CLIMATE RESILIENT AGRICULTURE: PRACTICES FOR SMALLHOLDER FARMERS

FARMER HANDOUTS: ISIXHOSA

E Kruger, BT Maimela, H Hlongwane, Philisa Dunyana

WATER RESEARCH COMMISSION
Supporting Sustainable Water Futures
1971-2026

TT 967/8/26

Climate Resilient Agriculture: Practices for smallholder farmers

Farmer Handouts: isiXhosa

E Kruger[1], BT Maimela[1], H Hlongwane[1], Philisa Dunyana[2]

[1] Mahlathini Development Foundation

[2] Independent translator

Report to the

Water Research Commission

by

Mahlathini Development Foundation

Email: info@mahlathini.org

WRC report no. TT 967/8/26
ISBN 978-0-6392-0790-2
ISBN set number 978-0-6392-0784-1

April 2026

Obtainable from

Water Research Commission
Private Bag X03
Gezina, 0031

Download from www.wrc.org.za

The publication of this report emanates from a project entitled *Dissemination and scaling of a decision support framework for CCA for smallholder farmers in South Africa* (WRC Project No. C2022/2023-00746).

This publication is part of a series. The other publications in the series are:

- Dissemination and scaling of a decision support framework for climate change adaptation for smallholder farmers in South Africa (**WRC report no. TT 967/1/26**)
- Community-based climate change adaptation and local food systems: Handbook and case studies (**WRC report no. TT 967/2/26**)
- Climate resilience impact measurement for poor rural communities. A MERL (Monitoring, evaluation, reflection and learning) manual for community-based climate change adaptation (CbCCA) (**WRC report no. TT 967/3/26**)
- Community-owned water access: Guidelines and case studies (**WRC report no. TT 967/4/26**)
- Microfinance handbook for smallholder farmers in South Africa: A case study on small businesses (**WRC report no. TT 967/5/26**)
- Multistakeholder platform development manual: Guidelines for successful implementation (**WRC report no. TT 967/6/26**)
- Climate Resilient Agriculture: Practices for smallholder farmers. Farmer Handouts: English (**WRC report no. TT 967/7/26**)
- Climate Resilient Agriculture: Practices for smallholder farmers. Farmer Handouts: isiZulu (**WRC report no. TT 967/9/26**)
- Climate Resilient Agriculture: Practices for smallholder farmers. Farmer Handouts: sePedi (**WRC report no. TT 967/10/26**)

DISCLAIMER

This report has been reviewed by the Water Research Commission (WRC) and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the WRC, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Published in the Republic of South Africa

© WATER RESEARCH COMMISSION

IMIBULELO

The project team from MDF wishes to thank the following people for their contributions to the project.

Reference Group	Affiliation
Prof S. Mpandeli	Water Research Commission
Dr L. Nhamo	Water Research Commission
Dr S. Hlophe-Ginindza	Water Research Commission
Dr M. Mutema	Agricultural Research Council
Dr L. Muzangwa	Northwest University
Prof S Walker	Agricultural Research Council
Dr J.J. Anderson	Agricultural Research Council
Dr T. Dirwai	International Water Management Institute
Dr E. Kamba	KwaZulu-Natal Poultry Institute
Others	
Dr B. Letty	Institute of Natural Resources – INR
Mrs N. McCleod and Dr S. Mathela	Environmental and Rural Solutions
Dr D. du Toit	Association for Water and Rural Development
Ms A. Kotschy	Independent consultant
Mahlathini Development Foundation (MDF) staff and interns	Mazwi Dlamini, Hlengiwe Hlongwane, Nqobile Mbokazi, Lungelo Buthelezi, Siphumelelo Mbhele, Noxolo Sibiya.
MDF board members	Timothy Houghton and Desiree Manicom
Independent editor	Mr. T.G. Houghton
Co-funders	SODI-BMZ
Community members	All participants involved in the process across five provinces.

This document used AI-assisted editing and summarisation (ChatGPT, OpenAI) to help condense, restructure, and rewrite draft chapter material provided by the authors. All factual content, case study data, and interpretations remain the responsibility of the authors. **OpenAI. (2025).** *ChatGPT (GPT-5.2) [Large language model].* https://chat.openai.com. All chapters in this report were also sent to a professional and independent language and grammar editor for review

IZIQULATHO

IMIBULELO iii
iziqulatho iv
1 Luyintoni Oluhlelo Lwe-Zolimo Olulungiselelwe Ukumelana Nesimosezulu (CRA) 1
2 Imigaqo siseko 2
3 Ulawulo lwamanzi (lawula amanzi afumanekayo kwaye wandise indlela yokufumaneka kwawo) 2
3.1 Imisele yokungenisa amanzi ngaphantsi komhlaba (umsele ogijimisa amanzi, umsele ophambukisa amanzi) 2
3.2 Umsele owekukanisiweyo 3
3.3 Imisele nemimmango 4
3.4 Imimmango edityanisiweyo 5
3.5 Imingxuma yokutshonisa amanzi/yenziwa ngezangqa zoobhanana 6
3.6 Ukufumisa 7
3.7 Iitonela ezingumthunzi owenzeka ngelaphu 8
3.8 Uqokelelo nogcino lwamanzi 9
3.9 Uqokelelo nogcino lwamanzi; ngama Tanki (oojJoJo-tanki) 10
3.10 Amadama amancinyana 11
3.11 AMANZI AFIKELELEKAYO 12
3.12 Ulawulo lwamanzi amdaka 13
3.13 Uhlumiso lwengca endaweni zamanzi 17
4 ULAWULO LOMHLABA (UKULAWULWA KOKHUKHULISEKO, UKUCHUMA KOMHLABA, KUNYE NEMPILO YOMHLABA) 18
4.1 AMATYE AKRELISIWEYO/ AYINGQUMBA 18
4.2 AMADAMA AMISELWEYO 19
4.3 AMATHAMBEKA 20
4.4 IKUPHUCULWA KOKUVUNDISWA KOMHLABA 21
4.5 UKUTYALA IMIDUMBA KUNYE NOMANYOLA WOHLAZA 22
4.6 IMISELE YEBHEDI ZOKUTYALA 23
4.7 IMISELE EMIFISHANE 24
4.8 IZANGQA ZOKUTYALA 25
4.9 IQONDO LOKUJOLISWA NOKUBHEKELELA EKUSETYENZISWENI KWEZICHUMISI NEKALIKA 26
4.10 IMINGXUMA YE ZAI/ OKUZIZIGINGQI ZOKUTYALA 27
4.11 ULIMO LOKULONDOLOZA (CA) 28
4.12 UKUTYALA NGOKUCAZULULA 30
5 ULAWULO LWEZITYALO (IINDLELA ZOKULIMA, IZITYALO EZINEMPILO, UCAKACO KUNYE NEMVELISO YEZIQHAMO) 31
5.1 UMANYOLA WAMANZI LIQUID MANURES 31
5.2 IZIKHULISI ZEZITYALO 32
5.3 UKUTYALA NGOKUXUBANISA 33

5.4 UKUTYALA NGOKUTSHINTSHANISACROP ROTATION 35
5.5 IINDLELA ZENDALO ZOKULAWULA UKHULA NEZINAMBUZANE 36
- *Umzekelo: ngogalikhi* 37

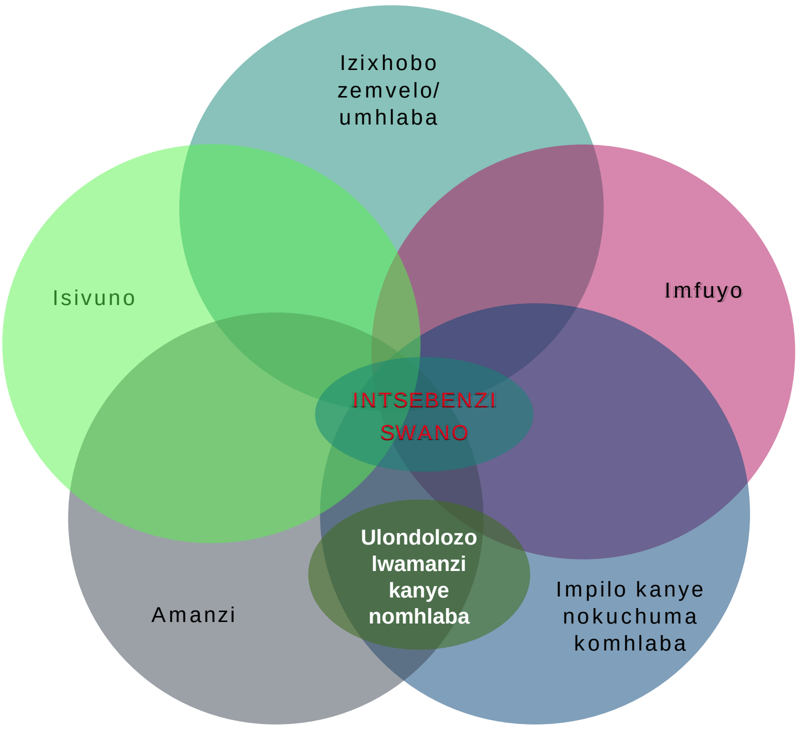
INDLELA YOKWENZA: 37
5.6 ULAWULO LOKHULA OLUMANYENEYO 38
5.7 UKHULISO LWEZITYALO ELUGCINWENI ZIPHINDE ZICAKAZWE 39
5.8 UKUGCINWA KWEMBEWU 40
5.8.1 UKWENZIWA NOKUGCINWA KWEMBEWU 41
5.9 IMVELISO YEZIQHAMO 42
5.10 IMVELISO YEMANGO YENDALO 43
6 Ukungenelela Kwemfuyo 44
6.1 Ukhetha kwindawo zolimo lwemithi 44
6.2 Inkqubo ye-Agri-silvipastoral 45
6.3 Isondlo kunye noxhaso lwemfuyo 46
6.4 Ukondla ngesitali kunye nokwenza i-hay 48
6.5 Ukujikeleza amadlelo 49
6.6 INTLOBO YENKUKHU YENJONGO EZININZI 50
6.7 IMVELISO YOKUTYA KWENKUKHU 51
6.8 Imveliso yokutya (FODDER) kwemfuyo 52
6.9 ukwenza ibhloko zeprotheni 53
7 Ubutyebi bendalo 54
7.1 imithombo nemigxobhozo 54
7.1.1 Ufikelelo nolawulo lwamanzi 54
7.1.2 Indlela ezisezantsi zobugcisa zokukhusela imithombo 55
7.2 ukubuyiselwa komngxobhozo 59
7.3 amadama okuhlola 61
7.4 IMIGCA YAMATYE 62
7.5 upakisho lamagatya 62
7.6 UKUBUYISELWA KWENDLELA 63

Uhlelo Lwezolimo Olulungiseselwe ukomelela Nokumelana Noguquguquko Lwesizo Sezulu: Lulungiselelwe Abalimi Abasakhasayo

1 LUYINTONI OLUHLELO LWE-ZOLIMO OLULUNGISELELWE UKUMELANA NESIMOSEZULU (CRA)

Uhlelo lokumelana noguquguquko lwesimo sezulu lulungiselelwe uzinzo, ukuphuhlisa/ukunyusela ngokuthe xaxa imveliso kunye nengeniso kwezolimo, kuhambisana nokuziqhelanisa neengqubo mgomo ekuqhubeni kohlelo lwethu lwezolimo ngaphansi kwemeko ezitshintshileyo kanye nokuqinisekisa ukuba iindlela zethu zolimo zinobudlelwane obuhle nendalo/imvelo. Oku kumalunga nokwenza iinguquko malunga neendlela esilima ngazo ekutshintsheni iindawo ezisingqongileyo okukukuphucula ukwazi kwethu kanye namandla endalo esingqongileyo ukuze sonke sikwazi ukumelana nezinguqunguquko

Ugxininiso lukwinqanaba labalimini mveliso basemakhaya, okanye abakhasayo. Oluhlelo Lwe-Zolimo olulungiselelwe ukumelana nesimosezulu luneenjongo zokuphuhlisa kwimiba yesivuno, imfuyo kwaye nolawulo lwamadlelo; ulawulo lwezixhobo zemveliso, kanye-kanye nolawuleko lwamanzi nomhlaba njengoba kubonisiwe emfanekisweni ongezantsi.



Umfanekiso wokuqala: uphunyezo lohlelo olulungiseselwe ukomelela Nokumelana Noguquguquko Lwesizo Sezulu oluhlanganiswe kumacandelo onke kwinqanaba lwemizi *(adapted from Arslan, 2014)*

Kunoluhlu lweendlela zonkwenza oluhlelo lwezolimo ezingaba luncedo. Uluvo lwethu kukuba sizame ezindlela zokwenza ezizofaneleka ukuncedisana nathi, apho sihlala khona futhi siphinde sizithelekise kunye nezo ebesifudula sizenza, ukuze siqaphele umahluko kwaye sikwazi ukwenza izigqibo ukusukela apho malunga nokutshintsha indlela zethu zolimo.

Ukudibanisa iqela lezindlela zahlukileyo kungancedisa ukunyusa iziphumo zazo.Izicwangciso zichazwe kafitshane ngezantsiUlwazi oluthe vetshe luyafumaneka kulamacandelo alandelayo

2 IMIGAQO SISEKO

Eyona migaqo siseko okanye ingqikelelo esiziqwalaseleyo ekukhetheni oluhlelo lokwenza, zezi zilandelayo:

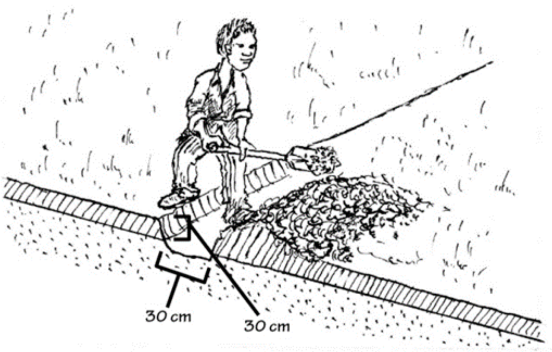
- Ukunciphisa uncedo oluvela ngaphandle
- Ukuzalisekisa ngokobukhulu kwiyanhlukano yangaphakathi
- Ingqwalasela kwimpilo yomhlaba kunye nobuchule ekwakhiweni komhlaba ngendalo
- Ukukhathalela okusingqongileyo
- Ukuqaphela ukusebenzisa amanzi afumanekayo ngendlela ekuyiyo nenononophela ngokuphangaleleyo.
- Ukusebenza kunye, sifunde kunye siphinde sicwangcise kunye.

Zonke ezi ndlela zokwenza sezike zazanywa kunye namafama asakhasayo eminyakeni emithathu ukuya kwemine eyedlulileyo. Ngokoke sinesiqiniseko sokuba ziyasebenza, Nani ke siningqwenelela amathamsanqa nempumelelo nisazozama ezinhlelo.

3 ULAWULO LWAMANZI (LAWULA AMANZI AFUMANEKAYO KWAYE WANDISE INDLELA YOKUFUMANEKA KWAWO)

3.1 IMISELE YOKUNGENISA AMANZI NGAPHANTSI KOMHLABA (UMSELE OGIJIMISA AMANZI, UMSELE OPHAMBUKISA AMANZI)

Le yimisele enzulu (Ngeesentimitha ezingamashumi amathathu (30cm) ububanzi, ishumielinesithathu ukuya emashumini amathathu (15-30 cm) ubunzulu) egrunjwe ukuba ihambise amanzi kwimimandla ethile (Imisele ephambukayo) okanye ibambise amanzi iphinde iwavumele ukuba ehlele ngaphansi komhlaba kummandla olinyiweyo (umsele ogijimisa amanzi), kamva agrunjwa kwi khonti.
Ukutyala kungenziwa amimangweni, ngokudibanisa umgquba kunye nokufumisa ummango kunye nemisele kokubini luluvo olulungileyo.Le misele yandisa ukufikeleleka ukuya, kunye nokufumaneka kwa manzi ekuveliseni ukutya kanzulu.



IIMFUNEKO

- Imvula: engaphezulu kwekhulu namashumi amahlanu yeelilitha ngonyaka (>150mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5ºC)
- Impandle: kungaba noma lithambeka elinjani (elenyukelayo okanye elehlelayo)
- Umhlaba: umhlaba ongumdongwe kumele ubephakathi kwesihlanu ukuya kumashumi amathathu anesihlanu (5-35%), kube ngaphezulu kwetshumi nesihlanu ubunzulu (>15cm)

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Angange hectare enye ukuya ku 0.1 ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe

Umsele ophambukisa amanzi, wafunyiswa kwaye utyalwe ubhatata emmangweni

Ukugrumba umselele ophambukisa amanzi (kwithambeka elifika kwisihlanu ukwenyukela, kube ngamatshumi amathathu ububanzi, kwaye namatshumi amathathu ububanzi, ube umhlaba ubekelwa ngasenhla kwithambeka

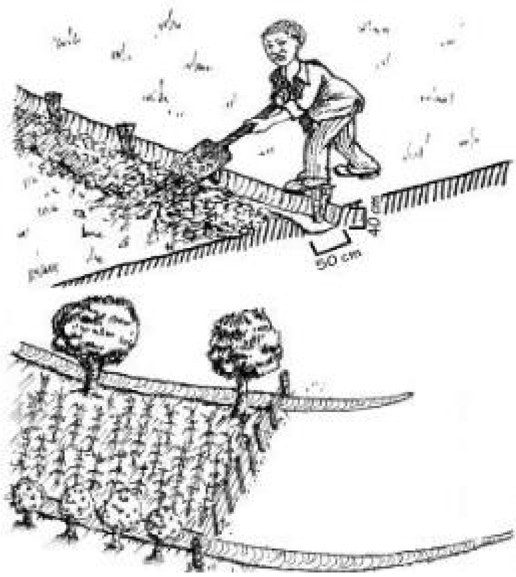
Ukulungiselela ummango womsele ophambukisa amanzi ukuze kutyalwe kulungelelene kwaye kongezwe umgquba

3.2 UMSELE OWEKUKANISIWEYO

Umsele owahlukanisiweyo wenziwa ngomhlaba oqokelelweyo (ingqumba yomhlaba) wakhelwe phezu kweekhonti nemijelo (engamashumi amane ubunzulu kunye namatshumi amahlanu ububanzi (40cm ubunzulu kunye 50cm ububanzi) kwicala lokuphumeleni kwethambeka. Umphezulu walengqumba yomhlaba ulungelelaniselwe ukuba uvumelane nokutyala. Lomsele uhlangabezana namanzi abaleka phezukomhlaba uwasasaze okanye uwabele ezindaweni ezihluka-hlukeneyo ukunceda ukuba adontseleke ngaphansi ebunzulwini bomhlaba. Ngokuqhelekileyo, izityalo ezisisigxina (njengemithi yeziqhamo) zityalwa phakathi kwalemisele.

IIMFUNEKO

- Imvula: engaphezulu kwekhulu namashumi amahlanu kugedluli kwiwaka namakhulu amabini yeelilitha ngonyaka (>150mm <1200/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5^{o}C)
- Impandle: Kube kuhlanu ukuya kumashumi amabini anesihlanu (5%-25%)
- Umhlaba: kungaba noma ngumhlaba onjani, nangona umhlaba onesihlabathi esininzi okanye onomdongwe omninzi kunzima ukuwulawula



Ukwakhiwa kwemisele, ukhonjiswe ngentla ubonisa amanzi ahambayo

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Angange hectare enye ukuya ku 0.1 ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe

Ukugrumba indinyana yomselel osikiweyo.Apha umhlaba ubekelwa endaweni engezantsi kommango.

Ukufumisa kuyenzeka kubekwe emseleni kwaye isivuno sityalelwe ndawo zombini, emseleni nasodongeni.

Ulungiselelo lweebhedi zemijelo ngezantsi kwendawo elungiselelwe ukuphambukisa amanzi abalekayo.

3.3 IMISELE NEMIMMANGO

Imisele eyembiwe kwikhonti kunye nomhlaba obekwe endaweni engaphezulu kodonga. Ukutyala kwenziwa kulendawo eludonga, nokunkcenkcetshela kuphinde kwenziwe ngaphezulu koludonga, apho namanzi ahla ngalo ukuya emseleni. Kuyenzeka ukuba kwenziwe amaqhina angqamlezayo ukuqinisekisa ukunkcenkcetshela okukuko, ukuze amanzi ezohlala afumbeke kulemisele aye ngokutshona ngaphansi komhlaba. Ukufumisa umhlaba kululuvo oluhle.

IIMFUNEKO

- Imvula: engaphezulu kwekhulu namashumi amahlanu yeelilitha ngonyaka (>150mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5ºC)
- Impandle: Kube ukuya kwisihlanu (0.5%-5%)
- Umhlaba: kungaba noma ngumhlaba onjani/ zonke iintlobo zomhlaba zilungile

Imisele nemimmango esetyenziswe ekulimeni amasimi; xa uphawula ngasentla lemimmango ibamba amanzi phakathi nemisele.

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Angange hectare enye ukuya ku 0.1 ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe

Igadi yemifuno ibekwe kwenye yendawo eyenziwe ngemisele nemimmango; kutyalwe iituma, iminqatha kunye nespinatshi. Qaphela ukuba okubonakala ngaphambili -kwesokudla kulomfanekiso ngummango.

Igade ekhombisa ukufumisa imisile etyalwe iitumato. Kufakwe izikhukhula lwamanzi emiseleni-okuluhlobo lokunkcenkcetshela olusetsenzisiweyo.

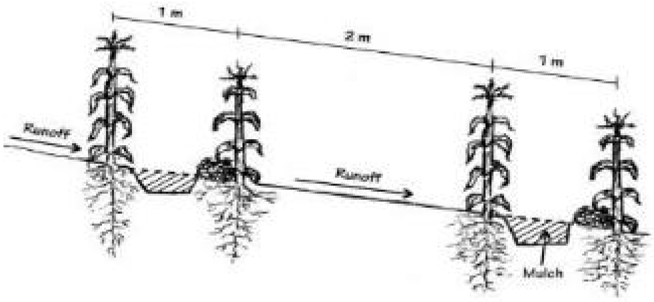
Imithi yeziqhamo iyakwazi ukudityaniswa yenziwe ezinye zeebhedi zokutyala

3.4 IMIMMANGO EDITYANISIWEYO

Le indlela yokwenza yandisa amanzi afumanekayo ezityalweni ngokuqokelela imvula esuka kumathambeka angalinywanga iphinde iyibambise ngemisele nemimmango. Ukutyala kwenziwa nokuba kweliphi icala lalemisele apho amanzi asemfimfithe khona. Ithambeka lesisiza kumele lu…….

Iziza zenziwe ngokomba imisele enzulu malunga nocangca lweekhonti eluthambekweni nokwakhiwa kwemimmango ecaleni elingezantsi kwalemisele. La maqhina akunye ngenxa yalemimmango engaphantsi kancinane eyenzelwe kwizithuba ezikunye nalemisele.

