CUVEwaters integrated water resources management

Initial check list for rain- and floodwater harvesting (roof and ground catchments, oshanas)

If you want to proceed with rain or floodwater harvesting at the envisaged location, you need to answer 'YES' to each of the questions:

☐ Is there an interest in the community/some households to grow vegetables in irrigated gardens?

☐ Do some householders think that the current water provision is thought to be seriously inadequate in quantity, quality, reliability or convenience to realise a gardening project?

☐ Does the capacity to design and construct rain or floodwater harvesting systems in the area exist, or could the capacity be developed in a suitable time or could external trainers be hired?

☐ Are there suitable roofs for rainwater harvesting or suitable oshanas for floodwater harvesting?

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Checklist for assessing feasibility of RFWH system

Technical feasibility

- ☐ Is rainfall and catchment/roof surface area or usable oshana water volume sufficient to meet the demand?
- ☐ Is the design appropriate (e.g. easy to maintain)?
- ☐ Are materials available?
- ☐ Are skills locally available?

Social and economic feasibility

- ☐ Is there a real need for producing vegetables (for subsistence or the market)?
- ☐ Is the design affordable and cost-effective?
- ☐ Is the community enthusiastic and fully involved?

Environmental feasibility and health

- ☐ Will rain/floodwater harvesting improve both the quantity and quality of the available water?
- ☐ Do we expect a positive impact on the users' health (food provision)?

Reasonable combinations of water sources

- ☐ Have we investigated all reasonable alternative means of water provision (including tap water)?
- ☐ Have we considered other options in combination with rain/floodwater supply?

If you cannot answer all of the questions above, please contact Issac Kariuki.

Technology Toolkit for Rain- and Floodwater Harvesting

Main decision steps towards running a sustainable rain- or floodwater harvesting facility for gardening

Julia Röhrig and Alexander Jokisch

Precondition:

Desire to improve water supply for gardening

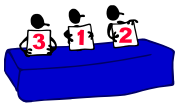
1. Is rain or floodwater harvesting a feasible option?

yes ↓ no ↘

2. Is the intended use of the harvested water to irrigate a garden?

Other options should be followed.

yes ↓ no ↘



3. Will we implement rain or floodwater harvesting?

Other options should be implemented.

yes ↓ no ↘

4. Which design of RFWH is feasible?

Other options should be implemented.

5. What is necessary to construct RFWH structure?

6. What is necessary for sustainable operation and maintenance of RFWH structure?

Technology Toolkit for Rain- and Floodwater Harvesting

Main decision and action steps towards running a sustainable rain- or floodwater harvesting for gardening

Julia Röhrig and Alexander Jokisch

Problem

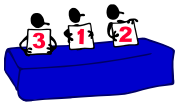
water scarcity,
unreliable water supply,
food insecurity, etc.

Goal

improve water availability,
improve food security due to own gardening,
overcome poverty,
generate income, etc.

Data/Information

current water sources,
rainfall data,
water demand,
rainwater harvesting options,
gardening options,
availability of labor,
financial options, etc.



Understanding

integration,
evaluation of feasibility, etc.

Alternatives

cost-benefit analyses,
scenario analyses,
advantages/disadvantages, etc.

