

# CLIMATE RESILIENT AGRICULTURE: PRACTICES FOR SMALLHOLDER FARMERS VOLUME 2 PART 6 FARMER HANDOUTS: ISIXHOSA

*E Kruger, MC Dlamini, T Mathebula, P Ngcobo, BT Maimela & S Ntonta*



**WATER  
RESEARCH  
COMMISSION**

TT 841/7/20



# **Climate Resilient Agriculture: Practices for Smallholder Farmers Volume 2 Part 6**

**Farmer Handouts: isiXhosa**

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**Water Research Commission**  
by  
**Mahlathini Development Foundation**



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**Volume 1:** Climate Change Adaptation for smallholder farmers in South Africa. An implementation and decision support guide. Summary report. (WRC Report No. TT 841/1/20)

**Volume 2 Part 1:** Community Climate Change Adaptation facilitation: A manual for facilitation of Climate Resilient Agriculture for smallholder farmers. (WRC Report No. TT 841/2/20)

**Volume 2 Part 2:** Climate Resilient Agriculture. An implementation and support guide: Intensive homestead food production practices. (WRC Report No. TT 841/3/20)

**Volume 2 Part 3:** Climate Resilient Agriculture. An implementation and support guide: Local, group-based access to water for household food production. (WRC Report No. TT 841/4/20)

**Volume 2 Part 4:** Climate Resilient Agriculture. An implementation and support guide: Field cropping and livestock integration practices. (WRC Report No. TT 841/5/20)

**Volume 2 Part 5:** Climate Resilient Agriculture learning materials for smallholder farmers in English. (WRC Report No. TT 841/6/20)

**Volume 2 Part 6:** Climate Resilient Agriculture learning materials for smallholder farmers in isiXhosa. (WRC Report No. TT 841/7/20)

**Volume 2 Part 7:** Climate Resilient Agriculture learning materials for smallholder farmers in isiZulu. (WRC Report No. TT 841/8/20)

**Volume 2 Part 8:** Climate Resilient Agriculture learning materials for smallholder farmers in Sepedi. (WRC Report No. TT 841/9/20)

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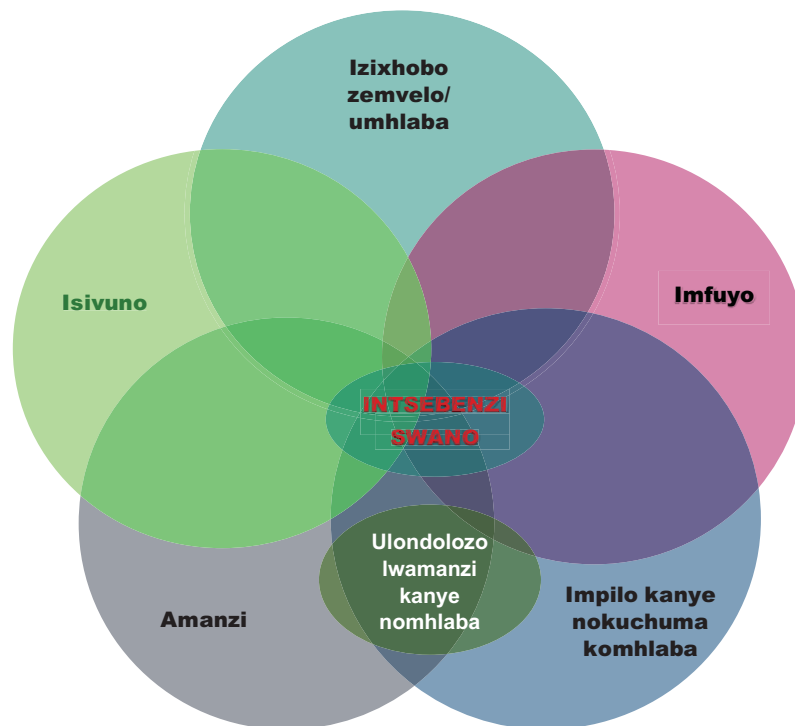
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# Uhlelo Lwezolimo Olulungiseselwe ukomelela Nokumelana Noguquguquko Lwesizo Sezulu: Lulungiselelwe Abalimi Abasakhasayo

## 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 nezinguquguquko.

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: uphuyezelo 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 kafutshane ngezantsi. Ulwazi oluthe vetshe luyafumaneka kulamacandelo alandelayo

[www.mahlathini.org](http://www.mahlathini.org) , [www.amanziforfood.co.za](http://www.amanziforfood.co.za)

## 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 nama fama asakhasayo eminyakeni emithathu ukuya kwemine eyedlulileyo. Ngokoke sinesiqiniseko sokuba ziyasebenza, Nani ke siningqwenenelela amathamsanqa nempumelelo nisazozama ezinhlelo.

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

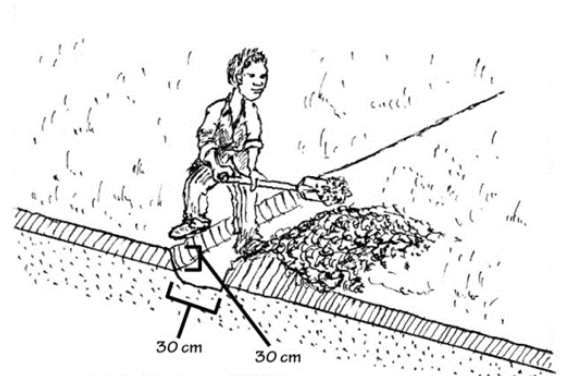
### 3.1 IMISELE YOKUNGENISA AMANZI NGAPHANTSI KOMHLABA (UMSELE OGJIMISA AMANZI, UMSELE OPHAMBUKISA AMANZI)

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.

Ukutyalala 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 ( $>150\text{mm/year}$ )
- Amaqondo obushushu: angaphezulu kwesihlanu ( $>5^{\circ}\text{C}$ )
- 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 ( $>15\text{cm}$ )



#### UPHUNYEZO

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



Umsele ophambukisa amanzi, wafunisiwa 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



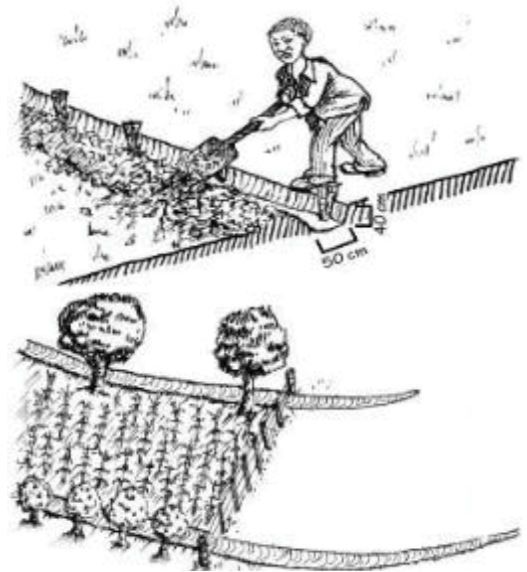
Ukulungiselela ummango womsele ophambukisa amanzi ukuze kutyalwe kulungelelene kwaye kongezwe umgquba