IIMFUNEKO



- Imvula: ephakathi kwamakhuluamane ukuya kumakhulu asixhenxe yeelilitha ngonyaka (400-700mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5ºC)
- Impandle: Kube ukuya kwisixhenxe (0.5%-7%)
- Umhlaba: Umhlaba kumele ube ngozinzileyo. Okunguwona mhlaba ulungileyo ngulowo onomdongwe okanye kube ngumhlaba okwaziyo ukungeneka umphezulu wawo ukudlula lowo ongeneka kancinyana ongaphantsi kwawo

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Angange hectare enye ukuya ku 0.1 ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe

Ufumiso emiseleni yegadi ibekwe nemimmango.

Amanzi aqokelelwa emiseleni, ensimini yombona eyenziwengemimmango.

Indinyana ebekelwe imimmango ityalwe ubhatata, umbona eFree state.

3.5 IMINGXUMA YOKUTSHONISA AMANZI/YENZIWA NGEZANGQA ZOOBHANANA

Indawo ezikhongozeley ezembiwa emhlabeni ongeneno kwamanzi ahambayo (ukubamba kunye nokunciphisa isivinini sokubaleka kwamanzi). Eziziza ziye zigcwaliswe ngomgquba okanye izifundisi (ngobuninzi bazo) sixutywe nomhlaba nababhanana okanye ezinye izithelo ezithanda amanzi ziye zityalwe kweziziza.

Umahluko wale indlela kukuba umgxunya ngamnye wenbiwe endaweni ebaleka amanzi kwaye izalisekiswe ngezizivundisi (okuluhlaza okanye umgquba) - kuchula kuhle nokuvundisa. Apha ke iibhanana okanye ezinye izivuno zityalwa emingqibekweni.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amathathu anamatshumi amahlanu yeelilitha ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5^{o}C)
- Impandle: Kubekunye ukuya kumatshumi amabini anesihlanu (1.5%-25%)
- Umhlaba: kungaba lulo lonke uhlobo lemihlaba (kubesisihlanu ukuya kumatshumi amathathu epesenti zomdongwe (5-30% clay) kunye nobunzulu obungaphezulu kwamatshumi amathathu (>30cm)

UPHUNYEZO

- Kufanele ubenegadi
- Angango 0.1 wehectare ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe

Iindawana, ezahlulwelwe ukukhongozela amanzi zingenziwa, ngokugrunjwa kuphinde kungezwe umgquba

Isangqa sikabhanana esidityaniswe nohlaza.

Isiza esikhongozele amanzi senziwe mayelana nomsele wokuhambisa amanzi egadini yasekhayeni. Imimmango edityanisiweyo yenziwe Phakathi kwemisele.

3.6 UKUFUMISA

Umhlaba uyagqumathelwa ngeentlobo-ngeentlobo zeentsalela zesivuno okanye umgquba, ukugcina amanzi, ukunciphisa amaqondoobushushu, kuphinde kwenyuse izinga lomhlaba onempilo

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amathathu anamatshumi amahlanu yeelilitha ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: Kubekunye ukuya kumatshumi amabini anesihlanu (1.5%-25%)
- Umhlaba: kungaba lulo lonke uhlobo lemihlaba (kubesisihlanu ukuya kumatshumi amathathu epesenti zomdongwe (5-30% clay) kunye nobunzulu obungaphezulu kwamatshumi amathathu (>30cm)

UPHUNYEZO

- Kufanele ubenegadi
- Angango 0.1 wehectare ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe

Iintsalela zamagqabi zibekelwe ukufumisa iibhedi zemijelo

Uhlaza okanye ingca esetyenziselwe ukufumisa umhlaba eyomileyo. Intsimi yezolimo lokulondoloza umhlaba

Ukufumisa ngomdizaweswekile, neminye yemidiza nemidiza egadini yemifuno

Ukufumisa ngengca ohlelweni lokutyala ngemisele nemimmango.

3.7 IITONELA EZINGUMTHUNZI OWENZEKA NGELAPHU

Imithunzi ebungwevu elinganiselwa kumatshuma amane epesenti (40%) yeetonela zeminatha ezingange 4.2mx6m obungakanani ukuya kwisibini (2m) ubude zakhiwe kusetyenziswe 'ikhithi' kunye nezixhobo zasekuhlaleni. Iingqiniba ezi zayo zakhiwe ngemibhobho evumela ukugotyiswa- ekhuselwe ngeentsimbi ngaphandle. Ezingqiniba ziye zitshoniswe gqo emhlabeni- kubalekiselwa nasiphina isakhiwo kwaye iminatha yona iye ibekwe ngaphezulu yembathise okanye igubungele zonke ezintsimbi. Le tonela iye ibanjwe ngee ankile amacala omabini

Umfanekiso wetonela esigqityiwe, yafakelwa iipheyile elingiselelwe ukunkcenkcetshela, kutyalwe ispinatshi.

Ingaphakathi letonela liye libe nemijelo yeebhedi ezintathu 1mx5m kwaye ngayinye ibonelelwa ngezixhobo zokunkcenkcetshela ngamathontsi ezenziwa nge emele/ipheyile engamatshumi amabini eelitha. Kule tonela kwenziwa uhlelo lokulima olungumxube, kwaye namanzi ayintsila angasetyenziswa ukunkcenkcetshela.

Ezitonele zilungele/zifaneleke nakweyiphina indawo apho kutyaleka khona, ezibhedi zemijelo zonazingembelwa zigqibe zibonelelwe nganzi okunkcenkcetshela.

UPHUNYEZO

- Kufanele ubenegadi
- Kungaba ngu 0.1 weehectare ubukhulu begadi
- Kuneendleko ezifikelelekayo, kufuneka nobuchule, kunye nemfundiso ezihambisana nabacebisi.
- Kulula ukuqonda wenze nokukugcina

Kumgca wokuqala ngasentla kwesekhohlo ukuya kwesokunene: kusetyenziswa intambo ukuphawula indlela itonela ekumele ihambe ngayo nekuyona ndawo ekumele ime kuyo; kusetyenziswe neentsimbi ukuphawula imingxuma ezongena iintsimbi zetonela, ezizophinde zigotywe ziphinde zidityaniswe iingqameko ngendlela zakhona ezifaneleyo.

Emgceni wesibini ngasentla kwesekhohlo ukuya kwesokunene: 'Ukutyala' lemigqameko ekulemingxuma ithunga idibanise iminatha emingqamekweni kumacala omabini ngaphambi kokuba ifakwe ngaphezulu, adontswe iqiniselwe apha eminatheni itsho ukuyorhawula macala onke ngemva kokuba ifakwe ngaphezulu, kuphinde kubethelelwe iiankeli ngemva kokusukunyiswa kwetonela, kugqibe kucokisiswe ke indlela umnatha ongene ngayo ukuba ukhusele itonela ndawo zonke. Iminathi erhangqe apha emazantsi iyembelwa ukwandisa ukhuseleko nokomelela ukumelana nemimoya ebhudlayo.

3.8 UQOKELELO NOGCINO LWAMANZI

Ngokubanzi, amafama aye aqokelele amanzi kwimigqomo, kumagubu nakooJojo tanki. Oku akwenzi amanzi aneleyo. Omatanki embelwe ngaphansi komhlaba ngawo akwazi ukugcina amanzi amaninzi.

Iindlela zasekuhlaleni zokuqokelela uphinde ugcine amanzi, yenziwa eLimpopo; Izikhongozeli zamanzi, amakhulu amabini anetshumi leelilitha zamagubu; iwaka leelilitha zezikhongozeli kunye nooJoJo tanki. Ezi zibamba amanzi amancinyane.

La matanki aqokelela amanzi abalekayo esuka ekhukhulisekweni olucwangcisiweyo, asuka emigwaqweni kunye nasuka emimmandleni nje eqhelekileyo, ukugcina izixa ezinkulu zamanzi (asukela kumawaka amabini anesihlanu ukuya kumawaka amane eelitha zamanzi); ekungamanzi anele igadi engangekhulu ukuya kumakhulu amabini eemitha ubukhulu ezinyange ezine ukuya kwezintandathu.

Ikhona imfuneko yokugrumba imingxunya emikhulu ekwakhelwe kuyo lamatanki -kungaba yakhiwe ngesamente, iibhloko/izitena zesamente ibuye ityatyekwe nebhitumene.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amane anamatshumi amahlanu yeelilitha ngonyaka (>340mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5^{o}C)
- Impandle: Kubekunye ukuya kumatshumi amabini anesihlanu (1.5%-25%)Umhlaba: kungaba lulo lonke uhlobo lemihlaba (kubesisihlanu ukuya kumatshumi amathathu epesenti zomdongwe (5-30% clay) kunye nobunzulu obungaphezulu kwamatshumi amathathu (>30cm)

UPHUNYEZO

- Kufanele ubenegadi
- Elinganiselwa <0.1; 0.1-1; ukuya ku 2 wehectare ubukhulu bendawo
- Amaxabiso okwenza oku aphezulu kwaye nomsebenzi okumele wenziwe ekwenzeni ezizakhiwo zokugcina amanzi mninzi
- Kufuneka amanqanaba aphezulu obuchule nolwazi (ingxaso yangaphandle kunye noqeqesho luyafunek ukuqala lomsebenzi)Kunobunzinyana nemizamo efunekayo ukukugcina lamatanki. Amanzi kumele akhutshwe ngee emele okanye ipheyile, okanye ampontshwe. Intlenga ifanele ukukhethwa isuswe imihla ngemihla

Itanki elenzelwe ngaphansi komhlaba lanyuswa ngodonga olusamentiweyo

Umzekelo wetanki eyembelweyo (engamatshumi asibhozo eemitha

Ugibe wokukhusela umhlaba nenhlenga kwitanki eyembelwe ngaphantsi komhlaba elinganiselwa kumawaka amabini anesihlanu

Itanki esigqityiwe eyenziwe ngodonga lwezitena, yagqunyathelwa ngophahla

3.9 UQOKELELO NOGCINO LWAMANZI; NGAMA TANKI (OOJJOJO-TANKI)

OoJojo tanki bangasetyenziselwa ukuqokelela amanzi emvula asuka eluphahleni (isiqhelo, isilinganiso sawo kuye kube ngamawaka amabini anamakhulu amahlanu ukuya kumawaka amahlanu eelitha). Kubalulekile futhi ukuqinisekisa ukuba igathala okanye imibhobho yokudlulisa amanzi ifakwe ngendlela.

Kunokwenzeka ukuba kusetyenziswe ooJojo tanki abembelwe ngokungagqibelelanga njengenye yendlela yokuqokelela amanzi asuka ngasenhla kwethambeka. Koluhlobo lokwenza, amatanki angongliwa ngamanzi aitsalekelayo ngaphandle kokumpontswa okanye ukuthuthelwa ngee- emele

Inyanga	Silinganiso semvula yanyanga ngayinye (mm)	Indawo yephepha lophahla (m²)	Isilinganiso sokugeleza kwamanzi	Ivolumu yamanzi agijimayo (amalitha)
Januwari	115	43,6	0,9	4513
Februwari	123	43,6	0,9	4827
Mashi	109	43,6	0,9	4277
Ephreli	78	43,6	0,9	3061
Meyi	61	43,6	0,9	2394
Juni	35	43,6	0,9	1373
Julayi	30	43,6	0,9	1177
Agasti	35	43,6	0,9	1373
Septhemba	55	43,6	0,9	2158
Okthoba	60	43,6	0,9	2354
Novemba	80	43,6	0,9	3139
Disemba	95	43,6	0,9	3278
ISAMBA	876			34374

Itafile engentla ikhombisa isixa samanzi angakwazi akulobeka agcineke kwimizi.

Futhi ke, kuyenzeka uzikhethele ukusebenzisa ooJojo tanki abembelweyo, kodwa ke kweli ityelo kufuneka bomelezwe. Oku kulula kakhulu kunokwakhiwe kweetanki.

Impompo yokumfimfitha amanzi eyenzelwe ekhaya engasetyenziswa ukufumana amanzi kumatanki akhelwe ngaphantsi komhlaba.

Imibhobho neegatharingi zendlu zibalulekile ukuqokelela amanzi endlu xa kusetyenziswa ooJoJo tanki.

Amatanki embelwe naphantsi komhlaba ukufumana kuphinde kugcinwe amanzi asuka kumathambeka.

OoJoJo tanki abambelwe ngaphansi komhlaba ukuze kugcinwe amanzi.

3.10 AMADAMA AMANCINYANA

Lamadama amancinyane uyakwazi ukuba embelwe phansi apho akwazi khona ukubamba amanzi (angaphezulu kwamatshumi amabani anesihlanu omdongwe /okuzii 25%). Adle ngokuphulukana ke noko namanzi kwaye akwazi ukuhlala engcwele nje okwethutyana, kodwa abonelela ngenani eliphezulu kakhulu lwamanzi eziphandlekeni zomhlaba kulowo mmandla. Ngokuqhelekileyo, aye embelwe ezindawe apho intlakohlaza ingakwazi khona ukuba ihlale iwagcwalisa mihla-ngemihla, okanye apho amanzi ahambe phezu komhlaba nagijimayo axhaphakileyo.

Kunokwenzeka ukuba kukeliswe lamadanyana/amachibi neeplastiki, kodwa kuphela xa kukhona ithuba elifanelekileyo lokuba azohlala egcwele, ngokuba iiplastiki zibola kalula elangeni.

Kunokwenzeka futhi ukuba kukeliswe lamadanyana nohlobo thizeni lomdongwe okwazi ukuukulitywina, futhi kuphela xa ichibi kusenzeka ukuba lihlale lizele ngamanzi ngamaxesha amaninzi.

Ngasentla, yimizekelisa emithathu yamadanyana okanye amachibi agrunjwe emhlabathini onako ukubamba amanzi angaphezulu kwamatshumi amabini enesihlanu amaphesenti omdongwe- (>25%) ukuqinisekisa.clay. Ngakwesokudla kuboniswe idama elikhulu elondliwa ngamanzi omthombo ongasentla kwethambeka. Umfanekiso osembindini kuboniswa idama elondliwa ngamanzi adontswa ngemibhobho esusela amlanjeni.

Ichibi elincinyane elenziwe laqondiswa ngomdongwe (udongwe olububhelu ngaphakathi kwechibi), lagqiba lazaliswa ngamanzi. Phawula ikona yodonga lwechibi, ukuba livemela ebhentonathi (bentonite) ukuba incanyathiselwe yatywinwa emacaleni, nasezantsi kwechibi.

Ichibinyana alembelwe egadini yesekuhlaleni luluntu lwendawo, londliwa ngamanzi abaleka ngaphezu komhlaba, asuka emigaqweni, alungelelaniswe ngeplastiki.

3.11 AMANZI AFIKELELEKAYO

Ulawulo, kunye nophihlisa lwemithombo yamanzi asekuhlaleni, nohlaziyo loba afikelele ezindaweni zasekuhlaleni kunye nasezigadini yinto enokwenzeka kwindawe zethu ezincinane zasekuhlaleni:

- Amaqela enqanaba lasekuhlaneni asebenza kunye ukuvumelana ngabo banokuthi babandakaanyeke (abantu ababeqiyo kumashumi amabini), abantu abazoingeka ukuba babandakanyeke ngokusebenza kwezolimo baphinde babakufutshane nabanye.
- Baya bachonge umthombo wamanzi wasekuhlaleni, onamanzi angapheliyo okanye umthomo onamanzi adonseka ukusuka ngaphansi komhlaba, baphinde balungise indlela abasebenzisa ngayo owo mthombo, ngokumanyana nabasemagunyeni kuleyondawo.
- Emva koko kwenziwa inkqubo yokubonelela ngetanki eyintloko ekuyiyo ezogcwala ngamanzi avela emthombeni, emva koko kuhlaziywa indlela yokuhambise amanzi kumzi ngomzi kunye negadi zabalimi abababandakenyekayo kulentlelo.
- Ikomiti eyenzelwe oluhlelo iye yenze iphinde iphumeze imithetho nemigaqo sisekelo yokusebenzisa lwamanzi kumzi ngamnye iphinde ilawule yonke into efunisa imali zokugcina oluhlelo lusesimeni esilungileyo.
- Wonke amalunga alindeleke ukuba anikele futhi azibandakanye kuyo yonke imeko efunisa imali kunye nemisebenzi enzima yezandla emalunga nokuphumeza lenkqubo kusekela ekufakelweni/ekuqaleni.
- Wonke amalungelo nemvume ezisuka kwabasemagunyeni ukugunyazisa lenkqubo kufanele ukuba zenziwe kunye namalungiselelo okugcina oluhlelo lusebenza, lusesimeni esihle.

IMFUNEKO:

- Imvulal: kufanele ibengaphezulu kweshumi elinantlanu eemitha ngonyaka
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Ubume bendawo: Kungaba noma lithambeka elinjani
- Umhlaba: lonke uhlobo
- Umthombo wamanzi; amanzi aphantsi kohlaba.

UPHUNYEZO:

- Imizi kunye neegadi ezingaphansi kuka-0.1 weehekthara (<0,1ha)
- Amaxabiso aphezulu, kwaye kusetyenziswa izixhobo zangaphandle nezasekuhlaleni
- Iyasebenzisa kakhulu, kwaye ifuna izakhono ezinzulu, uqeqesho lwabahlali, kunye nenkxaso kwezobuchwephetshe.

Umthombo owembelwe ukwenza idamu. Ukukhuselwa komthombo kubandakanya ukugqunyathelwa kwemibhobho emiseleni eyembelwe eyembelwe ngaphansi kwedama ephinde yembozwe ngotyando (gravel),umnatha womthunzi kunye nomhlaba, ukuze ukhuseleke. Ngoluhlobo umthombo uyakhuseleka, ngaphandle kwezakhiwo ezinzulu.

Umzekelo wetanki eyintloko esuka kwimvelaphi yomthombo ethelela emizi engaphansi kohlelo.

Umzekelo womnye wemizi oxhunyiweyo ukufumana amanzi. Lemigqomo inxibelelaniswe yaphinde yaxhunyaniswa ne valuva edadayo ukuqinisekisa ukuba amanzi ayama ukungena xa imigqomo sele izele ngamanzi.

Ukubholwa kwequla (boreholes) kunye nokufakelwa kwemibhobho ehambisa amanzi kwitanki eyintloko ebasekhayeni.

3.12 ULAWULO LWAMANZI AMDAKA

Amanzi amdaka ngamanzi asetyenziselwa ukuhlamba emakhayeni (impahla, izitya, kunya nabantu) kodwa akawafaki amanzi amnyama (amanzi angasese, amanzi ogutyulo) Amanzi amdaka asetyenziswayo agcwele isepha yeentlobo ngeentlobo. Ubungozi bokusebenzisa oluhlelo kukungcoliseka kwezilwane, ukonakala kwe-nitrogini (i-nitrification) yesepha kunye nokuqhekeka komphezulu womhlaba apho lwamanzi asetyenziswa khona rhoqo. Ulawulo ekusetyenzisweni kwalamanzi ngendlela kunye nasekuchithweni kwawo kubalulekile. Ikakhulu oku kuquka ukusebenzisa uthuthu kunye nezinye izinto. Ezifana nembewu yemoringa, ukudibanisa kunye nokugquma enye yesepha, kunye nohlelo lokunkcenkcetshela oluphephisa lwamanzi amdaka ukuba adibane namagqabi ezityalo.

Iindlela ezintathu zokusebenzisa amanzi amadaka zichazwe ngezansi:

1. *Ikiti zokwenza iipheyile zilungele ukunkcenkcetshela ngamaconsi*

Ezi zee zindlela zokungcengcetshela ngamaconsi ezencelwa umntu ngamnye, ziba yimitha enye (1m) ukuvuleka, zibe ziimitha ezintlanu ubude (5m) kunye neepheyile ezingamashumi amabini eelitha (20L). Lekiti yokunkcenkcetshela iye iqokelelwe idityaniswe kwindawo yokulima ukuze ukwazi ukuzenzela iintambo zakho zokuconsisa amanzi okunkcenkcetshela, ukhethe ububanzi bemigca kunye nezithuba zokukhupha amanzi ngamaconsi. Ixesha elininzi kuye kusetyenziswe imigca emibini yezinnkconkcozisi, ezilingana namashumi amathathu ukwehlukana. Ukunkcenkcetshela kwenziwa nsuku zonke.
Ezipheyile zingaphinde zifakwe Isanti ukuhluza intlenga nokungcola kulamanzi amdaka ukuwenza alungele ukunkcenkcetshela. Kwelinqanaba, umda okanye uluhlu lwegrabile lubekwa ezansi kwipheyile, kulandele umda wesanti yomfula ecocekileyo. Isanti ifakwa ngaphakathi esakeni le-muslin ukuthintela ukuxubana xa ipheyile seyifakwe amanzi. Ezi zihluzo zidinga ukutshintswa kufakwe ezinye amaxesha ngamaxesha njengoba izinga lokubaleka kwamanzi kwezipheyile liye liqale lehle.Imibhobho yokunkcenkcetshela nayo idinga ukucocwa ngokuvulwa umva kuvunyelwe amanzi ahambe ahlambe aphinde agugule yonke into intlenga evalileyo.

Umaleko wegrabile ngaphansi ebheyileni

Kokubini igraveli nesanti ziyacocwa ngaphambi kokusetyenziswa, ukuthintela ukungcola nokuxineka kohlelo lokuhamba kwamanzi

Umzekeo womgca wokunkcenkcetshela ongamashumi amathathu eemitha ukwahlukana

Amanzi amdaka kwipheyile yokunkcenkcetshela ngamachaphaza.

Isanti ibekwe kwingxowa yemislin evaliweyo ngaphezukwegrabile ukuthintela ukuba iguguliseke iyovala imigqobho yokunkcenkcetshela.

e k machaphaza olwenziwa

Izangqa ezimanziswe luhlelo lokunkcenkcetshela

Umgqobho omncinane wenziwa emazansi kwipheyile engamashumi amabini eelitha apho kuzofakwa khon umbhobho nengqiniba yokuzidibanisa nombhobho owehlayo.

Ipheyile ibekwa endawi eqethukileyo kufakwe lombhobho ubheke phansi ukuqinisekisa ukuba amanzi ayakwazi ukwehlela kwimigqobho yokunkcenkcetshela.

Kuye kwenziwe imigqobho kwindawo zokuconsisa amanzi kulemibhobho, macala onke, kufakwe iqhina leplastiki ukwakha ezinkcenkcetsheli zamaconsi (“drippers”)

Iqela lomama lifunda indlela yokwenza uhlelo lokunkcenkcetshela ngamaconsi.

Imigca yokunkcenkcetshela emibini, elinganiselwa kumashumi amathathu ukwehlukana adityaniswe nombhobho owehlela ngezansi.

Umbhobho uye uvalwe ngokugotywa ngasekugqibeleni.

Xa sele wenziwe, uhlelo kuyavavanywa ukuqinisekisa ukuba amanzi aphuma ngendlela efanayo na kwaye yonke imigqobho iyawakhupha ngokulinganayo.

