



*Putting nitrogen fixation to work for
smallholder farmers in Africa*

Biological Nitrogen Fixation ne Nzira dzeKurimwa neKutengeswa Kwe Bhinzi: Bhuku ReVatungamiriri vevarimi Muchirongwa CheN2Africa MuZimbabwe



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Biological Nitrogen Fixation and Grain Legume Enterprise: Guidelines for N2Africa Lead Farmers

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Front cover photographs: top row, left to right, untreated soybean seed, two-step seed inoculation, soybean seed inoculated with rhizobia; middle row, N2Africa demonstration package of BNF technologies, healthy soybean plants, Master Farmer trainers field visit; bottom row, a well-nodulated bean root, farmers receiving a N2Africa demonstration package, improved legume seed and inoculants offered for sale. Photographs by K.E. Giller, S. Koala and P.L. Woomer.



Putting nitrogen fixation to work for smallholder farmers in Africa

Biological Nitrogen Fixation and Grain Legume Enterprise: Guidelines for N2Africa Lead Farmers

Bhuku re vaTungamiriri ve Varimi mu Chirongwa che N2Africa muZimbabwe

Zviri Mukati

Mashoko Ekuchigamidza mu N2Africa.....	1
Zvikwata zvevarimi neva Tungamiri Vavo	2
Chikafu chezvirimwa chiri muvhu	3
Kudya kwezvirimwa Kunobva Mumhepo.....	4
Mapundu e Midzi ye Bhinzi.....	4
Zvirimwa zve N2Africa nemarimirwe azvo.....	5
Kuchengetedza Biological Nitrogen Fixation.....	9
Kusanganisa Inoculants ne Mbeu.....	10
Nzira dze ma Demo Mumunda.....	13
Kudzidza Nzira Itsva dze BNF.....	15
Kurimwa Kwe Mbeu Mumisha.....	16
Kuchengetedzwa kwe Goho.....	17
Kutengesa Bhinzi.....	18
Vatungamiri ve Varimi nebasa Ravo.....	20
Kuverenga ma Nodules nekuapinza Muzvikamu.....	21

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Mashoko Ekuchingamidza

Chirongwa che N2Africa chinonzi “*Putting Nitrogen Fixation to work for smallholder farmers in Africa*” (N2Africa). Chirongwa ichi chinobatsira kusanganisa varimi kuti vawane kudya kunovaka muviri pamwe chete nekushandisa nzira dzegodzaivhu. Pamusoro pezvo, chirongwa ichi chinoita kuti varime mbewu dzinovapa mari kana vachinge vatengesa zvirimwa zvavo. Kubudikidza nekukudza goho ravo mukurimwa kwe zvirimwa zvina zvinoti; shuga bhinzi, soya bhinzi, nyemba nenzungu, chirongwa cheN2Africa chinobatsira kuti varimi vashandise nzira dze kuchengetedza chikafu chembeu muvhu uyezve kushandiswa kwenzira dzegodza ivhu, zvichizosiya varimi vave nemari muhomwe dzavo pamwe chete nekuwedzera ukoshi hwechikafu chinobva mu zvirimwa zvavo.

Donzvo guru rechirongwa cheN2Africa kubatsira varimi vemu Sub – Saharan Africa kuti vawane mbeu dzakauchikwa zvine unyanzvi dzebhinzi uye kutorwa kwechikafu (fertilizer – nitrogen) mumhepo. Chikafu ichi chinozoshandiswa nezvirimwa muvhu (Biological Nitrogen Fixation –BNF). N2Africa iri kushanda ne varimi 225 000 munyika sere (8) mu Africa, uye tinochingamidza varimi vose vangade kuve chikamu chechirongwa cheN2Africa.

Zvibatsiro zviri Kutarisirwa kubva muN2Africa

Zvibatsiro	Zvinotarirwa	Zvingaitwa kuti zvibatsiro zvishandike
Zvinotabatika		
Nyika dziri muchirongwa	8	Kutsvaka mapazi ekushanda nawo mu DRC, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda ne Zimbabwe
Varimi vekushanda navo	225 000	Kutsvaka nzira dzekuunza ruzivo, kuchishandiswa varimisi, zvikwata zvevarimi uye ma NGO.
Goho rinotarisiwa	+ 945 kg pa ha ¹	Kutsvaka mhando dzembewu dzebhinzi dzakauchikwa neunyanzvi uye kudzidzisa varimi kuti varime zvine unyanzvi pabasa ravo.
Kuwedzera BNF²	+46 kg pa ha	Kutsvaka nekushandisa mishonga ye godzaivhu inotora <i>nitrogen</i> mumhepo (<i>inoculants</i>) ichishandisa muzvirimwa. Kugona kuchengetedza mishonga inounza nitrogen kubva mumhepo (<i>rhizobia</i>) yagara iri munyika kuti ibatsire kuwedzera goho.
Zvinobatsira varimi	+\$465 pagore	Kukurudzira kuti varimi vagone kuwedzera ukoshi hwe bhinzi nezvinowanikwa mubhinzi, kupa mikana mitsva kuvarimi vechikadzi