### 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 ( $>150\text{mm}$   $<1200/\text{year}$ )
- Amaqondo obushushu: angaphezulu kwesihlanu ( $>5^{\circ}\text{C}$ )
- 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 aphantsi
- 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 (>5°C)
- 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 aphantsi
- 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

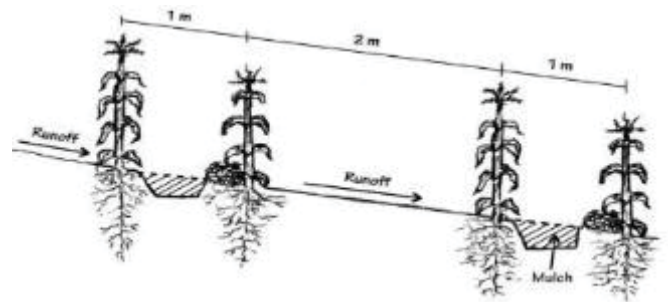
### 3.4 IMIMMANGO EDITYANISIWEYO

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

Iziza zenziwe ngokomba imisele enzulu malunga nolangca 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 ( $>5^{\circ}\text{C}$ )
- 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

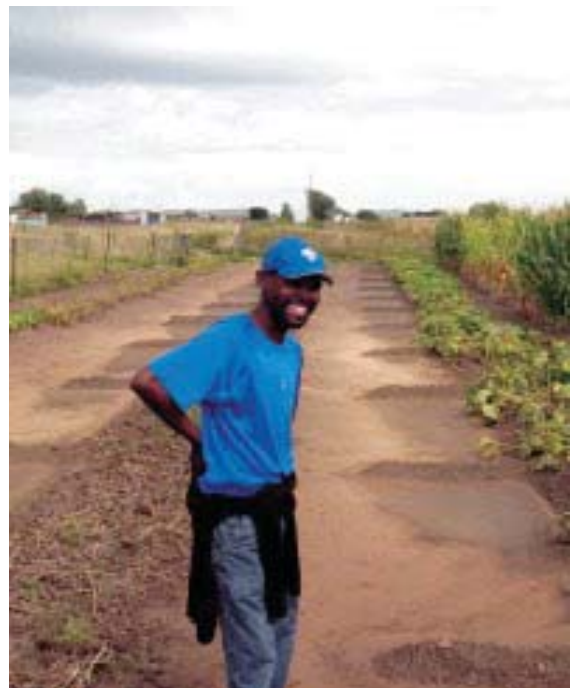
- Kufanele ubenegadi, amasimi
- Angange hectare enye ukuya ku 0.1 ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphantsi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe



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 izalisekисwe 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°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 nokukucina, 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 yeelitha 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 aphantsi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe



Iintsalela zamagqabi zibekelwe ukufumisa iibhedlzi 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

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



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

Ezitonele zilungele/zifaneleke nakweyiphi indawo apho kutyaleka khona, ezibhedhi zemijelo zonazingembelwa zigqibe zibonelelwe nganzi okunkcencetshela.

#### UPHUNYEZO

- Kufanele ubenegadi
- Kungaba ngu 0.1 wehectare ubukhulu begadi
- Kuneendleko ezifikelekayo, 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: 'Ukutyalala' 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 kokusukunywisa kwetonela, kugqibe kucokisiswe ke indlela umnatha ongene ngayo ukuba ukhusele itonela ndawo zonke. Iminathi erhangqe apha emazantsi ivembelwa ukwandisa ukhuseleko nokomelela ukumelana nemimova ebhudlavo.

### 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.

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 nebhithumene.

#### IIMFUNeko

- Imvula: engaphezulu kwamakhulu amane anamatshumi amahlanu yeelilitha ngonyaka (>340mm/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
- 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



lindlela zasekukhuleni zokuqokelela uphinde ugcine amanzi, yenziwa eLimpopo; Izikhongozeli zamanzi, amakhulu amabini anetshumi leelilitha zamagubu; iwaka leelilitha zezikhongozeli kunye nooJojo tanki. Ezi zibamba amanzi amancinyane.



Itanki elenzelwe ngaphansi komhlaba lanyuswa ngodonga olusamentiweyo



Umzekelo wetanki eyembelweyo (engamatshumi asibhozo eemitha (18m³), ebekelwe uphahla olusukayo ukwenzela ukhuseleko.



Ugibe wokukhusela umhlaba nenhlenga kwitanki eyembelwe ngaphantsi komhlaba elinganiselwa kumawaka amabini anesihlanu eelilitha, ukunciphisa intlenga eyehlala emanzini agciniweyo.



Itanki esigqityiwe eyenziwe ngodonga lwezitena, yagqunyathelwa ngophahla ukukhusela.

### 3.9 UQOKELELO NOGCINO LWAMANZI; NGAMA TANKI (OOJoJo-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 njengeny yendlela yokuqokelela amanzi asuka ngasenhla kwethambeka. Koluhlobo lokwenza, amatanki angongliwa ngamanzi aitsalekelayo ngaphandle kokumpontswa okanye ukuthuthelwa ngee- emele

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

| Month | Average Monthly rainfall (mm) | Roof area (m <sup>2</sup> ) | Runoff coefficient | Runoff volume (litres) |
|-------|-------------------------------|-----------------------------|--------------------|------------------------|
| Jan   | 115                           | 43.6                        | 0.9                | 4513                   |
| Feb   | 123                           | 43.6                        | 0.9                | 4827                   |
| Mar   | 109                           | 43.6                        | 0.9                | 4277                   |
| Apr   | 78                            | 43.6                        | 0.9                | 3061                   |
| May   | 61                            | 43.6                        | 0.9                | 2394                   |
| Jun   | 35                            | 43.6                        | 0.9                | 1373                   |
| Jul   | 30                            | 43.6                        | 0.9                | 1177                   |
| Aug   | 35                            | 43.6                        | 0.9                | 1373                   |
| Sep   | 55                            | 43.6                        | 0.9                | 2158                   |
| Oct   | 60                            | 43.6                        | 0.9                | 2354                   |
| Nov   | 80                            | 43.6                        | 0.9                | 3139                   |
| Dec   | 95                            | 43.6                        | 0.9                | 3728                   |
| TOTAL | 876                           |                             |                    | 34374                  |

Itafile engentla ikhombisa isixa samanzi angakwazi akulobeka agcineke kwimizi.