2. Izitiya zenqaba (tower gardens)

Ezitiya zakhiwe ukusuka phansi ukwenyuka kusetyenziswa izibonda ezine ziphinde zirhangqwe ngendwangu yomthunzi olinganiselwa kumaphesenti angamashumi asibhozo. Maphakathi nendawo apho kukho ezibhedi zokutyala, kwakhiwe umqolo wamatye unyuke kusetyenziswa ipheyile engenawo amazansi. Ibhedi igcwaliswa ngomxube owenziwe ngaphambile kokuba kuqalwe (womhlaba ongange 1/3, umanyola 1/3 umthuthu 1/3 (kudingeka umthuthu omninzi ukucoca amanzi amdaka)). Umigqobho emincinane iyenzima emacaleni kwalamasaka, kutyalwe izithole kuleyomigqobho zinyuseke, ngokuqhelekileyo, isipinatshi okanye eminye imifuno enamagqabi. Umphezulu webhedi zokutyala, ungasetyenziselwa ezinye izityalo-itutamatisi balungile ngjengoba bekwazi ukuba babanjwe ngezibonda. Ezibhedi zinkcenkcetshelwa ngokuba kuthekwe amanzi amdaka ngaphezulu kwamatye phakathi nendawo.

UPHUNYEZO

- Ulawulo lwamanzi amdaka
- Isitiya
- Ihektare ezingaphansi kuka 0.1 (<0,1ha)
- Amaxabiso aphansi ukuya phakathi nendawo, kukhona ukufunda nokucetyiswa, kusetyenziswa izixhoba zasekuhlaleni.
- Kulula ukuyigcina, kodwa amasaka adinga ukutshintshwa ngemva kweminyaka emithathu ukuya kwemihlanu rhoqo.

Ukwenza umhlaba, ngomxube womanyolo nomgquba, nomthuthu ozogcwaliswa kwiibhedi zokutyala egadini

Ukwenziwa kweekholamu zamatye– kukhona ipheyile encinci engenamphansi phakathi nendawo

Ukwakha inqaba (tower)- igcwaliswe ngomxube womhlaba ojikeleze ilitye lekholamu ukwenyuka

Ukwenziwa kwemigqobho emincinane emacaleni engxowa kwenzelwa ukutyala izithole

Ukunkcenkcetshela kwikholamu yelitye ephakathi nendawo

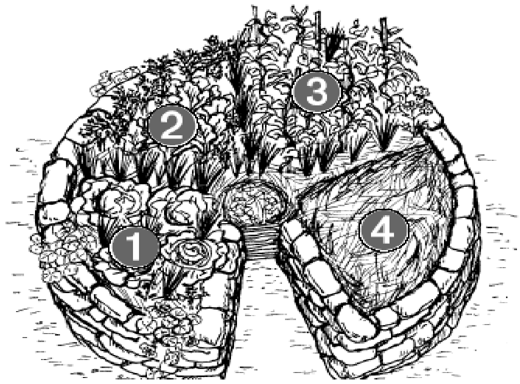
Inqaba yokulimam (tower) eseyindala ilinywe ispinatshi, ikale, itswele lasentwasantlobo kunye nemarigolds.

Ezi ziibhedi zokutyala ezakhelwe phezulu kanzulu ezinebhasikiti/ipheyile ephakathi nendawo enezivundisi ekuyeyokunkcenkcetshela nako ukusebenzisa amanzi amdaka. Kulula ukuzilawula. Ibhedi yokutyala isissangqa (esingangeesentimitha ezintathu) ezine-keyhole kwicala elithukileyo kuleyo ndawo, ekuyiyo encedisa ekutholakaleni lepheyile enomgquba nezivundisi kunye nokunkcenkcetshela okuqhubekayo. Iindonga zakhiwa zibe ngamashumi amathandathu ukuya kwasibhozo eesentimitha (60cm-80cm) ubude kunye nebhedi egcwaliswe ngomxube womhlaba olungiswe ngaphambi kokusetyenziswa, umgquba/umanyolo (kungaba ngamashumi amabini amapesenti isandi-20%) kunye nomthuthu. Ikalika kunye namathambo enyama angafakwa nawo. Ibhedi ityalwa ngezityalo ezahlukeneyi ezahlukaniswe ngeziqephu apho ziye zijikeleziswe khona.

UPHUNYEZO

- Isitiya
- Ihektare ezingaphansi kuka 0.1 (<0,1ha)
- Amaxabiso aphansi, kungeka ukufunda nokucetyiswa okuphakathi nendawo, kusetyenziswa izixhoba zasekuhlaleni (amatye alinganiselwa kumakhulu amahlanu ukuya kwasibhoza (500-800kg) ayafuneka kodwa angatholakala kalula)
- Kulula ukuyigcina

Ibhedi ye- keyhole igqiba kwakhiwa, nansi ikholamu ephakathi nendawo yegrabile okanye amatye amanncinci ngaphakathi kwebhedi – ngaphandle kwepheyile enomgquba.



Umzobo obonisa ibhedi ye-keyhole ibonisa umphezulu phakathi kukho ipheyile enomgquba ihlukaniswe kune ngokokujikeleziswa kwezityalo (iziqhamo-amagqabi-iingcambu-imidumba)

Ibhedi ye-keyhole eseyindala ityalwe umxube wezityalo

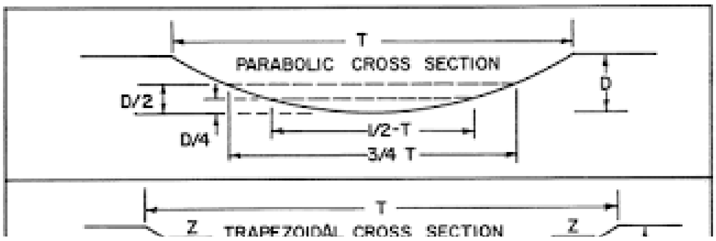
3.13 UHLUMISO LWENGCA ENDAWENI ZAMANZI

Ukuhlunyiswa kwengca endaweni zamanzi kubanzi, kuphinde kube kufutshane kwaye kunemijelo emilise okwesosala kuyilelwe ukuhambisa amanzi ngaphezu komhlaba anqamleze umhlaba ekulinywa kuwo ngaphandle kokubanga ukhukhuliseko mhlaba. Le mijelo iphinde isetyenziselwe ukhuseleko lwamanzi abaleka kakhulu asuka endaweno zolimo ukuyothso kwimibhobho yokuphumeza amanzi efana nemilambo okanye imilanjana.

- Ukhuliso lwezityalo ezegquma indlela ehamba amanzi icothisa ukuhamba kwamanzi iphinde ikhusele umjelo kuxinzelelo lwezikhukhulisi zamanzi abalekayo.
- Ukutyalwa kwengca yonyaka wonke ekuquka kuyo i-Paspalum, iFescue, iKikuyi kunye nengca ye-couch kukona kungcono kunokutyala ingca ende ukuya phezulu, etyalwa unyakawonke.
- Enza icandelo elinqamlezileyo lokudlulisa amanzi lingaba kumila kwe-trapezoidal okanye i-parabolic, kodwa kuye kuqinisekiswe ukuba ayenziwa ibe kumila ku-V kwaye nendlela yokuhamba amanzi noko kumele iqale kumashumi amathathu ukuya kwamane eesentimitha ubunzulu, kunye nethambeka lamacala ekumele lingaqethuki kangangokunye ukuya kokune.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amane anamashumi amahlanu eelilitha ngonyaka (>450mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elilinganiswa ku-1.5 ukuya kumashumi amabini anesihlanu (1.5%-25%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele (ongxenye inomdongwe olinganiselwa kwisihlanu ukuya kumashumi amathathu enesihlanu epesenti) (5-35%), kunye nangaphezulu kwamashumi amathathu ubunzulu (>30cm)



Izakhiwe ze-Parabolic okanye i-trapezoidal zizona zikulungeleyo ukutyalwla kwengca ezindaweni zokuhamba amanzi. Qaphela imida isecaleni kweqethuka elisentsheleni. (Isuselwe ku-Michigan state University, (MSU Extension 2015).

UPHUNYEZO

- Amasimi
- Iihekthare eziphakathi kuka 0.1 ukuya kwenye, nangaphezulu (0.1-1ha, >1ha)
- Iindleko ziphantsi, kunye nezixhobo zasekuhlleni

Ekhohlo: Ukhukhuliseko olubangelwe ngamanzi abalekayo ensimini yengqolowa (isuselwe ku-MSU Extension, 2015)

Kuseyintsimi enye nekwesokhohlo sekutyalwe ingca endleleni yamanzi ngemva kweminyaka embalwa (isuselwe ku-MSU Extension, 2015)

i-Paspalum (ingca ye-Bahia) yeyona ilungele ukwenza ezindlela zokuhamba amanzi–ilushica kwaye

i-Tall Fescue yona ihlala iluhlaza ubusika bonke.

Ingca ye-Couch (Elymus repens), ithathwa njengokhula, emhlabeni otyalwayo kodwa ikhula kakuhle nakumhlaba ongekho kumgangatho kwaye ibonelela ngokuqqumathela indawo ebaleka amanzi

4 ULAWULO LOMHLABA (UKULAWULWA KOKHUKHULISEKO, UKUCHUMA KOMHLABA, KUNYE NEMPILO YOMHLABA)

4.1 AMATYE AKRELISIWEYO/ AYINGQUMBA

Lamatye akrelisiweyo aye apakishwe kumathambeka ukulawula ukuhamba kwamanzi iphinde ibonelele kancinyane ekwakheni umhlaba kunye nesihlabathi ngemva kwaleyo migca yamatye. Amatye aqunjaniswa kumsele omfutshane kwaye amatye amakhulu wona aqokelelwa kwithambeka elingezantsi kwamatye amancinane ukuthintela uqhekeko lwamatye akreliswe emancinane kunye futhi nokuvumela ukuhamba kwamanzi acothayo edlula kulamatye. Utyalo lungenziwa ngezantsi kolukrozo lwamatye njengoba amanzi amaninzi ehlanganela ande khona, okanye nje ngasentla kolukrozo lwamatye apho kuqokelane khona isihlabathi nomhlaba.

IIMFANEKO

- Imvula: engaphezulu kwekhulu namashumi amahlanu yeelilitha ngonyaka (>150mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5ºC)
- Impandle: 0,5%-5% (ingadluli kwisihlanu)
- Umhlaba: kungaba noma ngumhlaba onjani – apho amatye atholakala kalula khona.

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Angange hectare engaphantsi kuka 0.1 ubuncinyane nangaphezulu kwesibini ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi
- Ubunzima busemsebenzini ekumele wenziwe

Ukrozo lwamatye enzelwe kwikhonto futhi angenzelwa kulo naliphi na inqanaba .

Imbonakalo ekhombisa amatye aqumbaniselwe kumsele onamatye amakhulu ditch kwithambeka elingezantsi kwamatye amancinane.

Ukrozo lwamatye amancinane asetyenziselwe ukulawula amanzi abaleka ezindleleni iphinde ikhokhele amanzi ukya ezigadini

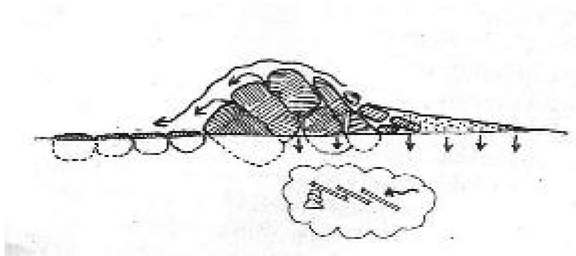
uBrinjolo otyalwe kulomhlaba nesihlabathi esiqokeleleke ngentla kwamatye alungelelaniswe negadi

Oobhanana abatyalwe ngezantsi kwamatye acwangcisiweyo.

4.2 AMADAMA AMISELWEYO

La ngamadama amancinane, ngamanye amaxesha aba ngawethutyana, amadama akhelwe anqamleza ngqo kumsele okanye kwindlela yamanzi ukumelana nokhukhuliseko ngokuthi kunciphiswe isivinini sokuhamba kwamanzi kuphinde kuvumele uzinzo lwesihlabathi. Izixhobo ezahlukeneyo zingasetyenziswa kuquka umhlaba, amatye, iinkuni, okanye imifuno. Amatye okanye ezinye izixhobo, zibotshelwa kwithambeka, kwikhonto, ukunciphisa ukhukhuliseko olubangelwa ngamanzi abaleka ngaphezu komhlaba. Iziphumo kuyoba kukwakheka kweginqinyana zomhlabathi ovundileyo wokutyala.

La madama “Check dams” ixesha elininzi aye ebekwe anqamleze la migca emfimfitha amanzi apho kuhamba khona amanzi xa kunethile, kodwa angahambi qhoqhoqho. Aphinde abeke anqamleze malunga nendonga ezigugulisekayo, kodwa akahambi ngokusisigxina. Aphinde futhi abekelwe anqamleze indawo eneendonga ezenziwe lukhukhuliseko. Asebenza kakuhle ukuzinzisa amigwaqo okanye indawo apho kunqamla khona. Kumele kusetyenziswe amatye axandileyo, kunamatye azingqukuva kwaye amazansi kumele abengamashumi amathathu ukuya kwamathandathu esentimitha ububanzi (30cm- 60m) kwaye kubesisihlanu ukuya kwisithandathu isisindo(5-9kg). Kube ngalawo amancinyane ngaphezulu kunye nembumba yamatye alishumi elinesihlanu ukuya kwamabini anambini (15cm-22cm). Ekulona cebo kukubekwa kwalamadama akroze ukusukela ezansi ukuyoma phezulu, apho inqanaba lethambeka elisisinyuko liqokelela khona isihlabathi kunye nomhlaba ongemva kwedama ngalinye wandele ukuyofika ekupheleni komfula ongezansi welidama apho linyukela khona.

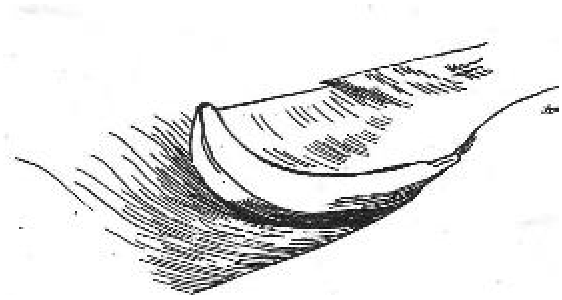


IIMFUNEKO

- Imvula: engaphezulu kwekhulu namashumi amahlanu yeelilitha ngonyaka (>150mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: kungaba ngu 1,5% ukuya kumashumi amini anesihlanu (25%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele– apho amatye neembokodo zitholakala kalula khona.

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Ibengu 0.1 nangaphansi ubuncinane bee hectare ukuye kwezingaphezulu kwesibini (<0,1ha, 0,1-1ha, >2ha).
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi
- Ubunzima obuninzi busemsebenzini ekumele wenziwe.



Umboniso weendonga zisenzeka ensimini

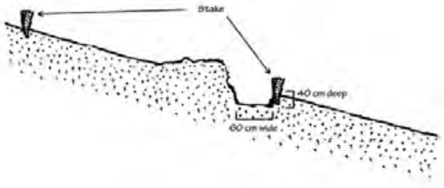
Ukwembiwa kwemisele ezofakelwa ematyeni kwenzelwa idama.

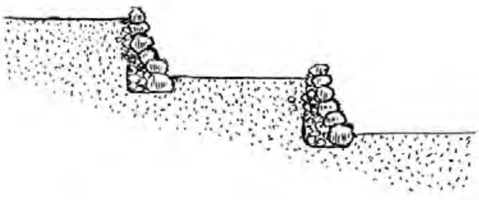
Umzekeliso wedama eseligqityiwe eline elinedonga le apron ngaphansi kwaye isimiselo sesakhiwo sooBhannana siyabonakala.

Isiqalelo sokupakishela elidama. Amtye amakhulu egokelelwe ngaphansi.

4.3 AMATHAMBEKA

Ithambeka ngumcu womhlaba oqondileyo owakhelwe kwikhonto zethambeka elisisenyuko kwaye ixhaswe ngumhlaba okanye igqumba yamatye okanye imiqolo yamavili amadala. Ithambeka lidala indawo ethe tyaba yokutyala iphinde izinzise ithambeka elesisenyuko okungenzeka ngenye indlela kuqethuke kakhulu ukuba kungasetyenziselwa imveliso. Ukrozo lwala mathambeka lungadala into esakumila kwamanyathelo ekwaziyo ukunciphisa ukubaleka kwamanzi, yandise ukutshona kwamanzi emhlabathini, kwaye iphinde incedise ukulawula uguguliseko mhlaba. Amathambeka akhiwa ezindaweni eziqethuke kakhulu.





IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amathathu anamashumi amahlanu eelilitha ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elisukela eshumini ukuya kumashumi amane (10%-40%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele– apho amatye neembokodo zitholakala kalula khona.

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Angange hectare enye ukuya ku 0.1 ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe.

Ukugoba komhlaba		Ibanga phakathi kwama-terrace (amamitha)
Iphesenti	Ubulingani	
10%	01:10	8
15%	01:06,7	5,3
20%	01:05	4
25%	01:04	3,2
30%	01:03,3	2,7
35%	01:02,8	2,3
40%	01:02,5	2

Amatye ethambeka enzelwe uba kulimeke amasimi.

Umboniso wethambeka eliqethukileyo apho kwenziwe khona ithambeka elilungele imveliso yombona kulingana namashumi amabini kwamaphesenti ukuqethuka kwethambeka (20%).

Amathambeka angenziwa futhi kusetynziswa amavili amadala ezindaweni apho amatye anqabileyo.

Umboniso wethambeka elisezingeni legadi kwithambeka eliqethuke kangangamashumi amane (~40% slope).

4.4 IKUPHUCULWA KOKUVUNDISWA KOMHLABA

Ukuphucula ukuvunda komhlaba kubaluleke kuwo wonke amanqanaba okusebenza ngalomxholo. Iindlela zokwenza ziquka ezi:

- Ukwandisa umgquba; ukuphucula umgangatho womgquba ngokuqokelela umgquba wasesibayeni oqulethe umchamo; apho ingca okanye iindiza zisetyenziselwa ukwendlalwa ziphinde zifunjwe ukuya phezulu kuphinde kogqunywe eyomfumba ngengca okanye amaplastiki. Oku kugcinwa kangenensku ezintlanu ukuya kwezisixhenxe phambi kokuba kusetyenziswe.
- Ukwengeza isivundiso; umaleko wezinto ezomileyo, izinto eziluhlaza, umgquba kunye nomhlaba owakhelweyo waphinde wamanziswa kakuhle.
- Iintsalela zesivuno; (kusukela kwizityalo, iingca, izityalo ezinemidumba, iibrassicas nama iichenopods) kunye,
- Nesigqum mhlaba esenziwe sanzulu okanye sigqunywe ngamashithi.

Ukufumana umthombo wezivundisi mhlaba ezinamazinga aphezulu ezondlo eziyimfuneko ezinjenge nitrojini kunye nekhabhoni kubalulekile. Ezinye Zeensalela zesivuno kunye nemigquba nazo ziqukethe izinga eliphezulu leezimpawu ezisemqoka zeenyutriyenti eziluhlobo lwe poteziyam (comfrey) kunye nesilikhoni (stinging nettle).

IIMFUNEKO

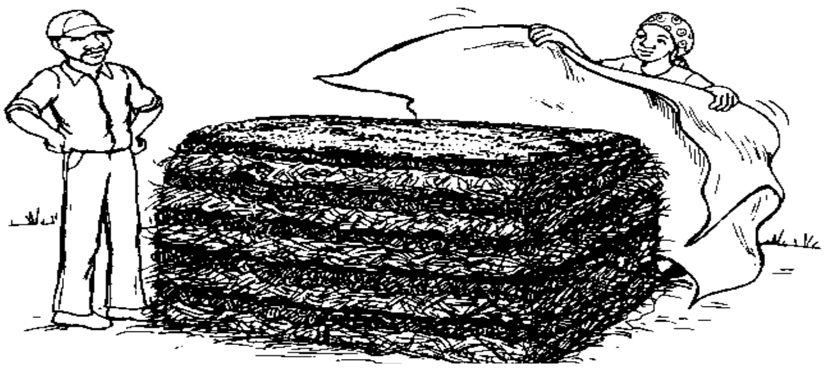
- Imvula: engaphezulu kwamakhulu amathathu anamashumi amahlanu nangaphansi kwewaka elimakhulu amabilni eelilitha ngonyaka (>350mm <1200/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elisukela kwisihlanu ukuya kumashumi amabini anesihlanu (5%-25%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele– nangona umhlaba osisihlabathi kakhulu okanye ongumdongwe kakhulu kulukhuni ukuwulawula.

Kg/ngetoni	Inko mo	Ihhashi	Imbuzi	Ibhokwe	Ingulube	Inkukhu	Umvundla	Umquba othengiwe
N (Nitrogen)	5	6	14	7	5	13	18	5
P (Phosphorus)	2	3	2	3	4	11	13	2
K (Potassium	3	6	6	4	6	20	6	8

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Angange hectare engaphansi kuka 0.1 ukuya kwenye nangaphezulu kwezimbini ubukhulu bendawo (<0,1ha, 0,1-1ha, >2ha).
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi-
- Ubunzima busemsebenzini ekumele wenziwe.

Ibhokhwe kunye nengca ebekelweyo ukuphucula manyolo.



Imfumba yesivundiso senzewe ngokwelekwa kweensalela zesivuno ezomileyo neziseluhlaza. Umgquba kunye nomhlaba omanziswe kakuhle wagqiba wogqunywa.

iComfrey, iinstalela zengca, zombona kanye nomxube osakhulayo wezityalo (ujongilanga, iimillet kanye nemdumba weDolichos)

4.5 UKUTYALA IMIDUMBA KUNYE NOMANYOLA WOHLAZA

Imidumba ibalulekile, njengoba iphinde ilungise initrogen esuka emoyeni iphinde iphucule ukuchuma komhlaba kunye nempilo yomhlaba ukulungiselela isivuno esisendaweni kunye nesiyakubakhona. Ziyakwazi ukutyaleka kunye nezinye izityalo ndawonye okanye zijikeleziswe. Umzekelo wemidumba elunga kwelifudumeleyo ixesha lonyaka iquka intlobo-ntlobo zembotyi: imbotyi eneswekile (sugar beans), imbotyi enabayo (runner beans), ii-ertyisi (cowpea), (Jugo beans), iinqoba (ground nuts), (lablab), (velvet beans), iilentile, lusini (lucerne), ujongilanga (sun hemp). Umzekelo wemidumba elungele ixesha lonyaka elipholileyo aquka; ii-ertyisi (peas), imbotyi ezixandayo (broad beans), ivetshi (vetch), kunye nefula (clover).