Chirongwa chezvkwata Zvevarimi ne vatungamiri vevarimi

Nzira ichatevedzerwa muchirongwa cheN2Africa ndeyekuita kuti varimi vashande vari muzvkwata vachitungamirirwa nevatungamiriri vanenge vasarudzwa nemapato ema NGO anenge achisevenzera munzvimbo dzavo. Ma NGO aya anenge achisevenza pamwe chete ne N2Africa. Varimi vanenge vasarudzwa ndivo vanovamba zvirongwa zve N2Africa mumatunhu avo kuti vamwe vose vadzidze. Vachibatsirana nevatungamiriri vavo, varimi ndivo vacharonga basa rekurima, nezvinoda kuitwa zvose vachikurudziranawo kubatsirana kuti chirongwa ichi chibudirire, chisvike kune vamwe. Vatungamiriri vevarimi vanokurudzirwa kubatsirana navamwe varimi kuti varime vachishandisa nzira dzavanenge vadzidziswa dzekurima bhinzi.

Basa Rezvkwata Zvavarimi (*Local Farming Groups*)

- Kupinda muchirongwa cheN2Africa zvizere.
- Kuita mabasa ese ezvekurima uye kutaura matambudziko nezvinoita kuti chirongwa chibudirire.
- Kukurudzira varimi vasiri muchirongwa kuti varime bhinzi nekushandisa nzira itsva dzekurima.

- Kukoka varimisi kumisangano yese yavanoronga nekuita.
- Kuronga ma field day apo varimi vose pavanosangana.
- Kucherechedza nzira dzekurima uye nekuona kushanda kwadzo mukukudza goho uye kukodza ivhu.

Basa revatungamiriri vevarimi (*Lead Farmers*)

- Kukuridzira varimi vose kuti vasevenzese nzira itsva dzekurimwa kwebhinzi.
- Kubatsira mukurongwa kwezvinoda kuitwa zvese
- Kubatsira varimisi kudzidzisa zvikwata zvevamwe varimi.
- Kuona kuti zivo itsva yasvika kuvarimi vose vari mudunhu mavo.
- Kupinda misangano nevamwe varimi nekuzivisa varimisi zviri kuitika mudunhu ravo
- Kubatsira kuti pave nekushanda kwakanaka kwevarimisi nevarimi vose.

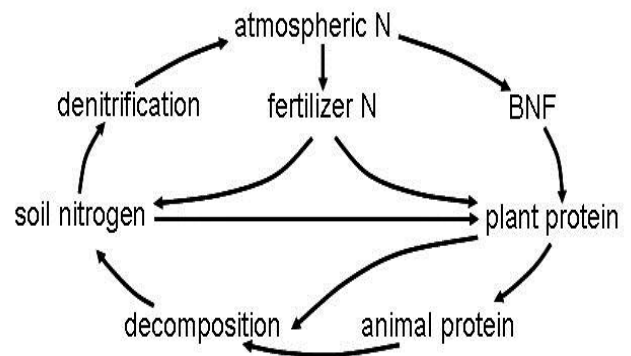
Mutungamiri wevarimi anoita basa re..... (mabasa anotevera)

- Kupanga mazano uye kubatsira kusimbisa chikwata chaanotungamirira, kutungamirira nekuronga zvinoda kuitwa muchikwata ichi.
- Kutungamirira pakudzidzisa vamwe varimi pane zvinoda kuitwa zvose achishandisa mapoka evarimi nevarimisi.
- Kuva munyayi pakati pavarimi nevarimisi.

Pamusoro pekusevenza nezvikwata, zvinokosha kuti vatungamiriri vevavirimi vashanyire murimi mumwe nemumwe kuti vanzwisise kusiyana kwevarimi, zvavanoshaya, mikana yavanowana uye matambudziko avanosangana nawo. Mamwe mabasa evatungamiriri ava ndeekubatsira varimisi kubuda nezvimwe zvikwata zvevarimi uye kubatsira nhairirano muzvikwata izvi mwaka mumwe nemumwe. Vatungamiri vevarimi mu N2Africa vachadzidziswa kuti vanzwisise nyaya dzegodzaivhu, zvirimwa zvebhini, BNF, nekushandiswa kwemushonga wegodzaivhu mubhinzi (*rhizobia*). Vanozogona kusevenza nevamwe varimi kurima bhini zvine unyanzvi. Vatungamiri vevarimi vanokurudzirwa kushanyira varimi vose, kusanganisira nevaye vanoshaya, kuti vanzwisise matambudziko avo nezvinoperevera pavari kuti vagone kubatsirika muchirongwa ichi.