Decision

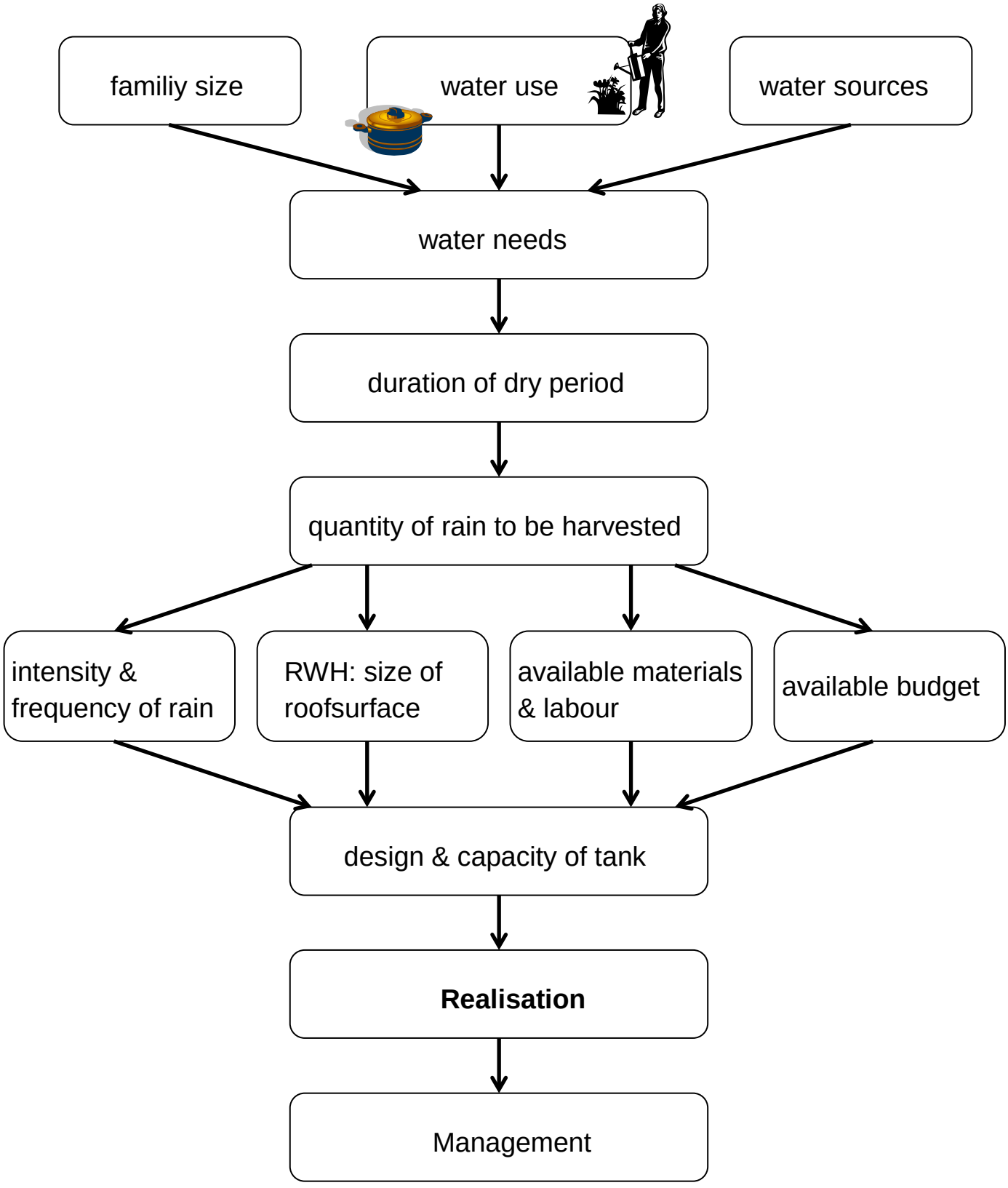
evaluation of alternatives,
preferences, etc.

Action

designing of feasible structure,
capacity development,
construction,
operation and maintenance, etc.

Technology Toolkit for Rain- and Floodwater Harvesting

Issues which you need to consider designing your rain- and floodwater harvesting system



Source: J. Röhrig, adapted from Worm & van Hattam (2006):26

Oku etapo eumbo ile etungo lokuhakela omeva odula (RWH)

Ombapila/omushangwa ou ota ulike eenghatu doku etapo etungo lokuhakela omeva.

Eenghatu nhano doku etapo etungo loye lokuhakela omeva

1. Onghatu yotete: tengeneka elongifo loye lomeva.

2. Onghatu onhivali: Ulika/tala kutya ouhapu womeva aeshe odula elipo oefike peni.

3. Onghatu onhinhatu: Hoolola noku etapo ounene wonhele yoye yokuhakela omeva

4. Onghatu onhine: Ulika/yandja ounene wo tenga.

5. Onghatu oninhano: Hoolola omutungilo/omufolomo tau wapalele noilongifo yotenga yoye.

1. Onghatu yotete: tengeneka elongifo loye lomeva

Etengeneko louhapu womeva apumbiwa onghatu yotete tai kwafele moku etapo etungo lokuhakela omeva odula. Etengeneko eli lomeva aa apumbiwa konyala olidjuu na olina oku ningwa pefimbo lope-tameko. Omivalu dimwe dokuwilika oda yandjwa apa.

Omikundu edi tadi shikula apa nadi talwe:

a) Omeva odula aa ahakelwa owahala oku alongifa shike?