Umanyola wohlaza uye utyalelwe ukuba uxutywe ugqumathelwe emhlabeni, nje phambi kokuba udubule oko kwandisa izondlo (eziquka unitrojini) ezingengezwa emhlabathini ukulungiselela izityalo ezifana nezi zilandelayo. Umanyola wohlaza ixesha elininzi uye wenziwe ngemiduba (aquka ivetshi nefula), iinkozo kunye nengca (ezifana nehabile emnyama kunye nefula yesityalo esifana nengqolowa), imihlobo ethile yemifuno (brassicas) (efana nefula lomfuno othile onegaqa eliqhwethayo, iiteniphu, mastadi kunye nekhanola) kunye nezityalo zohlaza ezifana nokhula ezinevumbana elithile (chenopods) (kuquka kuzo i-amarantasi) (Amaranthus).

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amahlanu anamashumi amahlanu nangaphansi kwewaka elimakhulu amabilni eelilitha ngonyaka (>350mm <1200/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elisukela kwisihlanu ukuya kumashumi amabini anesihlanu (5%-25%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele– nangona umhlaba osisihlabathi kakhulu okanye ongumdongwe kakhulu kulukhuni ukuwulawula.

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Angange hectare engaphansi kuka 0.1 ukuya kwenye nangaphezulu kwezimbini ubukhulu bendawo (<0,1ha, 0,1-1ha, >2ha).
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi-
- Ubunzima busemsebenzini ekumele wenziwe.

Iertyisi ethile ityalwe ngokudibanisa kunye nombona.

Imidumba yedolitshosi engu lebu-lebu (Dolichos (lab-Lab)) yeembotyi ityalelwa umanyola wohlaza njengesityalo sokukhusela ityalwe ngokujikeleziswa nombona

Umanyola wohlaza osisityalo sokukhusela, kwixesha lonyakaelibandayo- ihabile ye-Saia, ifula lesityalo esifana nengqolowa (rye) kunye nefula lomfuno othile onegaqa

Imbotyi enabayo, i-amarantasi, iluseni kunye nefula elibovu.

4.6 IMISELE YEBHEDI ZOKUTYALA

Ezi ziibhedi zegadi ezinzulu, ezembelweyo zaphinde zazalisekiswa zagqunyathelwa zezinto zokuvundisa ezicholwe endawe yazo

- Ibhedi yembiwa ibe ngamashumi asithandathu ukuya kwasibhozo eesentimitha (60-80cm) ubunzulu, kungaba yimitha enye (1m) ububanzi kanye nokusukela kwimitha enye ukuza kwezilishumi (1-10m) ubude.
- Izalisekisiwe zintlobo-ntlobo zezichumisi, umgquba, izinto ezomileyo, umanyola wohlaza kunye nomhlabathi.
- Omnye umeleko ungadibanisa iitoti ngaphansi ukwenzela i-ayoni kunye nokubamba amanzi
- Amathambo, izikhumba kunye neentsiba zingafakwe ukwenza isichumiso sika fosforasi (P).
- Uthuthu nalo lungengezwa ukwenzela ipotaziyam (K)
- Ibhedi yakhiwa iphakame ibe sisigingqinyana, elityaliweyo saphinde safulelwa ngesogquma mhlaba okanye isigcina kufuma emhlabeni.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amathathu anamashumi amahlanu eelilitha ngonyaka (>350mm <1200/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elilinganiswa ku-0.5 ukuya kwisihlanu (>0.5%-5%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele

UPHUNYEZO

- Kufanele ubenegadi
- Angange hectare engaphansi kuka 0.1 (<0,1ha),
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi-
- Kulula ukwenza nokugcina lomsebenzi, kepha ubunzima busemsebenzini ekumele wenziwe.

Imisele yembiwa ukusukela kuwashumi asithandathu ukuya kwimitha enye ukubanzi . Trenches are dug 60cm-1m deep. Umeleko ongaphantsi wenziwe ngeetoti ezindala okanye branches

Emva koko umeleko wezichumisi nawo wongezelwe- umzekelo umbona, amadiza, amagqabi, ukhula kunye nengca.

Emva koko umeleko womgquba uyongezwa, ulandelwe ngumhlaba ngaphezulu. Ngako ke oku kuyamanziswa kwaye lenkqubo iqalqa phantsi kwakhona iphinde

Xa kufumaneka, umeleko wezichumisi zohlaza ekuquka kuzo ukhula, amagqabi, amagxolo neentsalela zemifuno.

Iibhedi zemisele zakhiwa zibenodonga oluphakemeyo kube nomsele urhangqileyo apha emacaleni futhi kubekhona isigingqi ngaphakathi apho kutyalwa khona imbewu okanye izithole.

4.7 IMISELE EMIFISHANE

Imisele emifutshane yiyona elushicilelo olulula lwemisele yeebhedi. Aye embiwe kangangamasentimitha angamashumi amathathu agcqaliswe ngumxube wezichumisi, imigquba, iintsalela zezityalo ezomileyo kunye neziluhlaza. Kuye ke konke kugcwaliswe kugqunywe ngomhlaba kugqibe kutyalwe.

Lemisele emifutshane iqhele ukusetyenziswa xa kwenziwa imijelo nemimmango, oko kunika imigca emide emxinwa equkethe umhlaba ochumileyo– okufaneleka kakhulu ezigadini ezinkulu nasemasimini. Okwe misele, isigcina kufuma emhlabeni sibalulekile, njengoba kutyala ngokuxubanisa okanye ngokutshintshanisa. Ezibhedi zihlala iminyaka emithathu ukuya kwesibhozo ngaphambi kokuba idinge ukufulelwa kwakhona ngokwalekqubo.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amathathu anamashumi amahlanu eelilitha ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elilinganiswa ku-0.5 ukuya kwisihlanu (>0.5%-5%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele

UPHUNYEZO

- Kufanele ubenegadi
- Angange hectare engaphansi kuka 0.1 (<0,1ha),
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi-
- Kulula ukwenza nokugcina lomsebenzi, kepha ubunzima busemsebenzini ekumele wenziwe.

Ukwemba umsele emfitshane ongangamasentimitha angamashumi amathathu ububanzi kunye neshumi elinantlanu kwimigca yeekhonto ensimini.

Ukuqalisa ukugcwalisa lomsele ngomgquba, imvucu eyomileyo neluhlaza

Igadi enemisele emifitshane kunye nenzulu yeebhedi ityalwe ngokuxubanisa kunye nesifumisi mhlaba.

4.8 IZANGQA ZOKUTYALA

Ezi zizingqa ezincinane, ibhedi zakhona ziphindaphindiweyo ukwembiwa oku kwengezelwa nomgquba, okanye isivundisi. Amanzi ziwathola ngokungcengcetshelelwa kusetynziswa ibhotile elinganiselwa kwiililitha ezimbini enemingxunyana evuliweyo emacaleni, yaze yatyalelwa emacaleni ayo.

Ezi zangqa zifaneleke ezigadini ezincinyane kwaye ziye zisetyenziselwe ukufunda nokuziqhelanisa nokulima ngengqubo ezothi izise inzuzo yokwandisa ubunzulu bomhlaba ekulinywa kuwo ukwenzela iingcambu, umsoco womhlaba, izagquma okanye ezigcina kufuma emhlabeni kunye namanzi okunkcenkcetshela, kukonke kulawuleke.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amathathu anamashumi amahlanu eelilitha ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elilinganiswa ku-0.5 ukuya kwisihlanu (>0.5%-5%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele

UPHUNYEZO

- Kufanele ubenegadi
- Angange hectare engaphansi kuka 0.1 (<0,1ha),
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi-
- Kulula ukwenza nokugcina lomsebenzi, kepha ubunzima busemsebenzini ekumele wenziwe.

Ukumbiwa kwezi-zangqa ezincinane, ukusukela kwimitha enye ukuya kwezingu 1.5 isinqumla sangqa sakhona, kwaye zingamashumi amathathu ubunzulu kune neshumi elinantlanu eliye libekwe ukuze lisetyenziselwe ukuxuma umgquba, ngaphambi kokubuyiselwa kwalomhlaba wonke nawo oxutywe nomgquba okanye izichumisi

Umboniso wesisangqa opheleleyo, urangqwe ngamatye amancinane. Iinkuni ezingumbhoxo ukwenyuka zisetyenziselwe ukutyala ukunceda izityalo ezikhula zibambelele ngento ekufutshane ukwenyuka ekuquka kuzo iitomato.

Isangqa esincinane, sifakelwe isifudumezi mhlaba, kunye neelitha ezimbini zebhotile ebekelwe Phakathi nendawo kwagqiba kwatyalwa amachiza.

4.9 IQONDO LOKUJOLISWA NOKUBHEKELELA EKUSETYENZISWENI KWEZICHUMISI NEKALIKA

Izichumisi ziye zongezwe ngokwezicwangciso ezisekelwe ngaphezu kwesimo sokuchuma salowomhlaba, zijoliswe bucala nesityalo esikhulayo okuyindlela esebenza kangcono kunokuhlwanyelwa okanye usasazwe. Oku kulondoloza indlela yokusebenzisa ezichumisi kwaye kuphinde kubonelele ngesichumisi kuphela apho kunemfuneko khona, kukukwandisa ubuchule bokusebenzise izichumise ngokwaneleyo. Ikalika yona ingafakwa kwisidibi okanye kumqolo ukubhekelela umhlaba ongaphezulu- ukuthomalalisa i-asidi emhlabeni kwaye kugcine i-asidi yomhlaba iphansi, okanye ikalika ingalinywa emasimini ngaphambi kokungenelela kohlelo luka CA.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amane anamashumi amahlanu eelilitha ngonyaka (>450mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elilinganiswa ku-1.5 ukuya eshumini (>1.5%-10%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele, kuxhomekeke kwisisekelo sezicwangciso zezichumisi

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Angange hectare engaphansi kuka 0.1 (<0,1ha), kubephakathi kuka 0.1 ukuya kwenye, nangaphezulu kweehezimbini
- Iindleko/amaxabiso aphakathi nendawo-unciphiso loncedo oluvela ngaphandle luphunyezwa kukusebenza ngobuchule
- Ubunzima busemsebenzini ekumele wenziwe.

Ukutyala kwikalika ngaphambi kokuba kuqalwe ulimo lolondolozo emakhaya

Ukusetyenziswa kwekalika ngaphezulu komhlaba ozotyala imbotyi

Ukufaka ikalika kwizidibi ngokomlinganiselo wesiciko sebhotile

Ukufakwa kwezichumisi (i-LAN) ngaphansi kangangeesentimitha ezimbini kude nembewu.

Ukusebenzisa iplantara ekuncediseni ukwahlukanisa imbewu nezichumisi ngexesha elinye

Isilinganiselo sezichumisi ngetispuni

4.10 IMINGXUMA YE ZAI/ OKUZIZIGINGQI ZOKUTYALA

I-zai ingumgxuma wokutyala, imvamisa iye ibe ngamashumi amabini ukuya kwamane eesentimitha ukuvuleka, kwaye ibe lishuma ukuya kumashumi amabini eesentimitha ubunzulu. Le mingxuma ye Zai ukubamba amanzi emvula kunye namanzi abaleka ngaphezulu komhlaba kwaye ikhusele imbewu kunye nomsoco womhlaba kukhukhuliseko. Iphinde futhi ibe luncedo ekuqinisekiseni ukufikeleleka kwamanzi nezondlo kwizityalo. Imingxuma iye imbiwe ebusika. Lomhlaba ukhutshwayo uye unyuswe wenze ummango orangqileyo busangqa ukuphucula umthamo wamanzi ongathi ugcinwe yile mingxuma. Ngemva kokumba imingxuma, umanyola wesivundisi uye ufakwe ngomyinge, ekucetyiswa ukuba ulinganiselwe ku 0.6kg umgxuma ngamnye kwaye, ngemva kokuna kwemvula, indima iye igqumathelwe ngomeleko ophityileyo womhlaba kwaye imbewu ibekwa phathi nendawo emngxunyeni.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amathathu anamashumi amahlanu eelilitha ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elilinganiswa ku-1.5 ukuya kumashumi amabini anesihlanu (>1.5%-25%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele (ongxenye inomdongwe olinganiselwa kwisihlanu ukuya kumashumi amathathu) (5-30%), kunye nangaphezulu kwamashumi amathathu eesentimitha ubunzulu (>30cm)

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Kubephakathi kuka 0.1 ukuya kwihekthare enye, nangaphezulu (0,1ha-1ha, >1ha)
- Iindleko/amaxabiso aphansi, kwaye kusetyenziswa izixhobo zasekuhlaleni
- Kulula ukwenza nokugcinwa, ubunzima busemsebenzini ekumele wenziwe.

Imingxunya ye-Zai eKenya, ityalwe umbona yaphinde yenzelwa isigcina kufuma emhlabeni ukwandisa izinga lokubamba ubumanzi kunye nomhlaba ochumileyo (isuselwe ku-permies.com, 2017)

Imingxunya ye-Zai yembiwe endaweni yokhukhuliseko, nezinto zesivundiso esezilungele ukufakwa added (isuselwe ku- Chris Reij), 20100

Umbona otyalwe kwimingxunya ye-Zai, e-Kenya (isuselwe ku-Inadesforum.net)

4.11 ULIMO LOKULONDOLOZA (CA)

Ingqubo yokulima amasimi kusetyenziswa lemithetho sisekelo elandelayo:

- Ukuphazanyiswa komhlaba kancinane, ukulinywa, kepha kuvulwa nje umngxunyana ekufakwa kuwo imbewu, kwenziwe izidibi kunye nemiqolo
- Ukugqumathelwa komhlaba, iintshalela zesivuno zishiywa ngaphezu komhlaba njengesogqumi okanye isigcina kufuma emhlabeni, kwaye izityalo zigcinwa ensimini ixesha elide ukukhusela izityalo eziphilayo.
- Ukutyala ngokutshintshanisa, ngokuxuba, nangojikelezisa kunye nokutyala ubandakanye umxube wezityalo zasebusika nezasehlobo.

Iitlobo-ntlobo zeeplantara; i-Mbli (igaba),i-Haraka (ivili), i-Matracca (jab) kunye neplantara etsalwa zinkabi (i-Knapik- ngezansi)

Lengqubo yolimo lokulondoloza eyaziwa ngelika-CA, iphucula impilo yomhlaba kunye nokuchuma komhlaba, imveliso kunye nomthama wokubamba amanzi omhlaba. Inciphisa ukubaleka kwamanzi ngaphezu komhlaba kunye nokhukhuliseko ngokunjalo nezinga lobushushu bomhlaba. Inciphisa uqhekeko kunye nokuqinelana komhlaba.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amathathu anamashumi amahlanu eelilitha ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elilinganiswa ku-1.5 ukuya kwishumi elinesihlanu (>1.5%-15%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele (ongxenye inomdongwe olinganiselwa kwisihlanu ukuya kumashumi amathathu enesihlanu epesenti) (5-35%)

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Kubengaphansi kuka 0.1 ehekthare ukuya kwihekthare ephakathi kuka 0.1 ukuya kwenye, nangaphezulu kwezimbi (<0.1ha, 0.1-1ha, >2ha)
- Iindleko/amaxabiso aphakathi nendawo (aquka imbewu, umanyola,kunye neekhemikhali zezolimo), iimatshini zokulima, kepha kusetyenziswa izixhobo zasekuhlaleni.
- Ubunzima busemsebenzini ekumele wenziwe.

UMGAQO SISEKELO WOKUQALA: Ukuphazanyiswa komhlaba kancinane

Ukutyala ngemijelo nezigingqi ngezandla kusetyenziswa igaba kunye neplantara ye-MBLI– ngaphandle kokulima

Itrekta/iteletele ivula imiqolo emibini ngeplantara engawuphethuliyo umhlaba.

Ukusetyenziswa kweplantara enevili i-Haraka – Le plantara ikwazi ukutyala iintlobo-ntlobo zeembewu, kodwa ayivumelani nokufakwa kwezichumisi ngaxeshanye.

Ukusetyenziswa kweplantara i-Knappick engawuphethuliyo umhlaba idonswa ngeenkabi.

UMGAQO SISEKELO WESIBINI: Ukugqumathelwa komhlaba

Umhlaba ogqumathelwe kakuhle ngeentsalela yezivuno

Isigquma mhlaba ekuncedeni ukufumisa umhlaba kwindawo yolimo ngokulondoloza ukubonelela ekugqumatheleni umhlaba.

Indawo yolimo lokulondoloza kunye neentsalela zesivuno. Amanzi abalekayo asuka kwindawo yokulima acocekileyo futhi mancinane

Indawo yokulima engenazo iintsalela zesivuno. Amanzi amaninzi angcolileyo abaleka entsimini.

UMGAQO SISEKELO WESITHATHU: Ukutyala ngokutshintshanisa nokuhlukanisa

Umbona kunye ne ertyisi ethile zityalwe ngokuxutyaniswa-kusetyenziswe imiqolo ephindwe kabini kwaye kunciphisiwe ukuvuleka

Umbona kunye nembotyi zityalwe ngokuxutyaniswa-kusetyenziswe imiqolo ephindwe kabini kwaye kunciphisiwe ukuvuleka

Izityalo zasebusika; i-saia/ihabile emnyama, ifula lohlobo oluthile lwamazimba (sogam), kunye nefula lomfuno othile onegaqa eliqhwethayo.

Izityalo zasehlobo; ujongilanga, i-millet kunye ne-Sun hemp

Imbotyi ye-Lab-Lab (i-dolichos),

4.12 UKUTYALA NGOKUCAZULULA

Ukutyala ngokucazulula kukulima apho izityalo ezahlukeneyo zihlwayelwe kwimigca ehlukeneyo ukuthintela ukhukhuliseko mhlaba kwaye kulungiselelwe ukufikeleleka kwezityalo kwizondlo kwizityalo. Ukutyala ngokucazulula imigca kufanele ukuba kungqamleze ithambeka okanye iikhonto.

Izityalo zidinga ukukhethwa ukuze zixubane ebunzilwini beengcambu zazo kunye nezondlo eziyimfuneko. Ukutyala izityalo ezineentlobo ezahlukeneyo zemisebenzi kulicebo elihle. Ulwazi ngeentlobo zezityalo zamahlathi ekuquka kuzo imidumba yamahobe (Pigeon Pea), imoringa (Moringa), i-Sesbania sesban, i-Leuceana nokunye kusebenza kakuhle. Iintlobo zengca eziquka ivetiva, ingca elamuni (lemon grass) kunye nefula le nephiya (Napier) nakho kungasetyenziswa, ngokunjalo nomxube wengca irhodes-smutsfinger (Digitaria),i-Paspalum notatum kunye ne-Tall Fescue.

IIMFUNEKO

- Imvula: engaphezulu kwamakhulu amathathu anamashumi amahlanu eelilitha ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Impandle: elilinganiswa ku-1.5 ukuya kwishumi elinesihlanu (1.5%-15%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele (ongxenye inomdongwe olinganiselwa kwisihlanu ukuya kumashumi amathathu enesihlanu epesenti) (5-35%)

UPHUNYEZO

- Kufanele ubenegadi, amasimi
- Kubengaphansi kuka 0.1 ehekthare ukuya kwihekthare ephakathi kuka 0.1 ukuya kwenye, nangaphezulu kwezimbi (<0.1ha, 0.1-1ha, >2ha)
- Iindleko ziphantsi (kuquka imbewu, kunye nezixhobo zasekuhlaleni).
- Ubunzima busemsebenzini ekumele wenziwe.

Ukulima ngokucazulula kudibanisa umbona kunye ne-luseni okanye i-Lespedeza

Ukulima ngokucazulula kudibanisa umbona i-Paspalum kunye ne-Digitaria

Ingca elinywe ngokucazulula kwiikhonto phakathi kombona

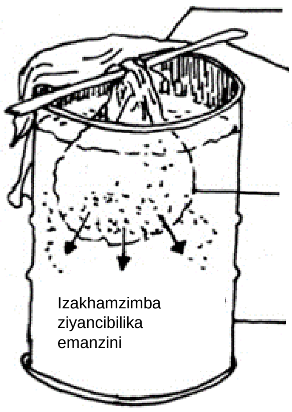
Ukulima ngokucazulula kudibanisa i-Pigeon pea/i-Leuceana kunye nombona.

5 ULAWULO LWEZITYALO (IINDLELA ZOKULIMA, IZITYALO EZINEMPILO, UCAKACO KUNYE NEMVELISO YEZIQHAMO)

5.1 UMANYOLA WAMANZI LIQUID MANURES

Umanyolo wamanzi zizicatshulwa zamanzi ezenziwa ngemfucuza yezilwanyane okanye izityalo, ezivubelweyo zaphinde zaxutywa, zacocwa ngaphambi kokuba zisetyenziswe ezityalweni okanye kumhlaba orhongqe izityalo njengendlela yokwengezelela nokuphucula ukuchuma komhlaba. Umanyolo wamanzi uyengeza uphinde ulungelelanise izondlo kwizityalo kwaye iphinde yongeze imixube yeentsholongwa ezithi zinyuse izinga lokuxhathisa ukulwa nezinga eliphezulu lezifo kunye nezitshabalalisi kwizityalo.

Umthombe wesiqhelo wemanyolo engamanzi ngumgqquba wezilwanyane (ekukhethwa kuyo ukuba kube ngumgqquba osemtsha, osenentshalela zomchamopreferably) ngengowenkomo, oweebhokhwe, owamahashe, owegusha kunye noweenkukhu. Okanye intshalela zezityalo ezifana nokhula olunamagqabi aluhlaza okubamnyama (esetyenziselwa initrogen), iziqu zebhanana(kwenzelwa ipotassium,iphosphate), icomfrey kunye ne-stinging nettle (zombini ezi zinceda ngo silicon ukuncedisa kwizondlo ezibalulekileyo (macro nutrients) kunye nezi zincinci zingabalulekanga kakhulu ukuvimbela izifo kwizityalo). Ezi ziyezivubelwe ziphinde zicocwe kangango 1:4 ngaphambi kokuba zisetyenziswe.



from: Production without Destruction

UPHUNYEZO:

- Izitiya
- Iihekthara ezingaphansi kuka-0.1
- Amaxabiso aphansi, kusetyenziswa izixhobo zasendaweni, mncinci umsebenzi
- Kulula futhi kuyakhawuleza ukuyenza

Ukunkqunkqwa kweziqu zobhanana njengesiseko seti okanye umngquba wolwelo osekelwe kwizityalo

Ukusika ukhula kongeza kumgquba

Umgquba wezilwanyane usetyenziswe njengomanyolo wamanzi; Iinkukhu, iibhokhwe, iinkomo zenza umanyolo olunge kakhulu- ikakhulukazi xa esematsha.

Iipheyile ezigcina ezimanyolo zamanzi zidinga ukuvalwa ukuthintela umphunga noma ukulahleka kwezinye zezondlo nomsoco.