Impompo yokumfifitha 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.



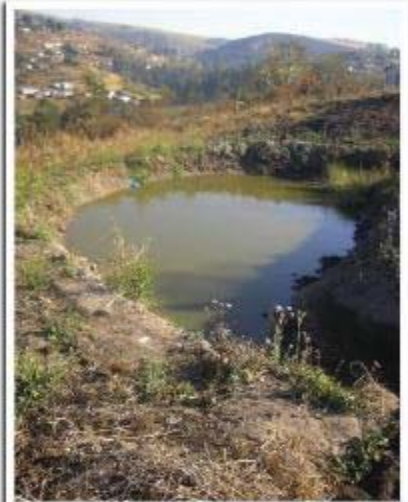
OoJoJo tanki abambelwe ngaphansi komhlaba ukuze kugcinwe amanzi.

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

Kunokwenzeka futhi ukuba kukelise 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 kuboniswa 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 lasekuhlaleni asebenza kunye ukuvumelana ngabo banokuthi babandakanyeke (abantu ababeqiyo kumashumi amabini), abantu abazolingeka ukuba babandakanyeke ngokusebenza kwezolimo baphinde babakufutshane nabanye.
- Baya bachonge umthombo wamanzi wasekuhlaleni, onamanzi angapheliyo okanye umthombo 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 ababandakanyekayo 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.

#### IMFUNKEKO:

- Imvulal: kufanele ibengaphezulu kweshumi elinantlanu eemitha ngonyaka
- Amaqondo obushushu: angaphezulu kweshumi ( $>5^{\circ}\text{C}$ )
- Ubume bendawo: Kungaba noma lithambeka elinjani
- Umhlaba: lonke uhlobo
- Umthombo wamanzi; amanzi aphantsi kohlabi.

#### UPHUNYEZO:

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



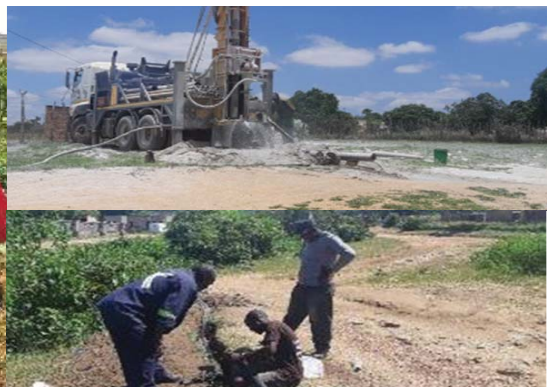
Umthombo owembelwe ukwenza idamu. Ukukhuselwa komthombo kubandakanya ukugqunyathelwa kwemibhobho emiseleni eyembelwe eyembelwe ngaphansi kwedama ephinde yembozwe ngotyando (gravel), umnatha womthunzi kunye nomhlaba, ukuze ukhuseleke. Ngoluhlobo umthombo uyakhuseleka, ngaphandle kwezakhiwo ezinzulu.



Umzekelo wetanki eyintloko esuka kwimvelaphi yomthombo ethlelela 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 lokunkcencetshela oluphephisa lwamanzi amdaka ukuba adibane namagqabi ezityalo.

Iindlela ezintathu zokusebenzisa amanzi amadaka zichazwe ngezansi:

#### 1. Ikithi zokwenza iipheyile zilungele ukunkcencetshela ngamaconsi

Ezi zee zindlela zokungcencetshela ngamaconsi ezencelwa umntu ngamnye, ziba yimitha enye (1m) ukuvuleka, zibe ziimitha ezintlanu ubude (5m) kunye neepheyile ezingamashumi amabini eelitha (20L). Lekithi yokunkcencetshela iye iqokelelwe idityaniswe kwindawo yokulima ukuze ukwazi ukuzenzela iintambo zakho zokuconsisa amanzi okunkcencetshela, ukhethe ububanzi bemigca kunye nezithuba zokukhupha amanzi ngamaconsi. Ixesha elininzi kuye kusetyenziswe imigca emibini yezinnkconkcozisi, ezilingana namashumi amathathu ukwehlukana. Ukunkcencetshela kwenziwa nsuku zonke.

Ezipheyile zingaphinde zifakwe Isanti ukuhlulwa intlenga nokungcola kulamanzi amdaka ukuwenza alungele ukunkcencetshela. 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 yokunkcencetshela nayo idinga ukucocwa ngokuvulwa umva kuvunyelwe amanzi ahambe ahlambe aphinde agugule yonke into intlenga evaliweyo.



Umaleko wegrabile ngaphansi ebheyileni



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



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



Umzekeo womgca wokunkcencetshela ongamashumi amathathu eemitha ukwahlukana



Izangqa ezimanziswe luhlelo lokunkcencetshela



Amanzi amdaka kwipheyile yokunkcencetshela ngamachaphaza.

Lomfanekiso ongezansi ubonisa indlela le kiti yohlelo lokunkcencetshel ngamachaphaza olwenziwa ngayo:



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



Ipheyile ibekwa endaweni eqethukileyo kufakwe lombhobho ubheke phansi ukuqinisekisa ukuba amanzi ayakwazi ukwehlela kwimigqobho yokunkcencetshela.



Kuye kwenziwe imigqobho kwindawo zokuconsisa amanzi kulembhobho, macala onke, kufakwe iqhina leplastiki ukwakha ezinkcencetsheli zamaconsi ("drippers")



Iqela lomama lifunda indlela yokwenza uhlelo lokunkcencetshela ngamaconsi.



Imigca yokunkcencetshela emibini, elinganiselwa kumashumi amathathu ukwehlukana adityanise 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 amanzi. Ibhed i'gcwaliswa ngomxube owenziwe ngaphambile kokuba kuqalwe (womhlaba ongange 1/3, umanyola 1/3 umthuthu 1/3 (kudingeka umthuthu omninzi ukucoca amanzi amdaka)). Umigqobho emincinane iyzima emacaleni kwalamasaka, kutyale 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)- igcwaliswa ngomxube womhlaba ojikeleze ilitye lekholamu ukwenyuka



