongoing; 2. Withdrawn)	Withdrawn in some areas.	Yes.		N/A			
36.3 If the institutional support is withdrawn, is the system still functioning?	Yes	na		N/A			
36.4 If the system is still functioning, is the pace of technology/practice uptake continuing at the same or better pace than when there was institutional support? (1. Same pace; 2. Better pace; 3. Slowed down)	Pace of uptake is slower.	Pace of uptake is actually higher.		N/A			
36.5 Give reasons for the response to 36.4	Community have a dependency syndrome such that when technology is not being promoted they tend to ignore it. Only a few individuals remain interested after institutional support is removed.	The local pumps were not of good quality as a result users developed a negtive attiude towards the local product. The imported type is actually favoured y users.		N/A			
37. Specific support provided[d]	Drip kits weredistributed for free and the receipients requested to submit regular reports on system performance and their own operations.			N/A			
IV. FACTORS CONTRIBUTING TO PROFITABILITY & SUSTAINABILITY OF TECHNOLOGY (see Annex 3 for sample answers #40-45)							

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38. Ease in implementation (Yes & No)	yes	Yes	The rope pump (rope and washer pump) is very suitable because its designed is to pump water from traditional family wells, rivers or small ponds for irrigation purposes. The Rope and Pump can be manufactured by the users which makes installation cost affordable, and repairs and maintenance is very simple and can be done by the family.	yes			yes
39. Ease in O&M (Yes & No)	yes	Yes	Yes	yes			yes
40. Suitability of technology/How adapted to local conditions (well, not so well, etc.)	Yes	Yes	Can be made using locally available materials and is affordable for the rural poor. O & M can be done by the local rural population.	well			very well
41. Cultural acceptability	Yes	yes	See advantages stated above	yes			yes
42. Effectiveness	Useful if clean water sources (groundwater) is available.	useful and well accepted by user communities.	It is culturally acceptable	N/A			yes
42. Environmental impact	Well		No degradation of the environment has been noted.	None			none
43. Other advantages (factors contributing to profitability & Suitability)	People generally do not have objections		Simple to operate, maintenance required is easily grasped by village level mechanics, spares are readily available in local hardware shops within rural areas and the rope pump has a much higher delivery rate than most hand pumps.				can be made from local available materials
44. Other disadvantages (factors constraining profitability & sustainability-- e.g. lack of specific support services or supplies of specific inputs, etc.-- be very specific)	Local manufacturing capacity is limited.	In the case of local manufacture the materials used may be of poor quality. On the other hand the imported materials are usually very costly.	It can actually be very strenuous to the user particularly women and children if it is poorly designed and aligned and furthermore the rope can only operate to a limited head and depth. It can only take water from a certain depth and up to a certain height.	not supported much			No much support from government

KEY:

na = Not Applicable

nil = No information available

[a] 1: ultra poor - extremely poor or most vulnerable engaged in rainfed cereal production, no potential to diversify because of lack of land, no livestock, limited available labor, no off-farm incomes/remittances, or without access to land and resources at all 2: poor; 3: non-poor; 4:

[b] 1: indigenous knowledge; 2: NGO (specify); 3: government agency/extension worker; 4: private enterprises; 5: other (specify)

[c] 1:government agency (extension agency/irrigation advisory services/University); 2: representative/authorized dealers of manufacturers; 3: private consultant; 4: farmers themselves; 5: other (specify)

[d] 1:introduction of technology; 2: facilitated access to inputs; 3: facilitated access to output markets; 4: provision of (or facilitated access to) credit; 5: capacity building such as training (specify what); 6: formation of association (specify: water user assoc., producers association,