5.2 IZIKHULISI ZEZITYALO

Izikhulisi zezityalo ngumxube okanye zintsholongwane ezithi xa zifakwa kwimbewu, kwizityalo, okanye kwindawo ezinengcambu, zandise ukudubula kwentyatyambo, ukukhula kwesityalo, ukubakho kweziqhamo, imveliso yezityalo kunye nokusebenza kakuhle kwezondlo. Kwakhona, ziyakwazi ukomoleza izityalo zikwazi ukumelana nobushushu kunye nembalela

Ezona zithako zidumileyo ezisetyenziswayo ziquka izinto eziphuma emhlabeni (i-humic kunye ne-fulvic acids), incindi yokhula lwaselwandle, intsholongwane eziluncedo (ezifana nezo ziguqula i-nitrogen), kunye nefangi eziluncedo (ezifana ne-Arbuscular mycorrhizal fungi).

Kudla ngokulungiselwa ngokuthenga kwemveliso, zixutywe namanzi kwaye zifafazwe emhlabeni okanye kwizityalo rhoqo ngexesha lokukhula.

Zibalulekile ngakumbi kwindawo ezinkulu apho abalimi betshintsha besiya kwindlela eziziphilisa ngokwendalo kwaye bejonga impilo yomhlaba.

I-Regen-Z (https://regenz.co.za) lishishini lenkonzo zezolimo eligxile kwindlela zokulima ezivuselelayo kunye nezisombululo zokulima ezintsha. Benza imveliso (ze-bio-stimulant) ezilungele ukuphucula impilo nokuchuma komhlaba ngenjongo yokunciphisa aze agcine esusa ngokupheleleyo izichumisi zekhemikhali kwinkqubo zolimo ezikhusela indalo.

Ngaphezulu: imigaqo emithandathu yokuhlaziya ezolimo (Zylem-Regen-Z)

Ngaphezulu: Uluhlu lezivuseleli lezityalo eziveliswe yiZylem (regen-Z) ukunceda impilo yomhlaba kunye nokukhula kwezityalo kwinkqubo zokuvuselela ezolimo

5.3 UKUTYALA NGOKUXUBANISA

Ukutyala ngokuxubanisa endaweni yasegadini, kukudibanisa indle yokutyala izityalo ezahlukeneyo, ukutyala ngokujikelezisa kunye nokutyala kwemihlobo. Injongo kukuba nezityalo ezahlukeneyo ezininzi (ekuquka izityalo zamayeza, ezixosha izitshabalalisi kunye nezityalo ezinemisebenzi emininzi) kangangoko kwinkqubo yakho yokuvelisa iziqhamo kunye nemifuno, unyaka wonke, ukuqinisekisa ukutya okunempilo, kuphuculwe indlela zokulawula izitshabalalisi, izifo kunye nokhula, kuphinde kunciphiswe ubungozi bokunqongophala kokutya ngenxa yokungaphumeleli kwezityalo.

Ukhetho lwezityalo kuyanyaniswa nezi zilandelayo:

- Ukukwazi ukuvuna ukudla kwasegadini okungathi kudliwe ekhayeni ixesha elingangonyaka wonke.Being able to harvest food from a garden for household use throughout the year. Oku kutsho ukugxila kwizityalo ezinokuvunwa ixesha elide ekuquka kuzo imifuno enamagqabi aluhlaza, iletisi enamagqabi aluhlaza, kunye netswele lase ntwasahlobo, iilike kodwa kuyekwe ukugxilisiswe kwizityalo ezifana neekhaphetshu, amatswele ezikwazi ukuhlala ixesha elide ngaphandle kokuvelisa ukutya.
- Izityalo izinevithamini-A ephezulu, ezifana nemifuno enamagqabi aluhlaza okumnyama (ezifana nesipinatshi, nesinaphi, imastadi, i-rape kunye ne-kale, oonomnqatha, uhlaza lwemvelo (olufana ne-amaranthus kunye namagqabi amathanga), kunye neziqholp (herbs-ezifana ne-parsley).
- Iztyalo ezithintela izitshabalalisi ziquka kuzo ii-coriander, ugalikhi kunye nezinye iziqholi kutya ezifana nama-rosemary kunye ne-thyme.
- Imidumba kumifino etyebileyo ziproteni ezifana nembotyi, iifama (peas) kunye neetheniphu.
- Izityalo zexesha elide nemisebenzi emininzi ezifana nee-wormwood, ingca yelemoni (lemon grass), i-bulbinella kunye ne-confrey.
- Iintyatyambo ezifana nee-marigold kunye ne-calendula.

Ukwengezelela, kuaye uxinzelelo lubekwa ekubeni kunatyalwa izityalo zohlobo olufanayo endaweni enye ukunciphisa ukwande kwezifo ezixhaphakileyo kuleyondawo kunye nokunciphisa umbango wezichumisi. Ngakho ke, iitumato, oobrinjolo, amazambane kunye nee-pepper azityalwa endaweni enye, kanjalo nee brassicas ezifana neekhaphetshu, ii-broccoli, i-cauliflower kunye ne-kale okanye ezomdiliya ezifana ne-swisschard kunye nebhithiruthi.

Ukutyala ngokujikelezisa kuye kwethulwe ngendlela zombini zokumela izondlo ezinesisindo ezinjengekhaphetshu kunye nezinesondlo esinesisindo esilula ezifana ne-swiss chard kunye nelethisi, kunye nendlela eyaziwayo yokujikelezisa amagxolo-iingcambu-imidumba-kunye neziqhamo. Amaxesha okutyala aye akhiwe malunga nendawo kunye nesimo sezulu sayo.

Ngezansi kuxhoma amaxesha adityanisiweyo enziwe kunye namalunga ase-Limpopo, ekungawo ebhekana nobusika obutshisayo kunye nehlobo elitshisayo. Kwazulu Natali naseMpumakoloni apha ubusika Bakhona bupholileyo futhi bubandayo amaxesha okulima aqhelekileyo akulungele ukuba angasetyenziswa khona.

Singazitshala nini izitshalo zemifino?

	Mrch	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Baby marrows						■	■	■	■	Kushisa kakhulu ukuthi kungatshalwa		
Basil	■	■	■			■	■	■				
Beetroot	■			■	■	■						
Brinjal						■	■	■				
Cabbage	■	■	■	■	■	■						
Carrots				■	■	■	■					
Chilli						■	■	■	■			
Green beans	■	■					■	■	■			
Green pepper						■	■	■				
Kale and other morogo e.g. amaranthus	■	■	■	■	■	■	■	■				
Lettuce	■	■	■	■	■	■						
Leeks, sping onions	■	■	■	■	■	■	■					
Mustard spinach	■	■	■	■	■							
Onions	■	■					■	■	■			
Parsley	■	■	■	■	■	■	■					
Peas	■	■	■	■	■							
Tomatoes	■	■	■	■	■	■						

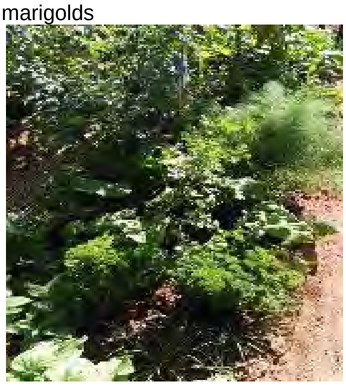
UPHUNYEZO:

- Izitiya, amasimi
- Iihekthara ezingaphansi kuka-0.1, nengu 0.1 ukuya kwenye nezingaphezulu kwezimbini
- Amaxabiso aphansi (imbewu nezityalo), kusetyenziswa izixhobo zasendaweni,
- Kulula ukuyenza

Kwa-Mrs Mcanyana (waseGobizembe) – u-broccoli, isipinatshi sasetTshayina, ispinatshi, i-coriander kunye ne-marigolds

uMagdelina Malepe (waseSedawa), ulime i-marigolds, ithyme, iparsley, ispinatshi kunye nekale

uChristina Thobejane (waseSedawa) – ulime umbona, i-okra, iitumato, ikale kunye nemarigolds



Imisele eyenza ibhedi zokutyala nomxube weziqholo, ifennel, icoriander, iparsley kunye nemachives

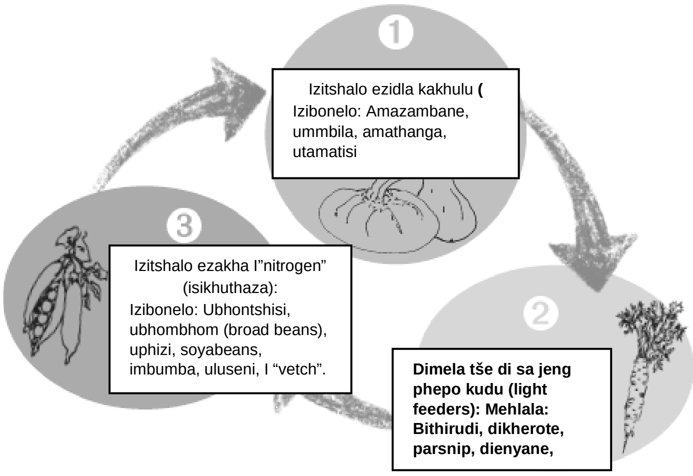
uPhumelele Hlongwane (waseZibomvini) – Ibeetroot, Ispinatshi sesinaphi, itswele lasentwasa ntlobo kunye neparsley

uAlex Makgopa (waseSedawa)- , itswele lasentwasa, ispinatshi, onomnqatha kunye nemarigolds

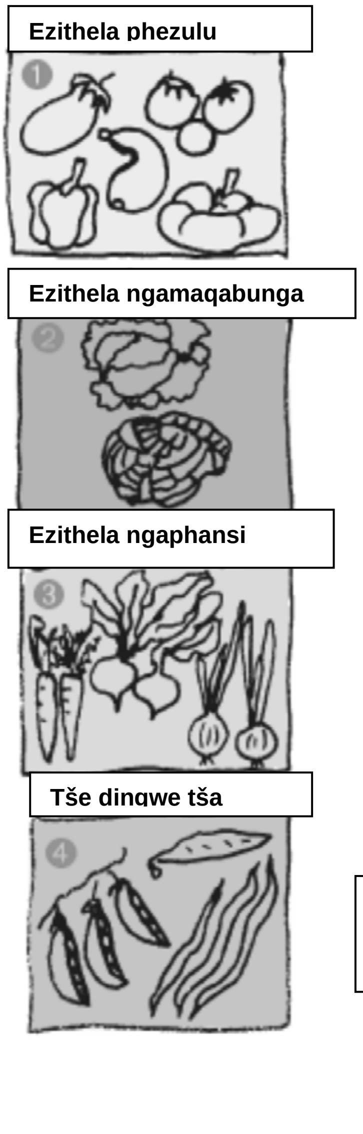
5.4 UKUTYALA NGOKUTSHINTSHANISACROP ROTATION

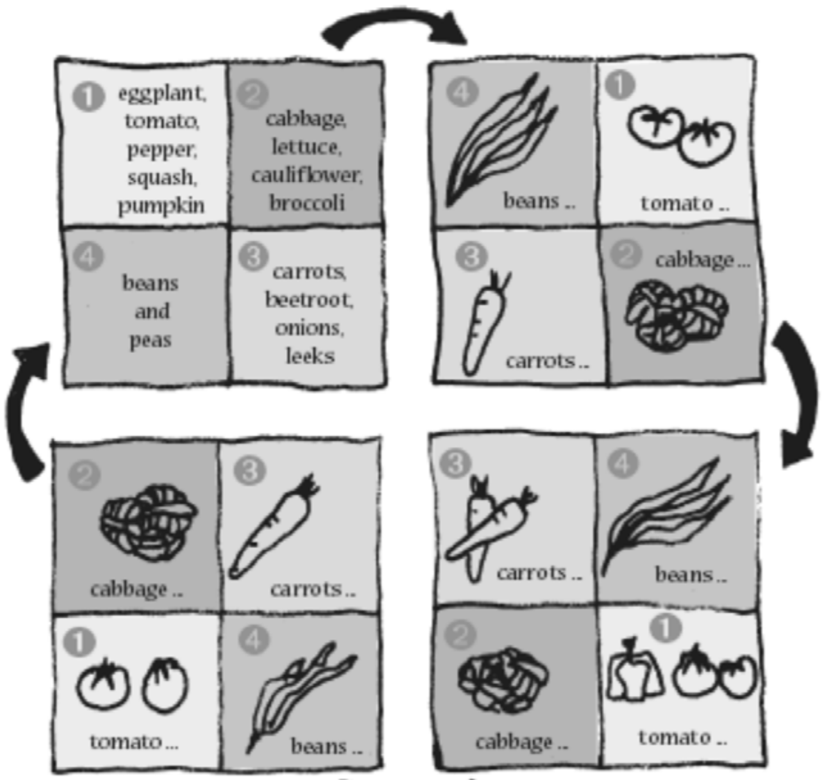
Ukutyala ngokutshintshanisa yindlela ebalulekileyo yokulawula igadi namasimi. Ukutyala ngokutshintshanisa kunciphisa izitshabalalisi, nezifo ezakheka emhlabathini nakwindalo engqongileyo ukulinganisa ukususwa kwezichumisi emhlabeni kwaye iphucule impilo yomhlaba.

Sebenzela ngaphezu kweminyaka emithathu ubuncinane bokujikelezisa ensimini. Umzekelo ngumbona (esisondlo esinesisindo) itshintshaniswa nomxube wezityalo zokugquma (cover crop mix-efana ne-sun hemp, imillet, kunye nojongilanga) (izondli ezingenasisindo) zitshintshaniswa nemidumba, efana (nembotyi eyomileyo, icowpea kunye nedolichos)



Sebenzela ngaphezu kweminyaka emithathu ukuya kwemine yamaxesha okulima ngokutshintshanisa ekuveliseni imifuno. Indlela enye yelande Inkqubo enye kukuhamba ngokulandela kwezintlelo zikeliswe apha ngemva kokumba umsele okanye ukongeza umgquba, iziqhamo, amagqabi, iingcambu, imidumba.





UKUSHINSHANISA OKULULA : ingadi ihlukaniswe amaploti amane alinganayo. Ngesikhathi esilandelayo sokutshala, dlulisela uhlobo lwezilimo eplotini elandelayo.

From: The People's Farming Workbook, EDA, 1995

5.5 IINDLELA ZENDALO ZOKULAWULA UKHULA NEZINAMBUZANE

Indlela zesintu zokuthintela izinambuzane kunye nezifo kuqiniseko lwenkqubo yokuveliswa kokutya kumanyene needlela ezidibeneyo kwezi zine zilandelayo:

- Ukuphuculwa kokuchuma komhlaaba, impilo yomhlaba kunye namandla okubamba amanzi emhlabeni ukuvelisa izityalo ezinempilo neziqaqambileyo, kusetyenzelwa ngaphezulu kokuqonda ukuba izityalo ezingaphansi koxinzelelo zisengozini yokungenwa zizifo kunye nezinambuzane ezitshabalalisayo.
- Ukutyala ngokuxubanisa kunye nococeko lwasegadini, ukunciphisa uxinzelelo lwezinambuzane ezibhubhisayo kunye nezifo ezithi zenzeke apho kungatyalwanga khona ngokuxubanisa. Kunye nenokwenzeka ngokuthi kusuleleke konke kunye nokuphinda ukusuleleka ngokuqikilela ukususa izozityalo zinesifo, kuphinde kususwe insusela yezinambuzane ezitshabalalisayo. Kuphinde kwandiswe ubukho bamarhamncwa kunye neenyosi okukokwendalo exhaphakileyo yezinambuzane zeegadi.
- Ukutyalwa kweentlobo zezityalo ezinemisebenzi emininzi, kuko kokubini kunyaka wonke kunye nezingapheliyo, ukufaka izityalo ezizigxothayo izitshabalalisi, kwaye ezilawula izitshabalalisi ngendlela. Ezi zifaka:
  - Iintyatyambo ezifana ne marigolds kunye nee-calendula
  - Iziqholo ezifana namalavenda (lavender) ii-rosemary,i-corinda, i-coriander, i-parsley, 1-thyme, i-fennel, i-basil, i-rocket, ingca yelamuni kunye neekonofile lemon grass and garlic chives;
  - Iintlobo zezityalo zamachiza/zonyango okanye amayeza ezifana ne-wormwood bulbine kunye ne bulbinella okuziintlobo zezityalo ezifana nekhala (aloe spp), i-comfrey, i-stinging nettle;
  - Kunye nemithi yemidumba efana ne-Sesbania sesban, i-moringa, udali (pigeon pea) kunye ne-Acacia spp.
- Ukwenza iti noma ukuvubela utywala ngezitshabalalisi kunye nezifo ube ube usebenzisa iindlela zokulawula izifo nezigulo. Nazi iindlela eziqhelekileyo zasemakhaya zokulawula izifo nezitshabalalisi ziquka ukudibanisa upelepele, igalikhi, itswele kunye nesepha eluhlaza (oku kunceda kwizitshabalalisi ezithambileyo njengeentwala), uparafini, itswele (ezi zisetyenziselwa izitshabalalisi ezinemizimba eqinileyo ezifana noonoqongqothwane neetotoviyane), icuba (lisetyenziselwa kuphela kuhlaselo olubi kakhulu nolusindayo). Kodwa ke kukhona ezinye iindlela futhi.

UPHUNYEZO:

- Izitiya, amasimi
- Iihekthara ezingaphansi kuka-0.1, nengu 0.1 ukuya kwenye
- Amaxabiso aphansi, kusetyenziswa izixhobo zasendaweni,
- Kulula ukuya phakathi nendawo ukuyenza kwaye kudinga ulwazi olunzulu

Ulawulo lwegadi oludibeneyo; ulawulo lwamanzi nomhlaba, izityalo ezahlukeneyo, umxube wezityalo ezihlala ixesha elide nezonyaka

Izilwanyana ezitya izinambuzane zilawula izinambuzane ngokuzitya okanye

I-Umbelliferae – ezifana no-anyanisi kunye ne-leek zitsala abatyi-zinambuzane (abazingeli

Iziselo zokulawula izinambuzane; imixube yesepha, itswele netshilisi kunye nekhaphetshu ne-anyanisi – yezinambuzane ezinemizimba

Ii-marigold zikhusela ngokuchasene ne-nematode ezibopha iingcambu

- ***Umzekelo: ngogalikhi***

INDLELA YOKWENZA:
Ungqungqa iiclove inkcoleke, (i-bulb enye, okanye ezimbini eziphakathi nendawo) uyicwinise etispunini ezimbini zamafutha usuku lonke okanye kwiparafini insuku ezimbini. Sebenzisa ingqayi yeglasi, hayi inkonxa. Dibanisa nesiqingatha selitha yamanzi nesepha, uhluze. Dibanisa oku ukwenze kwisiqephu sokuqala neenxalenye ezilishumi zamanzi, ukusebenzise njengetshiza. Yixukuze kakuhle ngaphambi kouba uyisebenzise.
Kujoliswe:

Kwizitshabalalisi gabalala: Iingcongconi, iintwala, iimpukane, iimpethu, amakhalane, iimbovane, oonoqongqothwane, iimopane, iinundu ezibizwa ngokuba yidayimbackback, ubuxoki,bokubamba iintaka, iigrub, iimites, iiborer zeepesika, kunye neentubi.

I-fungi: ukhwekhwe, ukungunda, umhlwa weembotyi, iswekile yetumato.

i-alternaria – ukubola kweziqhamo,i-blotch emfusa, kunye namabala kumagqabi.

i-Cercospora – Ukungunda kwamagqabi, amabala kumagqabi, imigqobho.

i-Colletotrichurn – amabala emagqabini, i-anthracnose, ukubola kweziqhamo, ukutshiza.

Intsholongwane: i-*Xanthomonas* spp.

Amabhola egalikhi

Izibungu zokufaka izinambuzane kunye nenundu ekungezo zenyani

Igciwane (Bacterial blight) kumaqunube ebangelwa yi-Xanthomonas campestris

Iimpawu ze-anthracnose (ezibangelwa yiColletotrichum) kwisiqhamo secapsicum

5.6 ULAWULO LOKHULA OLUMANYENEYO

Ukhulanalo luzizityalo, zamaxesha onke (unyaka wonke okanye ixesha elide), iye ikhule kakuhle, ikhululekile ndawo zonke emadlelweni kunye nasezitiyeni iphinde ibangisane nezityalo ngezondlo nezichumisi, amanzi kunye nendawo.

Isimo sezulu kunye nomhlaba owahluka-hlukeneyo, iindlela zokulima kunye nokuhlakula zixela ukuba hlobo luthile lokhula Luyanda kwaye lubenzima ukuhlakuleka. Umzekelo, ingca yamantongomane kunye nee-sedges zilunga kumhlaba wodongwe kwaye ingathatha indawo ngokupheleleyo xa ukhula lulawulwa ngendlela ngokuba lusikwe ngaphezulu xalukhulayo kuphela, ngekhuba. olukhula luyaphindaphindana ikakhulukazi kwii-ckhorms ngaphansi komhlaba.

Indawo yokutyala eyongamelwe zii-nut grass-ngenxa yokuphindelela ukutyala ngekhuba njengendlela yokumelana nokhula

Ukhula olundlongondlongo lonyaka olufana ne-black jack kunye ne-Amaranthus ithatha indawo xa ukhula lwamva kwixesha lokutyala ingasuswanga, ngengoba imbewu ikhula isabalakefuthi imbewu ingaphila ixesha elide lwamaxesha esomiso.

Ukumanyanisa ulawulo lokhula kudibanisa inani leendlela eazahlukiliyo ezifana nokuphucula ubume bomhlaba kunye nempilo yomhlaba, isigquma nesifudumezi mhlaba, izityalo zokwegquma, ukutyala ngokujikelezisa kunye nokunciphisa izithuba xa utyala. Idibanisa iikhemikhali kunye neendlela zoomatshini zokulawula ukhula. Ukwenza umgquba nako kuyalubulala ukhula, kwaye xa yenziwe ngendlela, inganciphisa imbewu eninzi yokhula endaweni. Ukuhlakula ixesha selidlulile, ukunciphisa imbewu yokhula onyakeni kubaluleke kakhulu.

Indawo elinywe umbona nembotyi ngendlela yokulima izityalo ezahlukileyo, apho ukhula selengamele izityalo.

UPHUNYEZO:

- Izitiya, amasimi
- Iihekthara ezingaphansi kuka-0.1, nengu 0.1 ukuya kwenye
- Amaxabiso aphansi, kusetyenziswa izixhobo zasendaweni,
- Kulula ukuya phakathi nendawo ukuyenza kwaye kudinga ulwazi olunzulu

Ukuvala izithuba nokutyala phakathi kwezityalo kukhusela izityalo ukuba zingongamelwa lukhula– Kwesokudla ngumbona otyalwe wanesithuba esincinci kukhona nokhula oluncinci, ngakwesokunxele ngumbona otyalwe nezithuba

iDock (ngezansi ikhombisa umhlaba omuncu, i-amaranthus (ngasentla kwesokunxele) ikhombisa umhlaba ovundileyo onesakhiwo esibi. Umhlabangula (kwesokudla ngasentla ungathatha izichumisi ezitholakalayo zezityalo)

Ukuvundisa umhlaba ngomgquba kuyayibulala imbewu yokhulakwaye yindlela enhle yokulungisa umanyolo ngaphambi kokuba usetyenziswe njengoba ibuye inyuse isisindo sezondlo kumanyolo.