Ukwenziwa kwemigqobho emincinane emacaleni engxowa kwenzelwa ukutyala izithole



Ukuncenkctshela kwikholamu yelitye ephakathi nendawo



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

### 3. *libhedi zokutyala ezinemingxunya engundoqo*

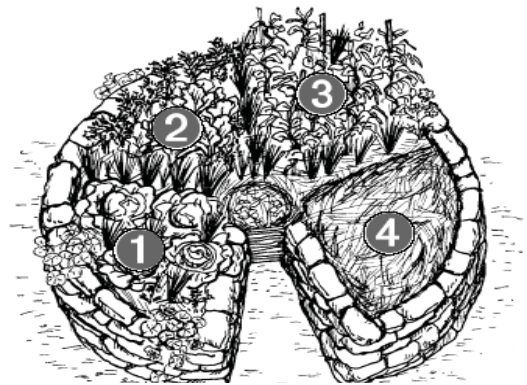
Ezi ziibhedi zokutyala ezakhelwe phezulu kanzulu ezinebhasikiti/ipheyile ephakathi nendawo enezivundisi ekuyeyokunkcencetshela nako ukusebenzisa amanzi amdaka. Kulula ukuzilawula. Ibhedi yokutyala isissangqa (esingangeesentimitha ezintathu) ezine-keyhole kwicala elithukileyo kuleyo ndawo, ekuyiyo encedisa ekutholakaleni lepheyile enomgquba nezivundisi kunye nokunkcencetshela okuqhubekayo. Iindonga zakhiwa zibe ngamashumi amathandathu ukuya kwasibhozo eesentimitha (60cm-80cm) ubude kunye nebhedhi 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 ezahlukeniswe ngeziquphu 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 amancinci ngaphakathi kwebhedhi – 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

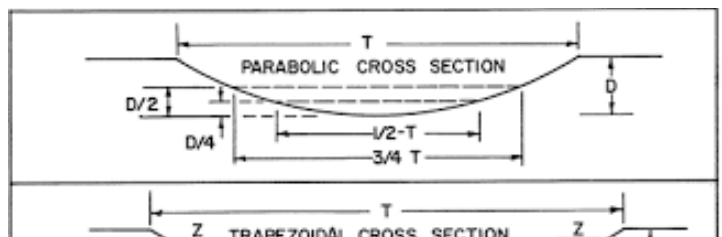
### 3.13 UHLUMISO LWENGCA ENDAWENI ZAMANZI

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 ezequma 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 kunokutyalwa ingca ende ukuya phezulu, etyalwa unyakawonke.
- Enza icandelo elinqamlezileyo lokudlulisa amanzi lingaba kumila kwe-trapezoidal okanye i-parabolic, kodwa kuye kuqinisekiswa 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.

#### IIMFUNO

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



Izakihiwe ze-Parabolic okanye i-trapezoidal zizona zikulungeleyo ukutyalwa 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,  $>1\text{ha}$ )
- 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 iyamelana nembalela



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 ngokugqumathela indawo ebaleka amanzi.

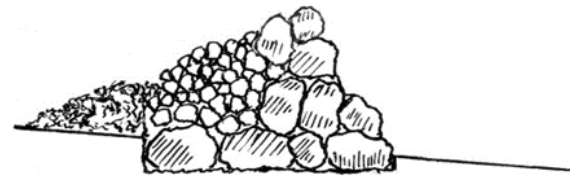
## 4 ULAWULO LOMHLABA (UKULAWULWA KOKHUKHULISEKO, UKUCHUMA KOMHLABA, KUNYE NEMPILO YOMHLABA)

### 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 yeeliitha ngonyaka ( $>150\text{mm/year}$ )
- Amaqondo obushushu: angaphezulu kwesihlanu ( $>5^\circ\text{C}$ )
- 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 aphantsi
- 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 ezindleni iphinde ikhokhele amanzi ukuya 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 kwamadama 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



Isiqalelo sokupakishela elidama. Amtye amakhulu eqokelelwe ngaphansi.



Ukwembiwa kwemisele ezofakelwa ematye kwenzelwa idama.



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

### 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 elisisenyuko 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 ( $>350\text{mm/year}$ )
- Amaqondo obushushu: angaphezulu kwesihlanu ( $>5^{\circ}\text{C}$ )
- Impandle: elisukela eshumini ukuya kumashumi amane (10%-40%)
- Umhlaba: lonke uhlobo lomhlaba lukulungele- apho amatye neembokodo zitholakala kalula khona.

#### UPHUNYEZO

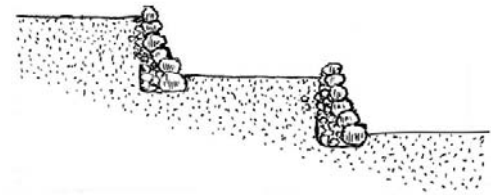
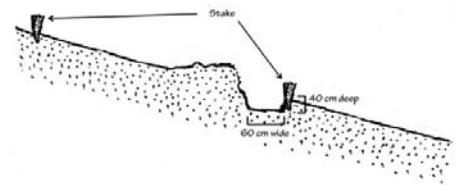
- Kufanele ubenegadi, amasimi
- Angange hectare enye ukuya ku 0.1 ubukhulu bendawo
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphantsi
- Kulula ukuqonda wenze nokukugcina, ubunzima busemsebenzini ekumele wenziwe.



Amatye ethambeka enzelwe uba kulimeke amasimi.



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



| Slope   |       | Distance between terraces (meters) |
|---------|-------|------------------------------------|
| Percent | Ratio |                                    |
| 10%     | 1:10  | 8.0                                |
| 15%     | 1:6.7 | 5.3                                |
| 20%     | 1:5   | 4.0                                |
| 25%     | 1:4   | 3.2                                |
| 30%     | 1:3.3 | 2.7                                |
| 35%     | 1:2.8 | 2.3                                |
| 40%     | 1:2.5 | 2.0                                |



Amathambeka angenziwa futhi kusetyenziswa amavili amadala ezindaweni apho amatye anqabileyo.



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

#### 4.4 IKUPHUCULWA KOKUVUNDISWA KOMHLABA

Ukuphucula ukuvunda komhlaba kubaluleke kuwo wonke amaqanaba 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 kangenensuku ezintlanu ukuya kwezisixhenxe phambi kokuba kusetyenziswe.
- Ukwengeza isivundiso; umaleko wezinto ezomileyo, izinto eziluhlaza, umgquba kunye nomhlaba owakhelweyo waphinde wamanziwa kakuhle.
- Iintsalela zesivuno; (kusukela kwizityalo, iingca, izityalo ezinemidumba, iibrassicas nama iichenopods) kunye,
- Nesigquma mhlaba esenziwe sanzulu okanye sigqunywe ngamashithi.

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

#### IIMFUNKEO

- Imvula: engaphezulu kwamakhulu amathathu anamashumi amahlanu nangaphansi kwewaka elimakhulu amabilini 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.

| Kg/Ton          | Cow | Horse | Goat | Sheep | Pig | Chicken | Rabbit | Purchased compost |
|-----------------|-----|-------|------|-------|-----|---------|--------|-------------------|
| N (Nitrogen)    | 5   | 6     | 14   | 7     | 5   | 13      | 18     | 5                 |
| P (Phosphorous) | 2   | 3     | 2    | 3     | 4   | 11      | 13     | 2                 |
| K (Potassium)   | 3   | 6     | 6    | 4     | 6   | 20      | 6      | 8                 |



Ibhokhwe kunye nengca ebekelweyo ukuphucula manyolo.