- Oshikunino
- Okulongifa meumbo, ngaashi okuteleka ile okukosha
- Okunwa, nosho tuu

➔ **Tengeneka omeva aeshe apumbiwa okulongifwa keemhumbwe adishe mefiku keshe komunhu umwe.**

Elongifo mefiku lomunhu umwe o: The use per day for one person is: litres

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b) Ovanhu vangapi tava ka longifa omeva?

➔ **Ulika ovanhu ava tava ka longifa omeva, nomalalakano a yandjwa pombada.**

Omuvalu/omwaalu wova longifi o:

c) Oule wefimbo lifike peni omeva odula taa kalongifwa?

- Omeva ota a ka longifwa ashike pefimbo loukukutu/ ngee kuhena omeva.
- Omeva ota a ka longifwa odula aishe moshikunino ile momaumbo, ngaashi okukosha (eedjo dikwao domeva delineekelwa opo dili).
- Omeva ota a ka longifwa odula aishe oku tekela oshikunino, oku longifa momaumbo nokunwa (kapena vali odjo imwe yomeva tai kalele yelinekelwa).

➔ **Ulika efimbo, omeva odula apumbiwa**

OMAFIKU keshe kodula omeva odula ahakelwa apumbiwa:

Paife oto dulu oku mona omeva aeshe kumwe apumbiwa.

➔ **Omeva aeshe kumwe apumbiwa moule wodula ota a dulu oku valulwa ngaha:**

OMEVA APUMBIWA = ELONGIFO x OVALONGIFI x OMAFIKU

Omeva odula ahakelwa APUMBIWA o:

2. Onghatu onhivali: Ulika ouhapu womeva aeshe odula elipo

Opo nee u ulike omeva aeshe odula elipo ouna oku shiiva oupokati (average) wokodula moshi topolwa sheni/moshitopolwa hoololo sheni /momukunda weni, osho yoo oule fimbo wodula yaloka.

Oupokati womeva odula wokodula moNooli yopokati ka Namibia oufike po 470 mm (0.47 m), unene odula ohai loko pokati ka Novemba na Maalitsa, Kotooba na Apiilili ovena odula inini. Mai fiyo Septemba unene ohava kala vakukuta. Odula oha i loko unene peenhele dimwe. Ngee nee wahala ushiive oupokati wodula (average) woitopolwa hoololo ikwao mo Namibia oto dulu oku tala kepandja loku yandja onghalo yomepo yaNamibia eli: http://www.meteona.com.

3. Onghatu onhinhatu: Oku hoolola noku etapo oshihakelo shomeva shoye

Opo tu hakela omeva awana odula owapumbwa onhele yokuhakela omeva ili nawa. Opo umone omeva ena ongushu ili nawa oihakeli yomeva ili nawa ongashi peembada deenduda domomaumbo, eefikola, oupangelo nosho tuu. Konyala eenduda edi oda uvilikwa noipeleki ei kwa talika kutya oina yoo omakungulukilo omeva eli nawa. Sha hala okutya omeva odula mahapu taa wile koipeleki oku

otaa tondokele kotenga nomashona ashike taa tukapo ayuka momhepo. Etondoko lomeva koipeleki ota li dulu oku etwa po 85 % ile po 0.85. Eshi osha hala okutya 85% domeva taa wile koipeleki okwa uka ko tenga.

4. Onghatu onhine: Ulika ounene wapumbiwa wotenga yoye

Opo umone kutya omeva efike peni taa hakelwa modula imwe owa pumbwa yoo u kale u na ounene woshihakelo shomeva (mee m^2). Ngee nee wamono ounene woshihakelo shomeva ouna oku shi indjipaleka noupokati (average) wodula yaloka modula (okudja ponghatu onhi 2) nonomola yetondoko lomeva (okudja ponghatu onhi 3) tolongifa omuvalu ou:

Ounene woshihakelo shomeva (m^2) x Ouhapu pokati (average) (m/m^2) x onomola yetondondoko lomeva (Runoff coefficient) = Ouhapu womeva aa taa dulu oku hakelwa (m^3)

Oshihopaenenwa tashi shikula ota shi ulike ashike ouhapu womeva oo taa dulu oku hakelwa okudja meumbo lili mo Nooli yopokati ya Namibia. Koshihopaenenwa eshi nee, ounene wopombada (apa pauvilikwa) (yoshihakelo) owa ningwa ukale ufike po 100 m^2 noilongifo yalongifwa oku uvilika oipeleki:

Ounene woshihakelo shomeva 100 m^2 x Ouhapu pokati wodula 0.47 m/m^2 x onomola yetondoko lomeva 0.85 = 39.95 m^3

Didilika kutya oilongifo ikwao ngaashi oiuvilikifi yomwiidi kaina omatondokelo omeva eli nawa!

