An Inventory of Agricultural Water Technologies and Practices in BOTSWANA

I. GENERAL	Technology 1= name	Technology 2 =name	Technology 3 = name	Technology 4 = name
1. Name of water technology or practice	**small dams**	**improved wells**	**pond improvement**	**permanent strip farming**
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)	see report for detail	see report for details	see report for details	see attachment for details
1.1 Source of technology (Indigenous or Imported)	imported	indigenous	indigenous	imported
1.2 If imported, any modifications done (Yes or No)	no	yes	yes	no
1.3 Provider of technology[b]	government	government	government	Sanitas farm
1.4 Who developed/designed the technology package[c]	government, FAO	government	government	Sanitas farm
1.5 Who installed the technology package[c]	government	government and farmers	government and farmers	Sanitas farm
1.6 Source of water (surface, groundwater, harvested rainwater, wastewater, etc.)	stormwater run-off	groundwater	rainfall run-off	harvested rainwater
1.7 Is the technology used for more than one use (multiple uses)? (Yes/No)	sometimes	yes	yes	no
1.8 If yes, what are they?	livestock, fish, irrigation	livestock, human use	livestock, human use	n.a.
1.9 If yes, how is the technical design adapted compared to the design for single use?	not adapted	trough for livestock watering added	trough for livestock watering added; handpump now used primarily for human use due to ease of use and filtration advantage	n.a.
1.10 What is seen as advantages of multiple use systems as compared to the design for one single use?	more economic activity	n.a.	n.a.	n.a.
1.11 What are the disadvantages of multiple use systems?	more demands & roleplayers	none in this context	none in this context	n.a.
2. Specific location/address & distance from main urban center (km)	117 dams since 1989, see list	across the country	across the country	Sanitas farm
3. Main source(s) of income in site	livestock	livestock	livestock	cropping
4. Other source(s) of income in site	irrigated production, where applicable	sometimes vegetable production	sometimes vegetable production	n.a.
5. Type of user (community or individual households)	registered farmer groups	farmer groups; households	farmer groups; households	n.a.
6. No. of benefitted households; average size of households	unknown	unknown; 6-7	unknown; 6-8	not yet promoted in rural areas
7. Total size for all beneficiaries (ha) -note average size per beneficiary	unknown	n.a.	n.a.	n.a.
8. Profile of beneficiaries (if mostly ultra poor, poor, non-poor or mixed)[a]	poor	poor	poor	intended for poor
8.1 Was project/program area selected based on available data on comparative incidence of poverty? (Yes/No)	no	no	no	n.a.

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8.2 If yes, indicate the poverty status of the project area relative to all other regions of the country	n.a.	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)	no	no	no	n.a.
8.4 If yes, indicate the poverty status of the beneficiaries relative to the non-beneficiaries in the project/programme area	n.a.	n.a.	n.a.	n.a.
8.5 Indicate the proportion of women beneficiaries	unknown	unknown	unknown; being livestock, probably low	n.a.
9. Month & year technology was introduced	various, see list	ongoing programme	ongoing programme	since 1970s
10. No. of years of adoption	since 1966, accelerated since 1989	various	various	30
11. Is technology still in use (Yes or No)	yes	yes	partially. Ponds continue to be used, but pumps not used for livestock, though still used for human use. Drinking troughs not used.	yes
12. If not anymore, why? (STOP here for this technology)	n.a.	n.a.	daily pumping with a handpump for 100-400 LSU is too onerous when animals can drink directly from the pond instead.	n.a.
13. Type of technology (water capture such as small dams, rainwater harvesting OR distribution/water use such as treadle pumps, drips, etc.)	water capture	concrete lining of old wells, addition of manual pumping, usually Bush Pumps	water capture	in-field rainwater harvesting
14. Describe the counterfactual or the old technology (practice) the new water management technology/practice replaces.	none	wooden-lined wells with wooden windlass and bucket	open ponds	traditional ploughing & cultivation
14.1 Is the change partial or complete?	complete	partial	partial	partial
14.2 If the change is partial, describe the elements of the old system that were preserved and those that were discarded	n.a.	the posts for the windlass are retained and a loose concrete slab used to cover the well, so that farmers can revert to the old technology in case of pump breakdown	pond still there, just deepened and pumping installation and drinking troughs provided	still using tractors; ripping in permanent strips instead of ploughing whole field

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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)	15-50 years, depending on desilting practices	well: 20-30 years; pump: 5-10 years, depending on maintanance	pond: 10-30 years, depending on desilting practices; pump: 5-10 years, depending on maintanance	indefinite
16. Was technology given out for free?	yes	yes, but with labour requirement from beneficiaries	yes, but with labour requirement from beneficiaries	n.a.
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)	n.a.	(2005) per well: P10 000-20 000 material costs; P4 000 - 7 000 farmers' labour; P50 000 - 60 000 govt salaries and allowances	unknown	(2005) additional capital cost to existing ploughing equipment: ripper and scraper (P20 000 total?)
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.)	n.a.	negligable	negligable	approx 60% reduced fuel costs; ripping only about 40% of field area
18.1. Does the new technology reqiure more or less labour than the old technology?	less	less	more	less. Weeding done mechanically with scraper between rows
19. Crops produced (indicate main crops vs. secondary crops)	livestock, vegetables if irrigation	livestock	livestock	maize, other field crops
20. Changes in crops grown (into what & when) & reason for new crops or switching	none before	none	none	n.a.
21. Indicate how many croppings per year (1, 2, or 3)	02-Jan	n.a.	n.a.	2-3
22. Increase in production (in kg/ha) due to technology (including amount used for own consumption & amount sold to market)	none before	n.a.	n.a.	increase from 2t/ha - 8t/ha reported
22. Increase in revenues (in local currency) due to technology (less amount used for own consumption)	dependent on market availability	n.a.	n.a.	not known yet for smallholder application
23. Estimated & actual financial profits (gross revenues-costs of all cash inputs)	unknown, variable	n.a.	n.a.	as above