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



iComfrey, iinstalela zengca, zombona kanye nomxube osakhulayo wezityalo (ujongilanga, iimiliet 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).

#### IIMFUNO

- Imvula: engaphezulu kwamakhulu amahlanu anamashumi amahlanu nangaphansi kwewaka elimakhulu amabilni eelilitha ngonyaka ( $>350\text{mm} < 1200/\text{year}$ )
- Amaqondo obushushu: angaphezulu kwesihlanu ( $>5^{\circ}\text{C}$ )
- 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 ( $<0,1\text{ha}$ ,  $0,1-1\text{ha}$ ,  $>2\text{ha}$ ).
- Kusetsenziswa izixhobo zasekuhlaleni, futhi indleko/amaxabiso aphansi-
- Ubunzima busemsebenzini ekumele wenziwe.



Iertyisi ethile ityalwe ngokudibanisa kunye nombona.



Imidumba yedolitsoshi 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 ( $>350\text{mm} <1200/\text{year}$ )
- Amaqondo obushushu: angaphezulu kwesihlanu ( $>5^{\circ}\text{C}$ )
- Impandle: elilinganiswa ku-0.5 ukuya kwisihlanu ( $>0.5\%-5\%$ )
- Umhlaba: lonke uhlobo lomhlaba lukulungele

##### UPHUNYEZO

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



Imisele yembiwa ukusukela kuwashumi asithandathu ukuya kwimitha enye ububanzi . 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.



libhedi 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 agcwaliswe ngumxube wezichumisi, imigquba, iintsalela zezityalo ezomileyo kunye neziluhlaza. Kuye ke konke kugcwaliswe kugqunywe ngomhlaba kugqibe kutyale.

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 emifutshane ongangamasentimitha angamashumi amathathu ububanzi kunye neshumi elinantlanu kwimigca yeekhonto ensimini.



Ukuqalisa ukugcwalisa lomsele ngomgquba, imvucu eyomileyo neluhlaza yezityalo. material



Igadi enemisele emifutshane 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 ngokuncengcetshelelwa kusetyenziswa ibhotile elinganiselwa kwiililitha ezimbini enemingxunyana evuliweyo emacaleni, yaze yatyalalwa 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 okunkcencetshela, 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 opholeleyo, 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 kunokuhlwanjyelwa 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 emakhava



Ukusetyenziswa kwekalika ngaphezulu komhlaba ozotvala imbotvi



Ukufaka ikalika kwisidibi ngokomlinganiselo wesiciko sebhutile



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



Ukusebenzisa iplantara ekuncediseni ukwahlukanisa imbewu nezichumisi ngexesha elinve



Isilinganiselo sezichumisi ngetispuni

#### 4.10 IMINGXUMA YE ZAI/ OKUZIZINGQI 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 (ongxenywe 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.

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 ( $>350\text{mm/year}$ )
- Amaqondo obushushu: angaphezulu kwesihlanu ( $>5^{\circ}\text{C}$ )
- Impandle: elilinganiswa ku-1.5 ukuya kwishumi elinesihlanu ( $>1.5\%-15\%$ )
- Umhlaba: lonke uhlobo lomhlaba lukulungele (ongxenywe 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 ( $<0.1\text{ha}$ ,  $0.1\text{-}1\text{ha}$ ,  $>2\text{ha}$ )
- 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



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



Ukutyala ngemijelo nezingingqi 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



Umdlaba ogqumathelwe kakuhle ngeentsalela yezivuno



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



Amanzi acocekileyo agijima kwindawo yokulima (amashumi)

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



Amanzi agijimayo amdaka (angangekhulu)

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

## UMGAQO SISEKELO WESITHATHU: Ukutyala ngokutshintshanisa nokuhlukanisa



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



Umbona kunye nemboty zityalwe ngokuxutyaniwa-kusetyenziswe imiqolo ephindwe kabini kwaye kunciphisiwe ukuvuleka



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



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 ehlukkeneyo 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 (ongxenywe 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



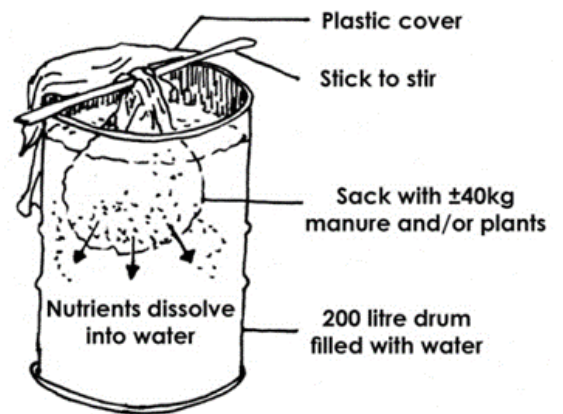
Ukulima ngokucazulula kudibanisa i-Pigeon pea/i-Leuceana kunye nombona.

## 5 ULAWULO LWEZITYALO (Iindlela zokulima, izityalo ezinempilo, Ucakaco kunye nemveliso yeziqhamo)

### 5.1 Umanyolo wamanzi liquid manures

Umanyolo wamanzi zizicatshulwa zamanzi ezenziwa ngemfucuzo 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 ngumgquba wezilwanyane (ekukhethwa kuyo ukuba kube ngumgquba osemntsha, osenentshalela zomchamopreferably) ngengowenkomo, owebbhokhwe, owamahashe, owegusha kunye noweenkukhu. Okanye intshalela zezityalo ezifana nokhula olunamagqabi aluhlaza okubamnyama (esetyenziselwa ininotrogen), 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:

- Izitya
- Iihexthara ezingaphansi kuka-0.1
- Amaxabiso aphantsi, 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; linkukhu, iibhokhwe, iinkomo zenza umanyolo olunge kakhulu- ikakhulukazi xa esemantsha.