Ii-Sedges and kunye nee-nutgrass zikhomba ukunqongophala komoya emhlabathini, ngenxa yokucinana nokungabikho esimeni kwesakhiwo somhlaba.

5.7 UKHULISO LWEZITYALO ELUGCINWENI ZIPHINDE ZICAKAZWE

Ukhuliso nocakazo lwezityalo emakhayeni (imifuno, iziqholo kunye neziqhamo) kunye nezityalo ezinemisebenzi emininzi (amachiza, kunye nezixhobo zokulawula izitshabalalisi) ukusukela embewini, ukusika, ukwehlukanisa, i-buld kunye namaKorms zibalulekile ukugcina ziphinde zinyuse ukwahlukana egadini. Azidinge zixhobo zikhethekileyo, kulindeleke ukutyala phakathi, ukutyala iibhegi, kunye nokutyala izithole kwiitreyi. Kwaye ingaphinde ilungiselelwe ngaphansi komthunzi womthi wasekhaya.

Iibhedi zokutyala izithole ziye zenziwe zibe ngamashumi amathathu ukuya kwamathandathu eesentimitha ubunzulu kunye nomgquba omninzi (onjengomanyola, nomgquba) kwaye kumele zibesemthunzini ukugcina imbewu ifumile (kodwa ingabimanzi), ngamaxesha okumila kwembewu kunye nangexesha zisencinci. Ukumilisa ukhulise izithole ngeetreyi kudinga ulawulo olukhulu kwaye kunzima okwenza lemveliso ibe ngokwemvelo (organically). Kodwa kungcono futhi kulula kakhulu ukukhulisa izithole zakho ngamaqela ubuye uuwatshintshe uwaxakaca ukusukela apho.

UPHUNYEZO:

- Izitiya,
- Iihekthara ezingaphansi kuka-0.1
- Amaxabiso aphakathi nenda (imbewu, izityalo, kunye nee-containers), kusetyenziswa izixhobo zasendaweni,
- Inomsebenzi omninzi

Imveliso yezithole endawe evundiswe ngomgquba kakuhle kwenziwa iibhedi zokutyala nomthunzi nesakhiwo seplastiki ukuvikela izithole.

Inursarries ezincinci zasemakhaya ngaphansi komthunzi wemithi zenzelwa ukucakacwa kweziqhamo, kwemithi enemisebenzi emininzi , iizihlahla neziqholo (shrubs and herbs). Iimango, iMoringa zikhuliswa apha.

Isakhiwo esenziwe ngomnatha sanomthunzi senzelwe ukucazwa kwemifuno kunye neziqholo.

Umwoba noomango becakacwe phansi kwi-nurseries ezincinci.

Ii-Tubs nezitya zokukhongozela zingasetyenziswa-kulula ukuzilawula nokuziphatha

5.8 UKUGCINWA KWEMBEWU

Ukugcinwa kwembewu kuyindlela eqhelekileyo kubalimi akasebancinci kunye nakubahlali. Imbewu igcinwa unyaka omnye ukuya kolandelayo ngenxa yobunzima obuya busenyuka besimo sendawo zokukhulisa imbewu. Ngezinga eliphezulu, abalimi amancinci bazothenga imbewu bazame ukuyigcina ecaleni kwimbewu yezityalo evuniweyo; into exela ukuba kobakhona umtsalane omkhulu ekutholakaleni kwembewu yemveli. Ukugcinwa kwembewu kuyinkrubo ebalulekileyo kakhulu ekugcineni imbewu yesintu/yemveliso ikhuselekile kwaye kwaye nabalimi bancamela iintlobo ezahlukeneyo ekungazona izityalo zohlobo, ezisilungeleyo isimo sezulu, izifo kunye nezinambuzane zasekuhlaleni.

Izinto ekumele uzihlalise engqondweni yakho xa ubeka imbewu zezi zilandelayo:

- Kubalulekile ukukhuthaza (izilwane ezincedisayo ngomungu (pollen)) ngakukhulisa intlobo ezininzi zeentyatyambo zezityalo futhi zigcinwe zizintlobo-ntlobo ezahlukileyo ngaphakathi nangaphandle ukurhangqa igadi namasimi kuphinde kunciphise ukusetyenziswa kwezinambuzane.
- Ngcin imbewu yezityalo ezomeleleyo nezinempilo kuphela, ungaze ugcine imbewu yezityalo ezibholayo (seeding eary)
- Khetha phakathi kwezityalo ezintandathu ukuya kwezilishumi elinane ozobeka imbewu yazo.
- Ungaze ubeke imbewu yezityalo ezinesifo okanye ezigulayo
- Imbewu kumele ivuthwe futhi yome esityalweni kangangoko
- Izityalo ekulula ukuba zichumisane zizodwakumele zahlukaniswe (umzekelo ngee-brassica, umbona, iipepa (peppers) kunye nopelepele, amathanga,ilethasi nezinye) endaweni okanye exesheni okanye zivalelwe olugcinweni (use caging).

UPHUNYEZO:

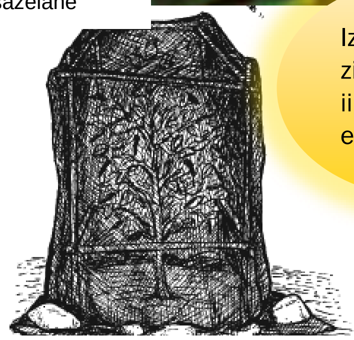
- Izitiya, amasimi
- Iihekthara ezingaphansi kuka-0.1, nengu 0.1 ukuya kwenye
- Amaxabiso aphansi, kusetyenziswa izixhobo zasendaweni,
- Kulula ukuyenza nokuyigcina kodwa kubuye kusebenzise kwaye kudinga ulwazi olunzulu

Igadi yokuvelisa imbewu, nesakhiwo sokugcina, kunye nesithandathu ukuya kwishumi elinesibini lohlobo ngalunye kwiintlobo ezininzi zezityalo zokubeka imbewu zityalwe ndawonye ukunciphisa ukuba zisasazelane

Iintyatyambo nezityalo ukuqhakazisa usasazeko olwenziwa ziinyosi, amabhabhathane kunye nezinye

Izisasazi ziyazithanda iintyatyambo ezahlukeneyo

Ukusasaza ngezandla kombona ukuvelisa imbewu ezokhethwa.



Isityalo sikapelepele esivalelweyo ukuqinisekisa imbewu enkcolekileyo ukuba ingaba luhlobo

5.8.1 UKWENZIWA NOKUGCINWA KWEMBEWU

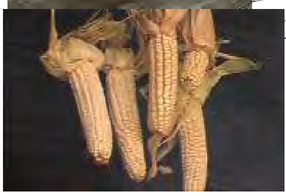
Kukonke, imbewu idinga ukuhlala isendaweni epholileyo, ebumnyameni kwaye ihlale yomile ukugcina umgangatho wokusebenza kwayo kangangoko. Xa imbewu igcinwe kumaqondo obushushu nasekufumeni okwehlukeneyo, iye ikhawuleze ukuphulukana namandla ayo okuntshula. Ngezansi kukhona amanqaku ambalwa abalulekileyo achaza indlela ekuyiyo yokugcina imbewu:

- Ukufuma; imbewu ifunxa ubumanzi obuvela emoyeni. Imbewu idinga ukugcinwa ungaphansi kwamaphesenti alishumi obumanzi kwindawo eyomileyo okanye evalelekileyo emoyeni.
- Qikelela ukupakisha kooplastiki.
- Ukukhanye kuyayinciphisa impilo yembewu, beka imbewu yakho kwindlu okanje ingqayi emnyama. Kufuneka ihlaliswe ebumnyameni.
- Amzinga obushushu; imbewu ihlala ixesha elide endaweni ebandayo hayi kumaqondo angumkhenkce.
- Imbewu efana neyetamatisi kunye ikhukhamba ezegqunywe ngejeli ekuyiyo engqanda imbewu ukuba imile. Lejeli idinga ukususwa, ngaphambi kokugcinwa nokuntshula kwembewu. Le jeli ingavubelwa neswekile emva koko imbewu iyahlanjwa yomiswe.
- Ukomiswa futhi okugqibeleleyo kuyenziwa ngejeli yesilica.
- Ugcino ngothuthu, ikalika, kunye namagqabi esityalo thizeni omisiweyo aphinde agaywa umzekelo, ikhala liyacetyiswa ukuqikilela ukuphepha nokungabikho komonakalo ongenziwa zizinambuzane elugcinweni.

Uvubelo lwembewu yeetumato negooseberry ukuze zigcinwe ziphinde zimile kakuhle

Ngayo yonke ipesenti yokunciphisa ubumanzi kwimbewu, ubomi bembewu buphindeka kabini

Sebenzisa isilicon ukukhupha amanzi kwimbewu nomthuthu ukugcina imbewu



Ubeko nobume apho kwenzelwa khona ugcino lwembewu, ukuqwayita, amaphepha kunye neengqayi zokubeka imbewu.

Beka imbewu kwiingqayi zegilasi

Ubomi bembewu buphindeka kabini ka amazinga obushushu enciphiswe ngamapesenti amahlanu

Beka imbewu kwindawo eyomileyo, epholileyo, ebumnyameni.

5.9 IMVELISO YEZIQHAMO

Ukuvelisa iintlobo ezininzi zeziqhamo kwizinga lasekhaya, ezikwazi ukuhluma ixesha elikhulu enyakeni kubalulekile kukhalo lokusabalalisa iintlobo ezahlukileyo nokomelela. Iziqhamo zingaveliswa zenze imbewu, ukusika, iingcambu, ukwahlulahlulaa kunye nokudibanisa iingcambu. Imithi yeziqhamo idinga ukutyalwa nzulu, kwindawo echumileyo, futhi idinga ukunkcenkcetshelwa, ikakhulukazi xa isemincinci. Idinga ukukhuselwa emoyeni iphinde ithenwe ebusika (iziqhamo ze-deciduous ezifana neepesika, iplums kunye neeapile) okanye ithenelwe ukuvelisa iziqhamo ngokuveleleyo (imithi ehlala iluhlaza efana nesitrasi, oomango, kunye neeavokhado). Izityalo zendalo zilungcedo xa zinokusetyenziselwa ukugqanda izilwane nezinambuzane (ezifana neempukane zeziqhamo, iimbovane, iintwala kunye nezitshabalalisi) kunye nezifo.

Sebenzisa amayeza endalo afana nepyrethrum, amafutha ezembiwa kunye nelime yesulphur. Sebenzisa umgubo weengcambu xa uzohlukanisa izityalo ngokuzisika.

Iintlobo ezahlukeneyo zeziqhamo zikulungele ukutyalwa kwimimmandla eyahlukeneyo yezolimo. Ngokuyintloko, kukhona ezo zidinga ukubanda kobusika (sub-tropical fruit), ezifana neeapile, amapere, amaplums, iidiliya kunye neepesika kunye neziqhamo zetropikhali ezingakwaziyo ukuphila ngaphansi komkhenkce wobusika ezifana neemango,iibhanana, iiavokhado, kunye nee-litchis. Isitrasi yona iyakwazi ukumelana namaqondo obushushu ahlukeneyo, kodwa idinga ukunkcenkcetshelwa ngokwaneleyo.

UPHUNYEZO:

- Iigadi okanye izitiya
- SeIihekthara ezingaphansi kuka-0.1, nengu 0.1 ukuya kwenye
- Amaxabiso aphakathi nendawo (imbewu kunye nezityalo), kusetyenziswa izixhobo zasendaweni,
- Inomsebenzi omninzi kwaye idinga ulwazi olunzulu

Ukunkcenkcetshela umthi weeorenji, nezitya ezibamba amanzi

Imithi yeetumato ecakaciweyo yenza imbewu enevithamini C ezininzi kunye neziqhamo kweyokwindla ukuya kucanzibe apho suke zincinci ezinye iziqhamo.

Ukucakacwa kusukela kwimbewu, igranadila, ukotapeya kunye neemango, igooseberries, kunye nemithi yeetumato.

Sebenzisa amagqabi kunye nezitya zokubamba amanzi ukusebenzisa amaenvula ngokupheleleyo kwimithi

Indlela yasekhaya yokubamba iiimpukane zeziqhamo yenziwe ngeorenji kunye namanzi aneswekile

Tyala imithi kwimingxunya emideegcwaliswe ngomgquba uphinde wenze indawo yokukhongozela iphinde igcine amanzi okunkcenkcetshela

5.10 IMVELISO YEMANGO YENDALO

Iimango zomelele kakhulu kwaye zenza kakuhle kwindawo eziphakathi kobusika nobushushu behlobo. Kuneenhlobo zendalo ezikhuliseka kalula ngembewu. Nezininzi ke intlobo zeemango zanamhlanje ezikhuliselwa ukuba zibenkulu, nencasa kunye nefayibha encinci, kepha ukuvelisa iziqhamowhere ezingqwenelekayo zimeliselwa kwiingcambu eziqinileyo kwaye ezimelana nezofo. Imizekelo yamagama eentlobo eziqhelekileyo kulamaxesha zi-Keit, i-Kent, i-Shelley kunye neTommy Atkins. Ezintlobo zithengiswa njengeziqhamo, ijusi, imango eyomileyo kunye nezikhumba zeziqhamo.

Ukunyuswa kwexabiso leziselo (i-juice) kunye nokomiswa komango

Ngezansi kukho iingcebiso ezimbalwa zokukhulisa imithi yeemango zendalo:

- Yenza umgquba kwinyanga ezine ukuya kwezintandathu ngaphambi kokuba utyale.
- Tyala imithi efunyenweyo kutsha nje yasentlakohlaza kwimngxunya elinganiswelwa kumashumi asithandathu esentimitha (60x60cm) ezaliswe ngomxube womgquba, umhlaba, ikalika, kunye namathambo. Yakha isitya sokunkcenkcetshela esijikeleze umthi ugqibe ubonelele ngesigqumatheli/isifumisi mhlaba.
- Umgquba wongezelelwa unyaka nonyaka, ngemva kokuqhamisa iziqhamo.
- Ukithena kuye kwenziwe unyakaa nonyaka ngemva kokuqhamisa ukuqinisekisa uphahla lomthi oluvulelekileyo, apho zonke iziqhamo zinokuthi zifumane imitha yelanga.
- Imithi esemincinci idinga amashumi amabini ukuya kwamane eelitha zamanzi ngeveki.

IMFUNEKO:

- Imvula: kufanele ibengaphezulu kwamashumi amathathu anesihlanu ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Ubume bendawo: kumele ibesendaweni elithambeka
- Umhlaba: lonke uhlobo
- Ukunkcenkcetshela, indlela yokufukelela emanzini okunkcenkcetshela ibalulekile.

UPHUNYEZO:

- Iigadi okanye izitiya
- Iihekthara ezingaphansi kuka-0.1, nengu 0.1 ukuya kwenye
- Amaxabiso aphakathi nendawo, kusetyenziswa izixhobo zangaphandle nezasendaweni, ukufikeleleka kwiintlobo-ntlobo ezintsha zizityalo
- Kulula ukuyilawula, kodwa ifuna iingcali kwezobuchwephetshe.

Umthi wemango otheniweyo ukhulella emacaleni kabutsha, kunomgquba owongezelwe kwikhongozeli sokunkcenkcetshela nokufumisa.

Umdiliya womfama osemncinci eLimpopo, uzocwaningwa ngumphathi woomango.

Ukuthena, umgquba kunye nesitya sokunkcenkcetshela zifakelwe umthi wemango omdala ukuwubuyisela kwimveliso

6 UKUNGENELELA KWEMFUYO

Ezi ziinkalo zolawulo lwemfuyo okuye kwenzeke zihambisane nokutyala okanye zibandakanyeke ekungeneleleni kwinkqrubo yezolimo ukwenza inkqrubo enye edibeneyo.

Kwelicandelo sizojongisisa iindlela esingaqhuba ngazo ezingathi zinyusele amazinga ziphinde ziphuhlise ifula kunye nokukhethwa kwamadlela angathi ondle imfuyo.

6.1 UKHETHA KWINDAWO ZOLIMO LWEMITHI

Izityalo zemithi zixutywe kulenkqubo yezolima kungaba ngokweziqendu zomhlaba, ukutyala uhlobo olunye lwesityalo okanye phakathi kokutyalwa kwezityalo zonyaka (ngokuqhelekileyo kuye kube kukutyalwa kwengca phakathi kombona-(strip cropping)). Livestock fodder species such as pigeon pea (udali), acacia species (umhlalankwazi), Sesbani sesban (umsokosoko), Moringa olifeara and Leauceana spp are common.

IMFUNEKO:

- Imvula: kufanele ibengaphezulu kwamashumi amathathu anesihlanu ngonyaka (>350mm/year)
- Amaqondo obushushu: angaphezulu kwesihlanu (>5°C)
- Ubume bendawo: kungaba yindawo ezipesenti ezilishumi nantlanu okanye ezilinganiselwa ku 1.5 (1,5&-15%)
- Umhlaba: lonke uhlobo

Imizekelo yokutyala imithi ngeendlela ezahlukeneyo kwenye imbonakalo mhlaba kubekhona udali (i-pigeon peas)

UPHUNYEZO:

- Iigadi, amasimi
- Iihekthara ezingaphansi kuka-0.1, ukuya ku 0.1 nenye, okanye zibengaphezulu kwesibini (>2ha)
- Amaxabiso aphakathi nendawo (ngawe mbewu, okanye ezinye izixhobo zokulima), kwaye kusetyenziswa izixhobo zasekuhlaleni
- Iyasebenzisa kakhulu.

Isityalo i-Sesbania ikhula ensimini kuluhlu lothango

Ibhokhwe idla udali

Umgca we-Moringas etyalwe ensimini encinane

I-Leaucena ityalwe kuluhlu lothango olutyalwe imbotyi (ngaphambili) kunye nombona (ngemva)

6.2 INKQUBO YE-AGRI-SILVIPASTORAL

Inkqrubo ye-Agri-silvicultural iyintlanganisela yokutyalwa kwemithi ebandakanye ukudityaniswa kwezityalo unye nemithi, ngenjongo zokwandisa imiphumela nezibonelelo kweso siqithi.

Iinkqrubo ezitholakala ngaphansi koluhlelo ziquka:

- Ukutyalwa kwe-Alley; ukutyalwa kweentlobo zemithi kuthango okanye ukulinywa kweentlobo ngeentlobo zezityalo kwi-alley phakathi namathango. Izixhobo zemithi zibalulekile ukuphuhlisa ukuchuma komhlaba kunye nokukhula kwezityalo.
- I phuhlisa ii-fallows. Iintlobo zemithi ziye zityalwe zishiywe ukuba zikhule ngemaxesha ee-farrows. Intlobo zemithi ziphuhlisa ukuchuma komhlaba kunye nomthamo wokubamba amanzi.
- Igadi zasemakhaya; ziye zibe busondelana; zibe kwindawo ezininzi ezidibanisa intlobo-ntlobo zemithi kunye nezityalo ezijikeleze imizi. Iphinde ibonelele ngemisebenzi emininzi efana nokwenza umthunzi, amachiza, iziqhamu kunye nefula.
- Imithi enemisebenzi emininzi kumhlaba wezityalo; imithi iyasabalaliswa okanye ilungelelaniswe ngendlela thizeni ehambisana neziqhoboshi, ngemimmandla okanye ibe kwimida yentsimi. Lemithi ikhethelwe ukulungisa initrogen, iphinde ibonelele ngeziqhamo , ngeenkuni zomlilo kunye nefula.

UPHUNYEZO:

- Iigadi, amasimi, imfuyo
- Iihekthara ezingaphansi kuka-0.1, ukuya ku 0.1 nenye, okanye zibengaphezulu kwesibini (>2ha)
- Amaxabiso aphakathi nendawo (ngawe mbewu kunye nezityalo), nezixhobo zasekuhlaleni.
- Iyasebenzisa kakhulu kwaye idinga ulwazi olunzulu.

Utshani bohlobo isesbania sesban-butshalwe ngohlelo lwe Alley cropping endawweni yakwa

Ummbila utshalwe emuva kweminyaka emibili kwakukade kutshalwe udali

Izihlahla zemidumba zityalwe endaweni zamadlelweni, kwenzelwa ukukhangela yimfuyo

Indlela ephucukile yokulalisa insimu-udali otshalwe unyaka owodwa kwase kwangatshalwa lutho emuva kwawo

Ingadi yasekhaya endaweni yakwa Mhlabuyalingana,, KwaZulu Natal: Inxube yezihlahla zezithelo,, imifino kanye nezitshalo

Idlelo lityalwe phakathi kwezihlahla kwi diliya kwenzelwa amadlela kunye nomthunzi wemfuyo.

6.3 ISONDLO KUNYE NOXHASO LWEMFUYO

Ukuxhaswa kwemfuyo ngesondlo kuyindlela yokulawula esetyenziswa ukubonelele imfuyo ngezondlo ezingekhoyo emadlelweni. Lenkqrubo ibaluleke kakhulu ebusika, apha ingca ingqongopheleyo emadlelweni kwaye amadlelo anesondlo esisemgangathweni ophansi kakhulu (umzekelo ukungqongophala okanye ukungabikho kweproteni) Ungakhetha kwiinhlelo ezingezantsi zesibonelelo sesondlo:

- Ukudla okuneeproteni kunye nolwelo olufana ne- Voermol Premix 450 (engumgubo) kunye ne-LS 33 (engamanzi)
- Iinkozo nembewu efana nombona ogutyiweyo, amazimba, nokunye okuninzi.
- Ilitye elikhothwayo, kukhothwa kokubini amaminerali kunye neproteni.

Uxhaso lwesondlo lungaphinde luze ngendlela yeentlobo ezahlukileyo zefula. Oku kumanyene nokukhulisa iintlobo zefula ezinexabiso eliphezulu nelingcono lwesondlo xa lithelekiswa nefula langaku. Intlobo ezininzi zefula zityalelwa ukwandisa uhlaza lwefula olunexabiso eliphezulu ebusika.

Umzekelo wezintlobo ubandakanya: i-Lucerne, ifula le-rye, I -oats emnyama (saia-black oats), i-vetch, i-Teff, ifula i-radish, i-Japanese radish, i-Kale, i-turnips. Iintlobo zengca engatshiyo ehlala iluhlaza nasebusika efana ne-kikuyu kunye neTall fescue zingumbono omhle.Ukondliwa kwemfuyo ngohlobo lovalelo yendlela yokulawula evumela amathole kuphela ukuba akwazi ukungena afumane ukutya okunesondlo okwengezelelweyo ngexesha esancela konini. Amathole aye abe nendlela angina ukuyodla koluxhaso , okuyindawo ebiyelweyo enesango elivulela amankonyane ngokwaneleyo kodwa iphinde ibe mxinwa ukungenisa inkomo endala, yilonto ke le ebizwa nge ‘creep feeding’.