5. Onghatu onhinhano: Hoolola omutungilo/omufolomo tau wapalele, noiloingifo yo tenga yoye

Ehoololo loilongifo tai wapalele yoku tunga otenga oyeli kwatelela unene ngee oilongifo opo ngaho ili, oshoyoo kowino yomutungi/yovatungi. Oilongifo yeetenga ei kwali ya konaakonwa moshitopolwa shopo kati monooli yaNamibia koprojeka yaCuveWaters oyalii:

- **Ocement**
- **Eedopi**
- **Onhailona hai ifanwa opolyethylene**

Ponhele yoku tuvikila omeva motenga ili kombada yedu, omeva otaa dulu yoo oku tuvikilwa **mee tenga dokoshi yedu dili ongonga ile ili eehuke.**.Omukalo ukwao muwa wakonaakonwa wokutuvikila omeva odula oyo u womoilambo (ponds). Oilambo ei oipu lela oku tunga ile oku etapo na oina ondado ili pedu.ouwa unene weetenga oku faafanifa noilamob ei okutya ashike eetenga oha di kala po (odakola) efimbo lile nodipu okufila oshisho.

Basic requirements for Rainwater Harvesting (roof catchments)

If these requirements are fulfilled rainwater harvesting structure can be designed.

Environment

- General rule concerning rainfall amount: rainfall should be over 50 mm/month for at least half a year or 300 mm/year (unless other sources are extremely scarce) to make RWH environmentally feasible
- If possible there should be no vegetation cover directly over the roof

Technology

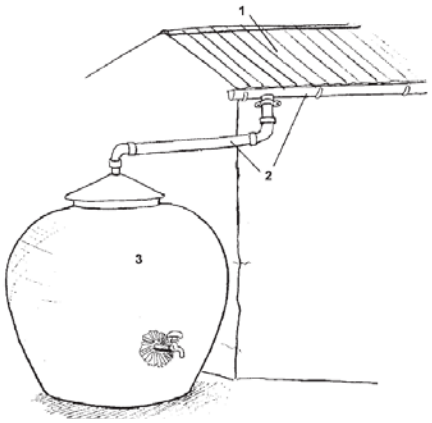
There are three basic components of a rainwater harvesting:

1.) catchment

2.) delivery system, and

3.) storage reservoir

- roof should be constructed by an impermeable material such as iron sheets, tiles or asbestos cement,
- local availability of construction material and tools
- availability of an area of at least 1 m² near each house for the construction of a storage tank
- knowledge about required storage capacity



Source: Worm & van Hattum (2006):12

Human resources

- community should be enthusiastic and fully involved
- availability of labourers with technical building and reparation skills in or nearby the community
- availability of people taking care for maintenance measures, such as regularly cleaning of the structure

Economy

- availability of financial resources or support to implement and operate it

Specific requirements for related gardening activities

- if RWH is planned for private households, than there should be a market to sell the products in the accessible surrounding

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Quality control checklist for tank construction

To make sure that the tank was well constructed you should check the following:

1. Was the tank carefully sited in the compound and in a firm stable soil?
2. Was the cement stored on a platform, covered in a shed, protected from moisture?
3. Were there no lumps in any of the cement bags when the bags were opened?
4. Was the sand used in the cement plaster clean?
5. Was the cement and sand mixed thoroughly until the mixture was all one color before adding water?
6. Was the water used in the cement plaster clean?
7. Was the plaster fairly dry, with just enough water added to make it stick together?
8. Was there no more plaster mixed than could be used within one hour?
9. Did the chicken wire overlap by at least 15cm?
10. Was the final coat of plaster trawled on smooth?
11. Was the final coat of nil inside pressed firmly with steel?
12. Is there more metal reinforcement, protruding from the finished plaster?
13. Are there no cracks in the nil layers of more than 5mm after one week of curing?
14. Was the tank splashed with water 4 hours after each of the plaster or nil, and covered with plastic sheeting, and kept moist, never allowing the cement to dry to a light gray color until for at least 4 weeks?

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