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

## 5.2 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 ukugxilisiwe kwizityalo ezifana neekhaphetshu, amatswele ezikwazi ukuhlala ixesha elide ngaphandle kokuvelisa ukutya.
- Izityalo izinevitamin-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).
- Izityalo ezithintela izitshabalalisi ziquka kuzo ii-coriander, ugalikhi kunye nezinye iziqholi kutya ezifana nama-rosemary kunye ne-thyme.
- Imidumba kumifino etyebileyo ziproteni ezifana nemboty, 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 kunatyala 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.

| When can I plant vegetables?          | Too hot to plant! |       |     |     |     |     |      |     |     |     |     |     |
|---------------------------------------|-------------------|-------|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|
|                                       | Mrch              | April | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Jan | Feb |
| Baby marrows                          |                   |       |     |     |     |     |      |     |     |     |     |     |
| Basil                                 |                   |       |     |     |     |     |      |     |     |     |     |     |
| Beetroot                              |                   |       |     |     |     |     |      |     |     |     |     |     |
| Brinjal                               |                   |       |     |     |     |     |      |     |     |     |     |     |
| Cabbage                               |                   |       |     |     |     |     |      |     |     |     |     |     |
| Carrots                               |                   |       |     |     |     |     |      |     |     |     |     |     |
| Chilli                                |                   |       |     |     |     |     |      |     |     |     |     |     |
| Green beans                           |                   |       |     |     |     |     |      |     |     |     |     |     |
| Green pepper                          |                   |       |     |     |     |     |      |     |     |     |     |     |
| Kale and other morogo e.g. amaranthus |                   |       |     |     |     |     |      |     |     |     |     |     |
| Lettuce                               |                   |       |     |     |     |     |      |     |     |     |     |     |
| Leeks, spring 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 saseTshayina, 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 ne-marigolds



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



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

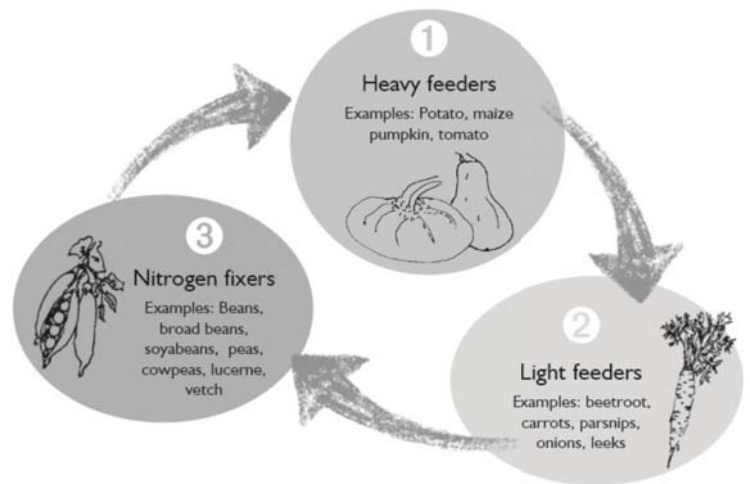


uAlex Makgopa (waseSedawa)-, itswele lasentwasa, ispinatshi, onomnqatha kunye ne-marigolds

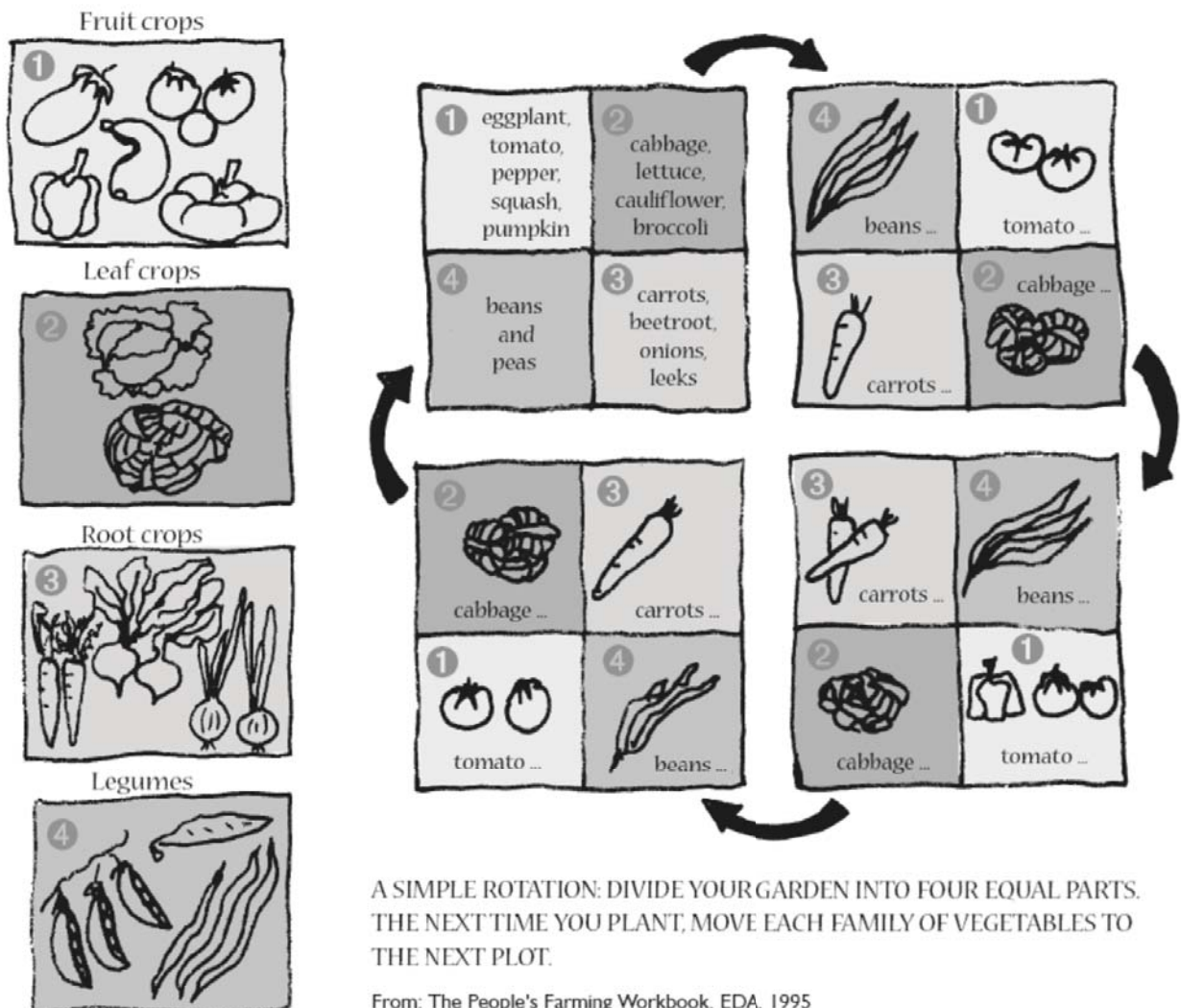
### 5.3 UKUTYALA NGOKUTSHINTSHANISA CROP ROTATION

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.