Chikafu chezvirimwa chiri muvhu (Nitrogen)

Nitrogen yakawanda inogara mumhepo isingashandisike. Kutorwa kwechikafu ichi mumhepo netumbuyu tunonzi Rhizobia, kunoita kuti chikafu ichi (nitrogen) chishandiswe netumbuyu twemuvhu, zvirimwa zvichzosvikao kuzvipfuyo chikafu ichi chisati chadzokera mumhepo zvakare. Donzvo guru nderekudzorera nitrogen iyi kuti irambe ichishanda muzvirimwa. Kuchengedzwa kwe nitrogen iyi kunoita kuti varimi vasatenga fertilizer yakawanda, mashanga achengetedzeke uye nitrogen zhinji izobatsira kuvanhu nekuti inobatsira sechikafu chinovaka muviri. Kushaikwa kwe nitrogen kunoita kuti zvirimwa zvisakure zvakanaka. Kushaikwa kwayo muzvirimwa zvinoratidzika nekutsvukuruka kwe mashizha epasi muzvirimwa zvese. Kana nitrogen iri shomasa muminda, mashizha anodonha achiri madiki, zvirimwa zvinenge zvakaondoroka, uye goho rinodzikira chaizvo. Zvirimwa zvebhini zvinobatsira zvikuru pakutorwa kwe nitrogen mumhepo. Zvirimwa izvi zvinobatsirawo zvikuru nekuti zvinotipa kudya kunovaka muviri. Goho rebhinzi harina kukura serechibage asi bhini dzine chikafu chinovaka muviri kupfuura chibage.



Mafambiro anoita nitrogen muvhu, zvirimwa, zvipfuyo nemumhepo

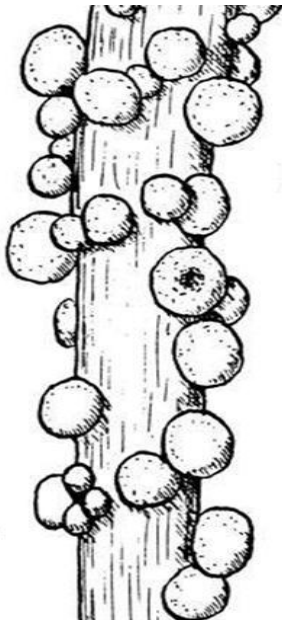
Nitrogen inofanira kuwedzerwa muvhu kuti zvirimwa zviite goho guru. Kushomeka kwe nitrogen kunokonzerwa nekuva shoma kwayo muvhu, kukukurwa nemvura, kuyeredzwa nemvura, nekuwanda kwemvura muminda. *Nitrogen* inowedzerwa muvhu nekushandisa fertilizher ine nitrogen uye netumbuyu tunodzika nitrogen iyi kubva mumhepo (BNF). Ma *fertilizer* anodhura kuatenga saka panoda kutsvaka imwe nzira yegodza vhu isinganyanyodhura.

Kudya kwezvirimwa Kunobva Mumhepo (Biological Nitrogen Fixation)

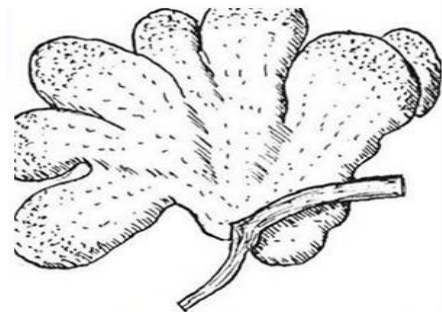
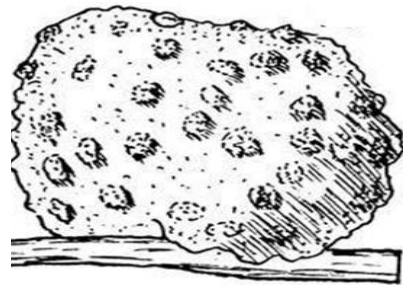
Kune tumbuyu (bacteria) tunoshandura nitrogen kubva mumhepo tuchiidzika muvhu kuti ishandiswe nezvirimwa. Nzira inoshandiswa ne bacteria iyi inonzi Biological Nitrogen Fixation. Bacteria iyi ine ukama hwainoita nebhinzi (symbiosis) kuitira kuti bhinzi idzi dziwane nitrogen. BNF inzira isingadhuri inoshandiswa nezvirimwa zvebhinzi, uye inobatsira varimi kuti varege kutenga fertilizher inodhura. Pane nzira ina dzinoshandiswa kuti BNF iwedzerwe pamurimi wega wega; 1) kuwedzera ndima dzinorimwa bhinzi mumunda, 2) kuwedzera marimirwe ebhinzi ane unyanzvi, 3) kushandisa mbeu dzebhinzi dzakauchikwa zvine unyanzvi, uye 4) kushandisa ma inoculants pakurima bhinzi.