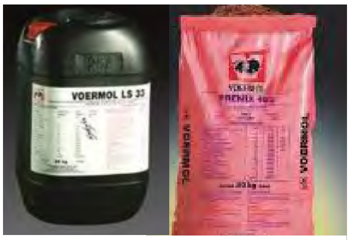
UPHUNYEZO:

- Kudingeka ubenemfuyo
- Iihekthara ezingu 0.1 kuya kwenye, okanye zibengaphezulu kwenye (>1ha)
- Amaxabiso aphakathi nendawo kusetyenziswa izixhobo zasekuhlaleni.
- Iyasebenzisa kwaye idinga ulwazi olunzulu.

Ibhloko yeproteni eyenziwe ekhayeni-lebhloko ibandakanya i-molasses, i-urea, isidle seproteni , isidlo se-urea proteni, umthombo we-phosphorous. Amanzi, isamente encinci kunye netyuwa.

Umzekelo wesondlo sokuvalela (creep) okuyindlela yamankonyane.

Japanese radish



i-LS 33 kunye ne-premix 450

Ukuxhaswa kwefula kwenziwe ngokomisa amagqabi e-Sesbania sesban, ityuwa kunye nombona ogayiweyo.

Isityalo se-vetch kunye nengqolowa i-Saia zityalwe kwinsimi yombona ukuze kutviswe khona ebusika.

6.4 UKONDLA NGESITALI KUNYE NOKWENZA I-HAY

Ukondla ngesitali ngokusisiseko kuchaza ukusika uphinde uthwale isondlo eso semfuyo uyosibeka esibayeni sazo, kanjalo unciphisa umonakalo ungenziwa yimfuyo emasimini kwaye uqinisekisa isandlo esibhetele.

i-Hay yingca yokondla iinkomo eyomileyo ingenziwa ngengca yasemadlelweni, intlobo ezithile zengca ezifana ne-lucerne, i-cowpea, i-Teff nezinye okanye iindiza neentsalela zezityalo. I-bale ye-Hay ingenziwa ibencinane ngezandla kusetyenziswa umatshini wokwenza ama-bale, ikakhulukazi kumafama amancinci.

i-bale le-Eragrostis Teff

I-bale le-Lucerne

UPHUNYEZO:
Kudingeka ubenemfuyo

- Iihekthara ezingu 0.1 kuya kwenye, okanye zibengaphezulu kwenye (>*1ha)
- Amaxabiso aphakathi nendawo kusetyenziswa izixhobo zasekuhlaleni.
- Iyasebenzisa kwaye idinga ulwazi olunzulu

Ukondlela esibayeni

Isitaki sendiza zombona

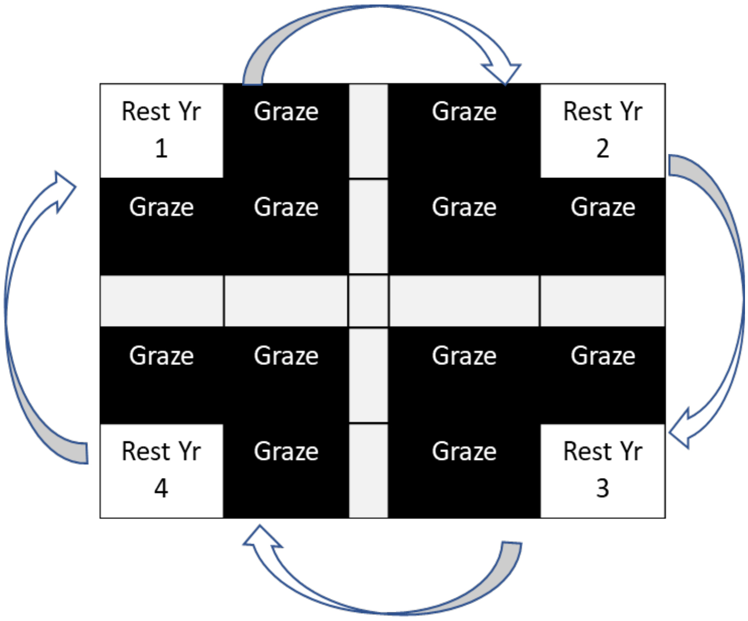
Ukwenziwa kwe-baler lezandla, ne-bale lengca yasemadlelweni

Indiza zemidumba (imbotyi yesoya)

6.5 UKUJIKELEZA AMADLELO

Ukutyisa qho emadlelweni anohlobo lwengca ethandekayo kuyekudambisa ukuthandeka kwayo kwandise izityalo ezingathandekiyo kulondawo. Ukugcina imveliso kumhlaba onengca kuyimfuneko ekuphumzeni ingxenye yedlelo kwixesha lonke lokukhulisa. Oku kuvumela izityalo zengca ukuba zigcine umsoco nezondlo kwiingcambu okuphinde kwnze ingca ibe nomsoco omninzi.

Ngokufanelekileyo enye yekota yamadlelo kumele iphunyuzwe ekudlisweni rhoqo ngemva konyaka abane. Kubalulekile kubafuyi bemfuyo ukusebenzisana ukunza umsebenzi walenkqrubo yokujikelezisa amadle.



Phumula (rest), udule (graze).

UPHUNYEZO:

- Kudingeka ubenemfuyo
- Iihekthara ezingaphezulu kwenye (>1ha)
- Amaxabiso aphakathi nendawo kusetyenziswa izixhobo zasekuhlaleni.
- Iyasebenzisa kwaye idinga ulwazi olunzulu

Ukutyisa emadlelweni ekuqaleni kwexesha, ingca yonke isencinci, ubungqina bubonakala ngokhukhuliseko mhlaba.

Idlelo lexesha lakamva elilawulwa kakuhle, linengca eninzi ebomvu (i-Themeda triandra), ikhombisa ngombala wentloko yembewu eqhakaze ubomvu. Kwegqumeke kakuhle ngengca, kunye nomxube weentlobo-ntlobo ezihlukileyo zengca.

6.6 INTLOBO YENKUKHU YENJONGO EZININZI

Kukho imfuneko yentlobo yenkukhu ezikwaziyo ukumelana nobushushu, kunye noxinzelelo olwahlukileyo, kwaye zibenenjongo ezininzi. Kukho imfuneko kwakhona yenzalo enokuthi iveliswe kwalapha ekhaya kwaye inokukhula ngokutya okuveliswa kwalapha ekuhlaleni. Injongo ezininzi kuthetha intlobo yenkukhu okulungeleyo ukubeka amaqanda kunye nenyama.

Inkukhu yaseBoschveld (**www.boschvled.co.za**) yintlobo esetyenziselwa injongo ezininzi eluphuma eLimpopo, kwaye ngumxube phakathi kwenkukhu zaseVenda, Ovambo kunye neMatabele. Eyona njongo yokufuya ephambili yayikukuvelisa inkukhu eyomeleleyo, engenazingxaki, kwaye ebonelela ngenyama namaqanda. Ziyaqhubeka zibeka amaqanda kangange minyaka emibini enesiqingatha, zikwazi nokumelana nezifo. Imiqhagi ilungela ukuxhelwa kwiveki ezilishumi elinesibini, izikhukukazi zona zinqala ukuzalela amaqanda kwiveki ezilishumi elinesibhozo.

Inkukhu zaseBoschveld zilungele imeko zokuhamba ngokukhululeka kwaye ziyakwazi ukuziqhelanisa noluhlu lwenkqubo zolawulo. Ziqhuba ngcono xa zifumana indawo efanelekileyo yokuhlala, ukutya kunye nokugonywa. Ukuze zisebenze kakuhle kakhulu kwaye zizalele amaqanda, inkukhu zeBoschveld zilawulwa ngendlela efanayo nezinye inkukhu ezibeka amaqanda kwaye zifumana ukutya kwe pullet starter kunye ne grower mash/pellets kwaye kamva zifumane layer mash/pellets. Zifuna ukunikwa ibhokisi zokubeka amaqanda ukuze zibeke kakuhle.

IMFUNEKO

- Imvula: >250mm/ngonyaka
- Ibushushu: >5°C, <40 °C

UKUPHUNYEZWA

- Imfuyo
- 0,1-1ha >1ha
- Ixabiso eliphakathi, izixhobo zasekuhlaleni
- Umsebenzi kunye nolwazi olunzulu

Inkukhu eBoschveld zenza kakuhle xa zinikwe indawo ecocekileyo neyilungele ukuhlala, enendawo yokubhadula. Kufuneka zinikwe ukutya okumgangatho ophezulu. Inyama yezi nkukhu iyafana neyenkukhu ezikhuliswa ngokukhawuleza.

Inkukhu zese Boschveld zibeka amaqanda ngendlela efanayo nezo zibekwayo (layers) ukuba nje zinikwe ukutya okufanelekileyo, amanzi amaninzi kunye nebhokisi zokuzalela ezisemgangathweni. Ziyaqhubeka zizalele kangangeminyaka emibini.

6.7 IMVELISO YOKUTYA KWENKUKHU

Kunokuba nzima ukuvelisa ukutya okupheleleyo kwenkukhu ngoko ke kulungile ukongeza ukutya okuthengiweyo ekunjenge intlabathi, inkozo, umbungu kunye nemifuno eveliswa ekuhlaleni.

- Inkozo yimbewu efana neyamazimba, amabele, ihabile, nombona. Kukwakho imbewu enamazinga aphezulu eprotheyini afana nesoya, i-Sun hemp, kunye nentlobo ngentlobo zembotyi (cowpeas, mung or sugar beans). Umbona otyheli ngumthombo olungileyo kwaye unexabiso eliphantsi.
- Uhlaza/Imifuno: Inkukhu zingazifumanela ngokwazo ukuba uzivumela ukuba zityhutyhe emini, okanye ungazityisa ikhaphetshu, i-comfrey, imifuno, intsalela zemifuno kunye nentlobo ezininzi zeziqhamo.
- Intlabathi (i-grit): ngamatye amancinci anceda ukwetyisa ukutya. Imithombo elungileyo yegrit yintlabathi erhabaxa kunye nengqalutye ezincinci kunye ne grabile ecocekileyo. Inkukhu zingaziqokelela ngokwazo i-grit ukuba zinendawo yokukrwela kuyo.
- Umbungu (grubs): izinambuzane zinika inkukhu uninzi lweprotheyini eziyifunayo ukuze zikhule.

Amantshontsho anganikwa ukutya rhoqo, kanti inkukhu ezikhulileyo zifuna malunga nekota yekomityi **(**1/4) yokutya okomileyo ngosu kwizikhukukazi kunye ne-1/3 yekomityi kwinkunzi.

Ngaphezulu ukusuka ekhohlo ukuya ekunene: IINKOZO: Umbona, amazimba kunye nejongilanga

Ngaphezulu ukusuka ekhohlo ukuya ekunene; UHLAZA: Usithathi onoVithamin A omninzi, umbabazane kunye nelusini

Ngaphezulu ekhohlo nasekunene: I-Herbhi ezifanelekileyo njengeMIFUNO yokutya kwenkukhu zinquka i-comfrey, i-parsley kunye ne-coriander

6.8 IMVELISO YOKUTYA (FODDER) KWEMFUYO

Inxalenye ebalulekileyo kwimveliso esisigxina yemfuyo kukuvelisa ukutya okufanelekileyo (fodder) ukuxhasa imfuyo (inkomo kunye nebhokhwe) xazisitya kumadlelo endalo akumgangatho ophantsi. Amadlelo amuncu kwindawo eziphakamileyo nezinemvula eninzi inomgangatho ophantsi ngexesha lasebusika nakuyo yonke imimandla yamafama asakhasayo ngenxa yokutyiswa ngokugqithisileyo. Eyona ndlela ilungileyo kukufaka intlobo zefodder kwinkqubo yokulima engcina indalo ukuvumela umhlaba kunye nenzuzo zokusingqongileyo, ngelixa kuveliswa ukutya kunye nezityalo zemali.

Kukhoindlela ezimbini: ukutya kwexesha elifutshane (unyaka) kunye nokuhlala ixesha elide. Imizekelo yezityalo zonyaka zasehlotyeni nasebusika yi-Sun hemp, ujongilanga, amazimba, amabele, intlobo zebotyi (iDolichos, cowpeas), itheniphu, i-oats emnyama kunye nemizekelo yezityalo zokugquma ezihlala ixesha elide yiLusini, iLespedeza kunye neTall fescue.

IMFUNEKO

- Ivula: >350mm <1200mm/ngonyaka
- Ubushushu: >5°C
- Ubume bomhlaba: 5%-25%
- Umhlana: Zonke intlobo – nangona imihlaba enesanti kakhulu okanye enodongwe kakhulu kunzima ukuyilawula

UKUPHUNYEZWA

- Imfuyo
- 0,1-1ha >1ha
- Ixabiso eliphakathi, izixhobo zasekuhlaleni
- Ifuna abasebenzi kunye nolwazi olunzulu

Ngaphezulu gasekhohlo ukuya ekunene: Izityalo zokugquma zasehlotyeni (unjongilanga, i-Sun hemp namazimba), imigca ye-cowpeas kunye nombona kunye nezityalo zokugquma zasebusika (Saia oats, fodder rye and fodder radish).

Ngaphezulu gasekhohlo ukuya ngasekunene: Amazimba angatyiwayo zintaka kunye nemigca ye-Lespedeza.

6.9 UKWENZA IBHLOKO ZEPROTHENI

Ezi zinokunikwa njengezikhotha (ilicks) kwinkomo ngexesha lasebusika, kwaye zingathengwa sele zenziwe okanye zenziwe ekuhlaleni. Ibhokisi zokwenza isamente okanye izitena zomhlaba, zisebenza kakuhle ekwenzeni ezi bhloko.

Izikhothwa zeprotheyini ziphucula impilo yemfuyo kunye nenzalo ngokuxhasa izakhamzimba ezinqongopheleyo kumadlelo omileyo, ithi ivuselela umdla wokutya kwaye yonyusa ukutya kwefodder kunye nokwetyisa. Zibonelela ngeminerali ezibalulekileyo, zithintele ukwehla komzimba, zonyuse umsebenzi we-microbial emathunjini, zonyusa izinga lokuzala kunye nokukhulelwa, okwenza ukuba zibe zezona zibalulekileyo ngakumbi ngexesha lasebusika okanye kumadlelo anomgangatho ophantsi.

Ukuzenzela izikhotha ekhaya kudla ngokuba lixabiso eliphantsi kunezithengiweyo, kodwa zibanokusebenzisa. Izithako kufuneka ziqokelelwe. Ngezantsi yitafile enenkcukacha zemfuneko. Zonke zixutywe kakuhle zicinezelwe kwibokisi. Emva kweyure ezimbalwa, ibhloko ziya “kuqina” kwaye zingakhutshwa ukuze zisetyenziswe.

Iveliso	Inkcazelo	Isixa
I-Voermol Procon 33	Le yimveliso eneprotheyini eziphezulu engena-urea, esetyenziselwa ukuxuba ukutya kwemfuyo kunomgangatho ophezu.	32 kg
Ityuwa erhabaxa	Kufuneka ibe ilungele ukutya- ingathengwa kwivenkile ezinkulu. Iyiminerali ebalulekileyo ekutyeni kwemfuyo.	4kg
Umgubo wombona	Uthengwa kwivenkile ezinkulu. Unceda ukugcina ubunzima kunye nokuncancisa kwinkomo	14kg
I-Whitewash	Ithengwa kwivenkile zokuthengisa izinto zokwakha. Kwi-bhloko yeprotheyini inceda ukwenza ukutya kube mnandi ngakumbi, Inika ikalsiyam kwaye isebenze njengeqhina elomeleza ibhloko.	8kg
I-Molasses	Iphucula umdla wokutya kunye nokwetyisa kwaye inika amandla kwinkomo.	16L

Ngaphezulu ngasekhohlo nasekunene: Ukuxuba izithako kunye nebhloko zeprotheyini ezigqityiweyo emva kokukhutshwa kwibhokisi.

.

7 UBUTYEBI BENDALO

Eli candelo liquka imiba yolawulo lwezibonelelo (resources) zendalo kunye namanzi. Kubandakanywa Ukubuyisela kunye nolawulo lokukhukuliseka komhlaba, kunye nokufikelela kwamanzi asekuhlaleni.

7.1 IMITHOMBO NEMIGXOBHOZO

7.1.1 Ufikelelo nolawulo lwamanzi

Umthetho wamanzi olungisiweyo nowahlaziyiweyo (2023) uvumela amanqanaba ahlukeneyo okuzinceda ngokwawo ngokusebenzisana nezigqeba ezilawula amanzi ukuze kuqinisekiswe ukunikezelwa kwamanzi kwinqanaba lasekuhlaleni (lengingqi). Ukusetyenziswa kwamanzi kwinjongo ezininzi kubalulekile kuba intsapho ezisemaphandleni zifuna amanzi okusela angaphezu kwe-25l ngomntu ngosuku, nto leyo esisabelo sasimahla esisetyenziswa ngoGunyaziwe beNkonzo yaManzi. Amanzi ayafuneka kwimpilo, ukuhlamba (ucoceko), kunye nenjongo zokuvelisa. Kwezi nkqubo, kuyacetyiswa ukucoca amanzi kwinqanaba lwasekuhlaleni.

Inketho zokuzinceda ngokwakho lungathatha indlela ezininzi:

- **Ukuzinceda ngokwakho** oku kungumsebenzi oxhasiwe, balawule baze basebenzise inkqubo ngokupheleleyo. Kudla ngokusekwa umbutho osekwe eluntwini nongekho sikweni. Abasebenzisi bathatha isigqibo ngobuchwepheshe, amalungiselelo enkxaso-mali, isicwangciso sokubuyisela indleko kunye nohlobo lwenkonzo abazifunayo. Kuxhaphakile ukukhuselwa kwemithombo yamanzi kunye nenkqubo zamanzi ezincinci ezisebenzisa i-gravity ukuze zidlulisele amanzi kwindawo zokugcina ezincinci (reservoirs).
- **Ukuzinceda ngokwakho okudityanisiweyo** kubonelela ngamalungiselelo apho uluntu luxhaswa yimibutho (ingakumbi iNGOs) kunye nabaxhasi ngemali kwinkqubo zabo zonikezelo lwamanzi kwingingqi. Oku kubonelela ngenkqubo enolawulo olucwangcisiweyo, ukubandakanyeka koluntu ngokupheleleyo kunye nophuhliso lwamandla oluphakathi koluntu ukuze luthathe indima kulawulo nakwinkonzo zokugcina emva kokugqitywa kweprojekthi. Lolu hlobo lulungele indawo ezincinci, ezikwanti.
- **Ukulawulwa kwamanzi ngokubambisana**: phakathi koluntu kunye nabachaphazelekayo abagunyazisiweyo bakaRhulumente kuthathwa njengokhetho olulungileyo. Ngale ndlela abahlali kunye noGunyaziwe weNkonzo yaManzi (iWSA) kunye nababoneleli ngenkonzo zamanzi ngokudibeneyo bathethathethana kwaye bachaze indima yeqela ngalinye kwinkqubo yobonelelo nolawulo lwamanzi. Ngokubanzi uluntu luhlala luthatha indima yemihla ngemihla yolondolozo kunye nokulawula, ngoxa iWSA ithatha uxanduva lwezinto ezinkulu ezifana nokulungiswa okanye ukulungiswa ngokupheleleyo kwenkqubo.

Kufuneka kuqale kwenziwe uhlolo lwemithombo yamanzi ukuze kuqondwe ukuba amanzi asekuhlaleni avela phi, asetyenziswa njani, ngubani owasebenzisayo, kwaye zeziphi ingxaki ezikhoyo kunye nokuqalisa ukucinga ngezisombululo ezinokubakho. Ukukhethwa kwemithombo (imithombo, imilambo emincinci kunye/ imingxuma yamanzi ibhorehole) kuxhomekeke kumandla omthombo, indawo, nokuba ingakhuselwa njani kwaye isetyenziswe njani, kunye nokuba ngubani onokufikelela. Ngokwenene, imithombo yasekuhlaleni inemida ngenani lentsapho ezinokuxhamla kuyo, Ngoko kubalulekile ukujonga umhlaba wonke ukuze kuyilwe i-patchwork yendlela ezahlukeneyo zokuhambisa amanzi ngendlela enobulungisa, ngelixa kukhuselwa indalo kunye nemithombo ekusebenziseni ngokugqithisileyo kunye nokungcoliswa.

Intlanganiso yabahlali yokuvavanya indlela zokusetyenziswa kwemithombo yamanzi eyahlukeneyo, eququzelelwa yiNGO.

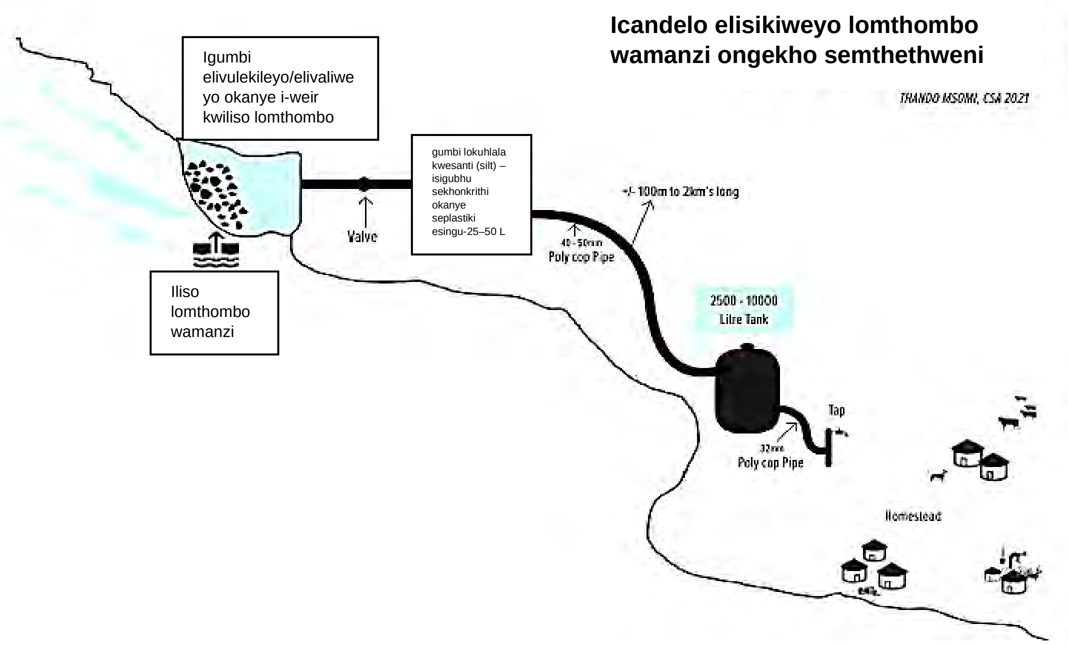
7.1.2 Indlela ezisezantsi zobugcisa zokukhusela imithombo

Imithombo ivela kwindawo xa amanzi angaphantsi komhlaba etyhalelwa phezulu. Oku kwenzeka kakhu kwimigxobhozo nakwimisinga kunye nanjengamajelo avuzayo ecaleni kwemithamo. Imithombo inokuhlala ixesha elide okanye ixesha elifutshane, kwaye inamandla ahlukeneyo. Ukuze ukhuseleke umthombo, ukuhamba kwamanzi kufuneka kungabi ngaphantsi kwelitha ezili-shumi ngomzuzwana.