#### 5.4 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.
- Ukutyalwa ngokuxubana kunye nococeko lwasegadini, ukunciphisa uxinzelelo lwezininambuzane ezibhubhisayo kunye nezifo ezithi zenzeke apho kungatyalwanga khona ngokuxubana. Kunye nenokwenzeka ngokuthi kusuleleke konke kunye nokuphinda ukusuleleka ngokuqikelela ukususa izozityalo zinesifo, kuphinde kususwe insusela yezininambuzane ezitshabalalisayo. Kuphinde kwandiswe ubukho bamaramhamncwa kunye neenyosi okukokwendalo exhaphakileyo yezininambuzane zeegadi.
- Ukutyalwa kweentlobo zezityalo ezinemisebenzi emininzi, kuko kokubini kunyaka wonke kunye nezingapheliyo, ukufaka izityalo ezizigxothayo izitshabalalisi, kwaye ezilawula izitshabalalisi ngendlela. Ezi zifaka:
  - linyatyambo ezifana ne marigolds kunye nee-calendula
  - Iziqholo ezifana namalavenda (lavender) ii-rosemary, i-corinda, i-coriander, i-parsley, i-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, igalikhhi, itswele kunye nesepha eluhlaza (oku kunceda kwizitshabalalisi ezithambileyo njengeentwala), uparafini, itswele (ezi zisetyenziselwa izitshabalalisi ezinemizimba eqinileyo ezifana noonoqongqothwane neetotoviyane), icuba (lisetyenziselwa kuphela kuhlasele olubi kakhulu nolusindayo). Kodwa ke kukhona ezinye iindlela futhi.

#### UPHUNYEZO:

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



Integrated garden management; water and soil management, diversified crops,



Pest control brews; soap chilli garlic mixes, paraffin and onions mixes – for soft bodied insects



Pest predators control pests by ingesting them and or laying eggs



Umbelliferae – such as onions and leeks attract pest predators- e.g.



Marigolds protect against root knot nematodes



▪ **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: lingcongconi, 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 weemboty, iswekile yetumato.

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

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

*i-Colletotrichum* – amabala emagqabini, i-anthraxnose, ukubola kweziqhamo, ukutshiza.

Intsholongwane: *i-Xanthomonas* spp.



Amabhola egalikhi



Izibungu zokufaka izinambuzane kunye nenundu ekungezo zenyani



Igcwane (Bacterial blight) kumaqunube ebangelwa yi-*Xanthomonas campestris*



Iimpawu ze-anthraxnose (ezibangelwa yi-*Colletotrichum*) kwisiqhamo secapsicum

## 5.5 ULAWULO LOKHULA OLUMANYENEO

Ukhulanalo luzizityalo, zamaxesha onke (unyaka wonke okanye ixesha elide), iye ikhule kakuhle, ikhululekile ndawo zonke emadlelweni kunye nasezityeni 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.

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 zomatshini 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.

### UPHUNYEZO:

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



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



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



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



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 yokhlakwaye yindlela enhle yokulungisa umanyolo ngaphambi kokuba usetyenziswe njengoba ibuye inyuse isisindo sezondlo kumanyolo.



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



## 5.6 UKHULISO LWEZITYALO ELUGCINWENI ZIPHINDE ZICAKAZWE

Ukhuliso nocabazo 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.

Iibhedhi zokutyala izithole ziye zenziwe zibe ngamashumi amathathu ukuya kwamathandathu eesentimitha ubunzulu kunye nomgquba omninzi (onjengomanyola, nomgquba) kwaye kumele zibesebentshini 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:

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



Imveliso yezithole endawo evundiswe ngomgquba kakuhle kwenziwa iibhedhi zokutyala nomthunzi nesakhiwo seplastiki ukuvikela izithole.



Isakhiwo esenziwe ngomnatha sanomthunzi senzela ukucacwa kwemifuno kunye neziqholo.



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



Umwoba noomango becakacwe phansi kwi-nurseries ezincinci.



Ii-Tubs nezitya zokukhongozela zingasetyenziswa kulula ukuzilawula nokuziphatha

## 5.7 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 ezahlukeyo ngaphakathi nangaphandle ukurhangqa igadi namasimi kuphinde kunciphise ukusetyenziswa kwezinzambuzane.
- Ngcin imbewu yezityalo ezomeleleyo nezinempilo kuphela, ungaze ugcine imbewu yezityalo ezibholayo (seeding early)
- 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 zahlukeniswe (umzekelo ngee-brassica, umbona, iipepa (peppers) kunye nopelepele, amathanga, ilethasi nezinye) endaweni okanye exesheni okanye zivalelwe olugcinweni (use caging).

### UPHUNYEZO:

- Izitya, 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



Ukusasaza ngezandla kombona ukuvelisa imbewu ezokhethwa.



Isityalo sikapelepele esivalelweyo ukuqinisekisa imbewu enkolekileyo ukuba ingaba luhlobo



Izisasazi ziyazithanda iintyatyambo ezahlukeneyo

### 5.7.1 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 ukuqikelela 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 eyomileyo.



Ubomi bembewu buphindeka kabini ka amazinga obushushu enciphiswe ngamapesenti



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



Beka imbewu kwiingqayi zegilasi



Beka imbewu kwindawo eyomileyo, epholileyo, ebumnyameni.

## 5.8 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.

Iintlobo ezahlukeneyo zeziqhamo zikulungele ukutyalwa kwimimandla 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, iavokhado, kunye nee-litchis. Isitrasi yona iyakwazi ukumelana namaqondo obushushu ahlukeneyo, kodwa idinga ukunkcenkcetshelwa ngokwaneleyo.

### UPHUNYEZO:

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



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



Ukunkcenkcetshela umthi weorenji, nezitya ezibamba amanzi



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



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



Sebenzisa amagqabi kunye nezitya zokubamba amanzi ukusebenzisa amaenvula ngokupheleleyo kwimithi



Indlela yasekhaya yokubamba iimpukane zeziqhamo yenziwe ngeorenji kunye namanzi aneswekile



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

## 5.9 IMVELISO YEMANGO YENDALO

Imango 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 ezingqwenekayo zimeliselwa kwiingcambu eziqinileyo kwaye ezimelana nezozo. Imizekelo yamagama eentlobo eziqhelekileyo kulamaxesha zi-Keit, i-Kent, i-Shelley kunye neTommy Atkins. Ezintlobo zithengiswa njengeziqhamo, ijusi, imango eyomileyo kunye nezikhumba zeziqhamo.

Ngezansi kukho iingcebiso ezimbalwa zokukhulisa imithi yeemango zendalo:

- Yenza umgquba kwinyanga ezine ukuya kwezintandathu ngaphambi kokuba utyale.
- Tyala imithi efunyenweyo kutsha nje yasentlakohlaza kwimngxunya elinganiselwa kumashumi asithandathu esentimitha (60x60cm) ezaliswe ngomxube womgquba, umhlaba, ikalika, kunye namathambo. Yakha isitya sokunkcencetshela 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.



Ukunyuswa kwexabiso leziselo (i-juice) kunye nokomiswa komango

### IMFUNeko:

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

### UPHUNYEZO:

- ligadi okanye izitya
- lihekthara 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 sokunkcencetshela nokufumisa.