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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.	2-5 years	10-30 years, depending on desilting practices	as for traditional ploughing and cultivation
25. What is the capital cost of technology?	n.a.	n.a., local materials only	n.a., local materials only	as for traditional ploughing and cultivation
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.	n.a.	n.a.	as for traditional ploughing and cultivation
27. Crops produced (indicate main crops vs. secondary crops)	n.a.	n.a.	n.a.	field crops, particularly maize
28. Indicate how many croppings per year (1, 2, or 3)	n.a.	n.a.	n.a.	1
29. Estimated & actual financial profits (gross revenues-costs of all cash inputs)	n.a.	n.a.	n.a.	as for traditional ploughing and cultivation; mostly for own consumption
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)	n.a.	n.a.	n.a.	n.a.
30.2 Is the support still on-going or withdrawn? (1. Ongoing; 2. Withdrawn)	n.a.	n.a.	n.a.	n.a.
30.3 If the institutional support is withdrawn, is the system still functioning?	n.a.	n.a.	n.a.	n.a.
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)	n.a.	n.a.	n.a.	n.a.
30.5 Give reasons for the response to 30.4	n.a.	n.a.	n.a.	n.a.
31. Specific support provided[d]	n.a.	n.a.	n.a.	n.a.

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32. Support by government extension workers & other government agency (specify which agency & whether local or national government) (yes or no)				
32.1 Indicate the total value of the support (in Dollars or local currency)	average P180 000 (USD31 600) per dam; 117 dams since 1989, total cost unknown	unknown	unknown	n.a.
32.2 Is the support still on-going or withdrawn? (1. Ongoing; 2. Withdrawn)	ongoing maintenance on old dams and construction of new dams	ongoing programme - reconstruction of hand dug wells; maintenance of reconstructed wells farmers' responsibility	withdrawn	n.a.
32.3 If the institutional support is withdrawn, is the system still functioning?	yes	yes	yes, partially as described above	n.a.
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)	use continues; maintenance reduces; construction stops	use continues; new reconstructions would stop, except wher government provides material only to those willing to reconstruct their own. Danger of incorrect installation in the absence of technical advice, as happened with the supply of RWH tanks	stopped	n.a.
32.5 Give reasons for the response to 32.4	poor farmers have no capital to build dams	see above	see above	n.a.
33. Specific support provided[d]	construction and desilting of dams	reconstruction of wells, installation of Bush Pump or similar	pond excavated to increase storage capacity; handpump installed; drinking trough provided	n.a.
34. Support by private enterprises (specify enterprise)				
35. Specific support provided[d]	n.a.	n.a.	n.a.	ongoing practice
36. Support by other organization (specify organization - e.g. community organization) or private sector service provider (e.g. manufacturers/dealers/retailers)				
36.1 Indicate the total value of the support (in Dollars or local currency)	n.a.	n.a.	n.a.	n.a.

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36.2 Is the support still on-going or withdrawn? (1. Ongoing; 2. Withdrawn)	n.a.	n.a.	n.a.	n.a.
36.3 If the institutional support is withdrawn, is the system still functioning?	n.a.	n.a.	n.a.	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)	n.a.	n.a.	n.a.	n.a.
36.5 Give reasons for the response to 36.4	n.a.	n.a.	n.a.	n.a.
37. Specific support provided[d]	n.a.	n.a.	n.a.	n.a.
IV. FACTORS CONTRIBUTING TO PROFITABILITY & SUSTAINABILITY OF TECHNOLOGY (see Annex 3 for sample answers #40-45)				
38. Ease in implementation (Yes & No)	yes	no	no	yes
39. Ease in O&M (Yes & No)	yes, occasional major desilting and repair; otherwise low maintenance	yes	no	yes
40. Suitability of technology/How adapted to local conditions (well, not so well, etc.)	well	well	not so well	depend on tractor availability; additional equipment (ripper, special scraper)
41. Cultural acceptability	good	good	no	unknown
42. Effectiveness	good	good	no	good
42. Environmental impact	unknown, probably low	low	low	lower than conventional ploughing
43. Other advantages (factors contributing to profitability & Suitability)	necessity for livestock - increases use of available grazing	n.a.	n.a.	low annual input costs
44. Other disadvantages (factors constraining profitability & sustainability-- e.g. lack of specific support services or supplies of specific inputs, etc.-- be very specific)	none known	none known	none known	access to specialised equipment; no current programme of promotion; needs to be assessed in context of overall potential conservation agriculture approaches

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[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

[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

[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