Ngokuqhelekileyo, yonke imithombo ekhuselekileyo iba nezi zinto zilandelayo kuyilo lwayo: Iliso, igumbi lesanti *(silt chamber),* igumbi lokugcina amanzi *(storage chamber)* sinendawo yokukha okanye itephu. Ezi zakhiwo zinokwahluka kakhulu.

Iliso yindawo apho amanzi aphuma khona emhlabeni. Igumbi lokugcina lidla ngokwakhiwa malunga nale ndawo. Igumbi lentlenga livumela ukuhla kwentlenga. Indawo engaphezulu itsala amanzi acociweyo kwaye indawo esezantsi ikhuhle kwaye icoce intlenga etankinil. Igumbi lokugcina ligcina amanzi okanye liwadlulisela kwizakhiwo ezinkulu zokugcina.

Kukho indlela ezimbini zokulandelwa: (i) ezisemthethweni: ukufakwa kwebhokisi yomthombo (spring box/V-box) njengendawo njengegumbi lokuthatha amanzi (ii) okanye indlela engesemthethweni: ukusebenzisa amatye okanye igrabile ukukhusela indawo yomthombo, ukwakha i-weir, kunye nokubiyela indawo.



Umzobo obonisa indlela yokukhusela umthombo ngendlela engekho sikweni ibonisa igumbi elivulekileyo/elivaliweyo/igumbi elikwilisoi, igumbi lentlenga kunye netanki yokugcina amanzi (Rose, Mojela, Msomi, & Matandela, 2021).

Ulawulo, kunye nophuhliso lwemithombo yamanzi asekuhlaleni, kunye nokulungelelaniswa kwezindlu kunye nezitiya kunokwenzeka kumaqela amancinci asekuhlaleni:

- Amaqela asekuhlaleni asebenza kunye ukuze avumelane ngokuba ngubani oza kubandakanyeka (kungabi ngaphezu kwabantu abangama-20), kwaye kufuneka babe ngabantu abaphila kufuphi kunye nabazibandakanyayo ngokukhuthala kwezolimo.
- Bayebachonge indawo yamanzi kufuphi; iba ngumthombo oqhelekileyo okanye iborehole baze bafumane imvume yokuwusebenzisa kwabasemagunyeni basekuhlaleni.
- Emva koko inkqubo yenzelwe ukuba ibonelele ngetanki yeheader egcwaliswa ngumthombo kwaye emva koko yandiswe igqithiselwe kwindawo zokuhlala kunye nezitiya zabo bonke abathatha inxaxheba.
- Ikomiti yamanzi iqulunqa kwaye isebenzise imithetho yokwabiwa kwamanzi kwikhaya ngalinye kwaye ilawule nayiphi na imali kunye nentlawulo ebandakanyekayo.
- Bonke abathatha inxaxheba kulindeleke ukuba bafake isandla ngokwemali, benza umsebenzi wokufaka izixhobo kwaye balawule amanzi ngokusebenzisana.
- Zonke imvume ezivela kwiziqu zokunika inkonzo zamanzi kunye nabasemagunyeni bengiqhi kufuneka zifunyanwe, kwaye kuqinisekiswe zenziwe ngokuqhubeka kokugcinwa kwenkqubo.

IMFUNEKO

- Imvula: >150mm/ngonyaka
- Ubushushu: >5°C
- Ubume bomhlaba: nakanjani na
- Umhlaba: nawuphi na
- Indawo zamanzi; imithombo, amanzi aphantsi komhlaba

UKUPHUNYEZWA

Intsapho nezitiya

- <0,1ha
- Indleko eziphezulu, izixhobo zangaphandle nezasekuhlaleni
- Ifuna abasebenzi kunye nezakhono ezinzulu; uqeqesho lwasekuhlaleni kunye nenkxaso yobugcisa.

Ngezantsi kukho umzekelo wenkqubo yokhusela umthombo okungekho sikweni eyenziwa liqela lamalungu oluntu e-Ezibomvini, eBergville. Yayiquka ukugrumba idama elincinane malunga nomthombo, ukugrumbela umbhobho obotshelelwe ngaphantsi kwedama ukuze uqokelele amanzi angaphantsi komhlaba, waza wathumela la manzi kwitanki elikhulu elisezantsi

Kwagrunjwa umthombo wenza idama elincinci. Ukhuseleko lomthombo lubandakanya umbhobho ogqunywekumngxuma ogrunjwe ngaphantsi kwedama uze ugqunywe ngegrabile, inethi yomthunzi kunye nomhlaba, ukuze ukhuselwe. Ngale ndlela umthombo unokukhuselwa, ngaphandle kokwakhiwa okukhulu.

Umzekelo wetanki ukusuka apho amanzi atsalwa khona

Umzekelo wodibaniso lwamanzi kwintsapho: lamagubu adityaniswe kwaye ane-valve egcina amanzi emi xa sele egcwele.

Enye indlela kukwakha i-V-box encinci ngaphakathi kwi-weir, kunokwakha isakhiwo esivaliweyo malunga neliso lothombo. Lo ngumbono olungileyo xa iliso lomthombo lithanda ukuvela kwindawo ezahlukeneyo.

Umsele wokukhupha amanzi angaphezulu wembiwa ngentla wajikeleze indawo yomthombo ukuphambukisa ukuphuma kwamanzi angaphezulu ekungcoliseni umthombo. Oku kufuneka kugrunjwe ubuncinci be-8m ukusuka kumthombo, kude ukuba kunokwenzeka. Indawo ke kufuneka ibiyelwe ukuze ikhuselwe kwzilwanyana nabantu. Ngezantsi kukho umzekelo omncinci wendlela le nkqubo yolwakhiwo eyathi yasetyenziswa yaze yalungiselelwa ukhuseleko lwemithombo yamanzi kunye nenkqubo yokwahlulwa-hlulwa kwelali yaseCostone eBergville, KwaZulu-Natal. Kule meko igumbi lokuqokelela lakhiwe eludongeni lokuqokelela amanzi, indawo esemva kodonga lokuqokelela

amanzi / idama yayizaliswe ngamatye kunye namatye amancinci kwaye indawo yabiyela. Le mifanekiso ingezantsi iyalathisa.

Ngaphezulu ekhohlo ukuya ekunene: umthombo ngaphambi kokhuseleko eStulwane, eBergville. Udonga olugcina lamanzi kunye nebhokisi ye-v kwikona esezantsi kwaye igqunywe ngamatye, igrabile kunye nesanti ejonge kwiliso. Ukwakha kwimibhobho yokuphuphuma. Imithombo ekhuselweyo enocingo olujikelezileyo ukuyikhusela kunye nommandla omncinci

wokutsala amanzi ngaphezu komthombo.

Uphayiphi wamanzi ophuma kwi-V-bhokisi edongeni lokubamba amanzi udlulisela amanzi kwitanki zokugcina amanzi. Kukho indlela ezininzi ezinokwenziwa. Kumzekelo wethu waseCostone eBergville, kwenziwa isiseko sekhonkrithi ukufaka itanki ezimbini zeJo-Jo e ezidityanisiweyo ze-2500L. Ukusuka apho kwafakelwa imibhobho ukuya kwimpompo ezine, ukuvumela ukufikelela kwamanzi kwinqanaba lekhaya elingekho ngaphezu kwemitha eziyi-200 ukusuka kumzi ngamnye oxhaswayo ngale nkqubo incinci.

Ngaphezulu ngasekhohlo ukuya ekunene: Ukwakhiwa kweqonga lekhonkrithi letanki. Itanki ezimbini ze-Jo-Jo ezingama-2500l ezidityanisiweyo. Ukumba imisele nokubeka imibhobho impompo zabahlali. Umzekelo wetaphu yoluntu egqityiweyo.

Ezi nkqubo zamanzi ezilawulwa luluntu (ukuzinceda ngokwakho) zithintelwa yimeko yomhlaba, amandla omthombo, kunye nomgama oya kumakhaya. Kubalulekile ukuqinisekisa ukuba ezi nkqubo ziyilelwe ukunika isixa esifanelekileyo samanzi (100-500l/ngosuku) kumakhaya athatha inxaxheba. Abantu bonke kufuneka baqonde ukuba umxholo wazo kukubonelela ngamacandelo amancinci okuphakela amanzi kwintsapho ezithile kuphela, ngendlela yokuba onke amakhaya ekugqibeleni afakwe kwimithombo eyahlukeneyo. Le yindlela yokulawula ukufikelela ngokulinganayo, kunokuba kube kukufikelela ngokuphandle. Imithombo yoqobo ekhuselweyo ihlala ivulekile ukuze isetyenziswe luluntu ngokubanzi kwaye oku kufuneka kucwangciswe kuyilo lwenkqubo. Ukongeza, ukucwangciswa kwendawo zokusela imfuyo yenye yezona zinto zibalulekileyo kwezi nkqubo.

Ikomiti zamanzi ezijongene nenkqubo zokufikelela kwamanzi asekuhlaleni zinendima kunye noxanduva olulandelayo:

- Ithatha uxanduva lwengxaki ezivela kwinkqubo.
- Ilungisa iingxaki ezinxulumene nabantu abangayilandeli imithetho
- Yabela ukusetyenziswa kwamanzi kwaye iqinisekise ukuba wonke umntu ofanelekileyo uyafumana
- Ijonga rhoqo ukuba isixokelelwano siyasebenza kwaye sisetyenziswa ngokufanelekileyo.
- Ivula i-akhawunti yebhanki yeminikelo kwaye yenza imisebenzi emincinci yokugcina.
- Ibiza iintlanganiso kunye yamalungu ukuze inike ingxelo malunga nemibandela yokusetyenziswa kunye nokugcinwa kwaye ifumane imvume yokusebenzisa imali kwimisebenzi ethile.
- Inxibelelana nekomiti yamanzi ekwinqanaba loluntu kunye nolawulo lwesintu kunye noceba
- Icele uncedo kwikomiti yamanzi yenqanaba loluntu xa kukho ingxaki abangenako ukuyisombulula.

7.2 UKUBUYISELWA KOMNGXOBHOZO

Umgxobhozo ngumhlaba ophakathi kwendawo ezomileyo kunye nezozinamanzi apho inqanaba lamanzi libaphezulu okanye kufuphi nomphezulu, umhlaba ugutyungelwe ngamanzi amaxesha athile. Izityalo ziqhelene nokuphila kumhlaba omanzi/ efumileyo

Indidi zemigxobhozo yasemilanjeni neye-palustrine zifumaneka kwindawo ezinentaba. I-Palustrine yimigxobhozo engenamanzi avulekileyo, njengemigxobhozo, amadlelo afumileyo, namadlelo amanzi. Imigxobhozo yasemilanjeni ifumaneka kwindawo ezincinci ezikufuphi nemilambo namajelo.

Umzekelo womgxobhozo omncinci ococekileyo nosebenzayo obonisa uhlaza olwahlukeneyo kunye nogubungelo lomhlaba

Imigxobhozo ibalulekile ngenxa yokuba: icoca amanzi, ibonelela ngokunciphisa umfutho wamanzi, ilawula izikhukhula nembalela, ibonelela ngezityalo zendalo kunye nepaseji zokuhamba kwezilwanyana zasendle, ibonelela ngezixhobo zokuphila kwengingqi kwaye inexabiso lenkcubeko.Ukusetyenziswa ngobulumko kubandakanya ukugcina umsebenzi wendalo, ngelixa kuvunyelwa ukusetyenziswa kwendawo kunye nokuziphilisa kwabantu balapho. Sisiqingatha esibalulekileyo esithintela ukungavumeli ukonakala kwemigxobhozo.

Umzekelo yendonga ezakheke kumgxobhozo ezintabeni ngenxa yokusetyenziswa gwenxa kwobutyebi bendalo kunye nokutsha rhoqo.

UKUPHUNYEZWA

Ulawulo lobutyebi bendalo: ulawulo lokhukuliseko

- 0,1-1ha >1ha
- Indleko eziphakathi, izixhobo zasekuhlaleni
- Abasebenzi nolwazi olunzulu

Amanyathelo okubuyisela kwisimo sangaphambili abandakanya iplagi/izithintelo kwimijelo yokuhambisa amanzi, izakhiwo zokulawula ukhukuliseko, ukususwa kwezityalo ezisuka ngaphandle, ukunciphisa ukutshisa, kunye nokuncipha koxinzelelo lokutya kwemfuyo. Ukuqala phezulu kwemigxobhozo ngowona mbono olungileyo.

Ngezantsi kukho umzekelo womlambo okhukulisekileyo onemigxobhozo eyathi yabuyiselwa kwisimo sangaphambili kusetyenziswa indlela ezininzi ezahlukeneyo: amadama okuhlola, indonga zamatye, ingubo zokulawula ukhukuliseko kunye nokubiyela.

Imifanekiso ecaleni ibonisa: (1) umjelo okhukulisiweyo kunye nomgxobhozo omncinci okwindawo eziphakamileyo ngexesha lasebusika, nto leyo ebonisa ukhukuliseko, ukulusa ngokugqithisileyo kunye nomonakalo ovela kwimililo yasendle; (2) i-eco champs ezakha amadama okujonga kwimijelo yomlambo; kwaye (3) iziziba ezincinci ezilandelelanayo ezinciphisa amandla okuhamba kwamanzi kunye nokuthintela amatye ukuba angakhukuliseki ehle nomlambo.

Ukwakhiwa kwendonga zamatye ecaleni kwengxangxasi nakwimiphetho yemijelo kwenza ukuba kuncitshiswe ukuhla komhlaba ungene kumjelo.

Umfanekiso osekunene ubonisa umda womlambo otyibilikayo, apho (ngasekunene kude) kusetyenzisweiingubo zokulawula ukhukuliseko lomhlaba (zenziwe ngenethi yokukhusela elangeni) kwindawo ezityibilikayo. Zenza ukuba amanzi ahambe kancinci, zigcina umhlaba endaweni yawo, zikhusele imbewu ukuba ingakhukuliseki, ngelixa zivumele amanzi nokukhanya ukuba kugqithele ngaphakathi ukukhuthaza ukukhula kwezityalo zendalo.

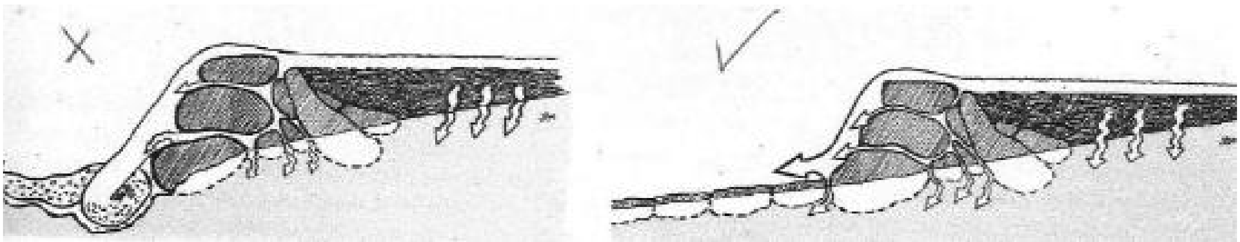
Le ndawoyabiyelwa ngocingo ukuze kuncitshiswe ukuhamba kwemfuyo kunye nomonakalo kwindawo.

7.3 AMADAMA OKUHLOLA

Idama lecheck lidama elincinane, ngamanye amaxesha elethutyana, elakhiwe ngaphaya komsele wokuhambisa amanzi, okanye emlanjeni ukulwa nokhukuliseko lomhlaba ngokunciphisa isantya sokuhamba kwamanzi kunye nokuvumela ukuzinza kwentlenga/udaka. Izinto ezahlukeneyo zingasetyenziswa ekwakheni eli dama, kuquka umhlaba, amatye, inkuni kunye nezihlahla**.**

Njengoko udaka luqokeleleka emva kwamadama wokuhlola, anokuhlaziywa kwaye aphinde enziwe phezulu okanye ingca nezinye izihlahla zingatyalwa kudaka oluqokelelekileyo kwaye yenziwe phezulu.

Amadama etshekhi akhiwa ngokubeka amatye amakhudlwana kwicala elisezantsi, ezantsi komsele onqumla kumjelo, kunye nokwenza iepro ngaphantsi kwedama lokutshekisha.



IMFUNEKO

- Imvula: >150mm/ngonyaka
- Ubushushu: >5°C
- Ubume bohlaba: 5%-25%
- Umhlaba: Zonke intlobo– ngakumbi apho amatye afumaneka lula

UKUPHUNYEZWA

- Igadi, amasimi
- <0,1ha, 0,1-1ha, >2ha
- Ixabiso eliphantsi, izixhobo zasekuhlaleni
- Ifuna abasebenzi abaninzi

Imizekelo emibini yamadama etshekhi ebonisa: 1- Indlela idama letshekhi elifakwa ngayo emenjelweni kwaye lakhiwe ngamaxesha athile enqumla kumjelo kunye 2- indlela udaka oluqokelelwa ngayo ngasemv kwedama letshekhi evumela ukuhluma kwakhona kwezihlahla

7.4 IMIGCA YAMATYE

Imigca yamatye yiyantlukwano kwingqikelelo yepakethi zamatye/amadama etshekhi, kwaye zizakhiwo ezincinci ezakhiwe kwikhonto kumhlaba othambekayo.

Kufuneka kusetyenziswe umgaqo ofanayo wokucwatywa kwamatye (keying in) kumathambeka. Oku kuthetha ukumba umsele omncinci ukuze kubekwe umaleko wamatye amakhulu ezantsi, ukuze kuthintelwe ukuba amatye angaqengqeleki ngezantsi. Kwakhona, amatye amakhulu abekwa ezantsi kwethambeka, aze agcwaliswe ngamatye amancinci kwicala elingaqenqqelekiyo ngaphezulu aphokuthambekayo.

Kuyenzeka ukuba imigca yamatye uguquguqulwe ukuze ilungele imeko zokhukuliseko kunye nempawu zomhlaba (topography) wendawo.

Imifanekiso emibini engasekunene ibonisa indlela ezahlukeneyo zemigca yamatye ezisetyenziswa kumathambeka anendlela ezininzi ezincinci zamanzi ezikhula zibe zindonga.

7.5 UPAKISHO LAMAGATYA

Le yenye indlela yokwakha isithintelo esingagqithisiyo (porous barrier) kwi-khoto ngenjongo yokunciphisa ukhukuliseko. Le ndlela iluncedo kwindawo apho kungekho matye maninzi okanye kunzima ukuwafumana. Ukupakishwa kwamagatya/amahlahla kubandakanya ukusebenzisa imithi okanye amasebe kwindawo ezokhukulisekileyo nakwindonga ezincinci ukuze kuncitshiswe ukuhamba kwamanzi, kuqokelelwe udaka, kwaye kuvumeleke ingca ukuba iphinde ikhule. Udaka luqokelelwa ngasemva kopakishoi, kwaye imbewu ingatyalwa kwezi ndawo.

- Inyathelo lokuqala kukugudisa imiphetho yodonga kunye nokususa izithole/ukhula.
- Emva koko kusetyenziselwa ama-A-fram ukuphawula ikhoto, ngohlukano lomphakamo oluyi-1m – ngokuqhelekileyo umgama -4-5 m phakathi kwemigca.
- Kufuneka kusetyenziswe amahlahla/amagatya asuswe kwipaki. Imigca emibini yepali, kumgama oyi-30cm phakathi kwazo, ibethelwa kwikonto emakiweyo, aze amagatya apakishwe phakathi kwepali kwaye abanjwe zipali ukuze angasuki.

Ngentla: Imifanekiso ebonisa ukugudiswa kwemiphetho, emva koko imigca yepali ibekwe kwikhoto kwaye izaliswe ngamagatya avela kwipaki esusiweyo. Umfanekiso osemazantsi ekunene ubonisa amagatya apakitshiweyo emva kwexesha, apho udaka luqale ukuqokeleeka kwicala elingasentla komphakisho.

7.6 UKUBUYISELWA KWENDLELA

Indlela kwindawo ezinentaba nemigxobhozo zihlala zikhukuliseka ngokuhamba kwexesha kunye nokusetyenziswa kakhulu. Izisombululo ezisekelwe kwindalo (Nature-based) ekwakhiweni kwakhona kwendlela zokunciphisa ukukhukuliseka ziquka indlela ezininzi.

- Ukubekwa kwamatye: Indlela ijikwa ibe ngamanyathelo ngogrumba amatye kumphezulu wendlela, agunqulwe icala elithe baca libengaphezulu.
- Indlela zoguqulo lomhlaba: Kumhlaba 'ombi' apho zenzekayo indledlana ezininzi kunye nendonga, umhlaba uyagrunjwa kwaye ubekwe umhlaba ongaphantsi komhlaba, ukuze kwenziwe indlela ephakamileyo enemisele yokukhupha amanzi ecaleni.
- Ibhari zamanzi (Water bars): Zizigodo ezibekwe kumgama we-30° endlela, kunye nomsele omncinci owakhiwe ngaphezulu kwayo ukuze ukhuphe amanzi ngokukhuselekileyo endleleni.

IMFUNEKO
- Imvula: >350mm
- Ubume bomhlaba: 1, 5%-25%
- Umhlaba: Zonke intlobo – nangona imihlaba enesanti kakhulu okanye enodongwe kakhulu kunzima ukuyilawula

UKUPHUNYEZWA
- Ulawulo lobutyebi bendalo: ulawulo lokhukuliseko
- 0,1-1ha >1ha
- Ixabiso eliphakathi, izixhobo zasekuhlale,
- Iyasebenzisa

Ukufakwa kwamatye-ukudalwa kwamanyathelo kwindlela ezikhukulisekileyo. Kusenokufuneka ukuba kugudiswe kancinci umhlaba kunye nasecaleni kwendlela ukwenza indawo ethambekayo efanelekileyo apho indlela kufanele ibe khona, kwaye kususwe indlela ezincinci ezisebenza kakhulu.

Indlela zokuguqula umhlaba zenziwe kumabala omhlaba **amabi** okanye kwindawo ezimanzi ngamaxesha athile onyaka.

Ibhari zamanzi: -Zizigodo ezibekwe kumgama we-30° endlela, kunye nomsele omncinci owakhiwe ngaphezulu kwayo kwaye ugcwaliswe ngamatye amancinci kunye negrabile. Ukuphuphuma kwamatye kudalwa yi-apron