Umdiliya womfama osemncinci eLimpopo, uzocwaningwa ngumphathi woomango.



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

## 6 UKUNGENELELA KWEMFUYO

Ezi ziinkalo zolawulo lwemfuyo okuye kwenzake zihambisane nokutyala okanye zibandakanyeke ekungeneleleni kwinkqubo yezolimo ukwenza inkqubo 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

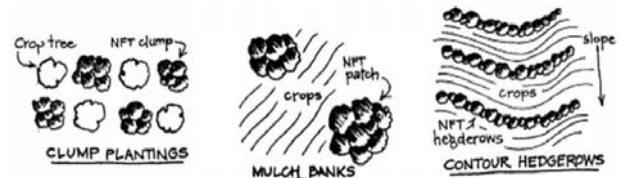
Izityalo zemithi zixutywe kulenkqubo yezolima kungaba ngokweziqendu zomhlaba, ukutyala uhlobo olunye lwesityalo okanye phakathi kokutyala kwezityalo zonyaka (ngokuqhelekileyo kuye kube kukutyala kwengca phakathi kombona-(strip cropping)). Livestock fodder species such as pigeon pea (udali), acacia species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

#### IMFUNeko:

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

#### UPHUNYEZO:

- ligadi, amasimi
- lihekthara ezingaphansi kuka-0.1, ukuya ku 0.1 nentye, okanye zibengaphezulu kwesibini ( $>2\text{ha}$ )
- Amaxabiso aphakathi nendawo (ngawe mbewu, okanye ezinye izixhobo zokulima), kwaye kusetyenziswa izixhobo zasekuhlaleni
- Iyasebenzisa kakhulu.



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



Isityalo i-Sesbania ikhula ensimini kuluhlu lothango



Ibhokhwe idla udali



Umgca we-Moringas etyalwe ensimini encinane



I-Leucaena ityalwe kuluhlu lothango olutyale imbityi (ngaphambili) kunye nombona (ngemva)

## 6.2 INKQUBO YE-AGRI-SILVIPASTORAL

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

Iinkqubo 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-fallows. Iintlobo zemithi ziphuhlisa ukuchuma komhlaba kunye nomthamo wokubamba amanzi.
- Igadi zasemakhaya; ziye zibe busondelana; zibe kwindawo ezininzi ezidibanisa iintlobo-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 neziqhuboshi, ngemimandla okanye ibe kwimida yentsimi. Lemithi ikhethelwe ukulungisa ininzi, iphinde ibonelele ngeziquhamo, ngeenkuni zomlilo kunye nefula.

UPHUNYEZO:

- ligadi, amasimi, imfuyo
- lihekthara 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.



*Sesbania sesban* – maize alley cropping system in KwaZulu Natal



Maize planted after a two-year pigeon pea fallow in KwaZulu Natal



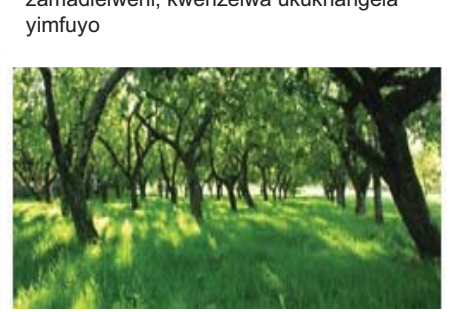
Izihlahla zemidumba zityalwe endaweni zamadelweni, kwenzelwa ukukhangela yimfuyo



Improved fallow: 1-year pigeon pea fallow, KwaZulu Natal



Home garden at Mhlabuyalingana, KZN: combination of fruit trees, vegetables and crop



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. Lenkqubo ibaluleke kakhulu ebusika, apha ingca ingqongopheleyo emadlelweni kwaye amadlelo anesondlo esisemgangathweni ophansi kakhulu (umzekelo ukungqongophala okanye ukungabikho kweprotini) Ungakhetha kwiinhlelo ezingezantsi zesibonelelo sesondlo:

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

Uxhaso lwesondlo lungaphinde luze ngendlela yeentlobo ezahlukeyo zefula. Oku kumanyene nokukhulisa iintlobo zefula ezinexabiso eliphezulu nelingcono lwesondlo xa litholekiswa 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 yeprotini eyenziwe ekhayeni-lebhloko ibandakanya i-molasses, i-urea, isidle seprotini, isidlo se-urea protini, umthombo we-phosphorous. Amanzi, isamente encinci kunye netyuwa.



Umzekelo wesondlo sokuvala (creep) okuyindlela yamankonyane.



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



i-Japanese radish



i-LS 33 kunye ne-premix 450



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 uyo sibeka 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 ( $>1$ ha)
- 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)

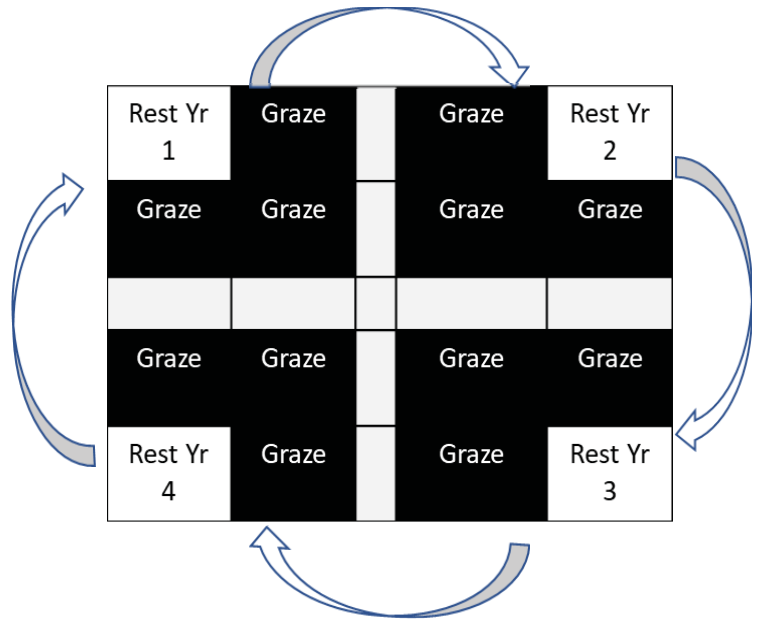
## 6.5 UKUJIKELEZA AMADLELO

Ukutyisa qho emadelweni 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 iphunyezwe ekudlisweni rhoqo ngemva konyaka abane. Kubalulekile kubafuyi bemfuyo ukusebenzisana ukunza umsebenzi walenkqubo yokujikelezisa amadlelo.

### UPHUNYEZO:

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



Ukutyisa emadelweni 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.