Mapundu emidzi yebhinzi (*Root Nodules*) ne ukama hwe Bhinzi ne bacteria

Mhando dzebhinzi zhinji kusanganisira nzungu, nyemba, soya bhinzi ne shuga bhinzi dzinoita mapundu pamidzi yadzo uye mapundu aya ndiwo anoshandiswa kuti bacteria ipinze nitrogen mumidzi yebhinzi idzi. Mapundu aya anonzi ma nodules, ndidzo nzvimbo dze BNF pazvirimwa zvebhinzi. Ma nodules ane masaizi akasiyana. Ma nodules mahombe anenge arimatsvuku mukati ndiwo anonza nitrogen yakawanda kubva mumhepo. Mhando dze bhinzi dzakasiyana dzinoshandisa mhando zhinji dze rhizobia kugadzira nitrogen kubva mumhepo. BNF inonyanyoshanda kazhinji kana ivhu rine nitrogen shomanene. BNF inogadzirwa ne bhinzi inogona kuwanda kubva pa 40 kg pa hectare kusvika pa 200 kg pa hectare. Kana zvirimwa zve bhinzi izvi zvaora muvhu zvinosiya uwandu hwunenge 25 kg kusvika ku 75 kg hwe *nitrogen*. Mufananidzo ye ma nodules iri pasi:



Mapundu emidzi yebhinzi ane masaizi nekukura kwakasiyana asi anoita basa rimwe chete. Anogona kunge akapwasharara (kuruboshwe), akabumba (pazasi), ane mapazi (kurudyi pasi), kana kuti akafutunuka (kurudyi pamusoro).



Zvirimwa zve N2Africa Nemarmirwe Azvo

Shuga Bhinzi (Sugar beans)

Shuga bhinzi dzine mhando dzinotanda nedzisinga tandi. Pane mhando dzembeu dzeshuga bhinzi dzakawanda. Ichi chirimwa chinonyanyorimwa kunzvimbo dzakakwirira mu Africa. Bhinzi dzinorimwa mu nzvimbo dzinotonhorera asi hadzinyanyokura zvakanaka munzvimbo dzinopisa uye dzine mvura yakawanda. Goho re shuga bhinzi mu Africa rinosvika pa 530 kg hectare asi kana dzikanyotsorimwa zvakanaka goho rinopfuura 2000 kg pa hectare. Shuga bhinzi dzinoda mvura isina kunyanyowanda uye kana dzave kuibva hadzidi kunaiwa nemvura yakawanda. Hadzikuri zvakanaka muvhu rino vava, saka *lime* inodiwa. Kazhinji shuga bhinzi dzinorimwa mumunda mumwe chete nechibage uye dzinobatwa nezvirwere zvakananda pamwe chete nezvipembenene zvakananda. Saka dzinoda mishonga pakudzirima. Shuga bhinzi dzinodyarwa ne mbeu inosvika pa 60 – 70 kg pa hectare. Mashizha, nhondo diki, uye ne vana veshuga bhinzi zvinoshandiswa semurivo. Shuga bhinzi dzinoshandiswa nemhando dzakasiyana dze rhizobia. Shuga bhinzi dzinotanda dzinogadzira nitrogen yakawanda (125 kg N per ha) kupfuura dzisingatandi (35 kg N per ha). Mhando dzembeu dzeshuga bhinzi dziri pa Table 2.



Nyemba (Cowpeas)

Mhando dzenyemba dzakawananda dzinotanda, uye pane dzimwewo dzisingatandi. Nyemba dzinorimwa munzvimbo zhinji dzinopisa uye dziri pakati nepakati pekupisa nekutonhora mu Africa. Goho renyemba rintangira pa 340 kg per ha kusvikira pa 2000 kg per ha. Chirimwa chenyemba chinogona kurarama munzvimbo dzine mvura shoma, dzichipisa uye dzine ivhu rinovava. Asi dzinoda mishonga nekuti dzinodyiwa nemakonye akawanda.

Pa hectare imwe chete panoda mbeu yenyemba inoita 20 – 25 kg zvichibva nekukura kwembeu dzacho. Mashizha, nhondo diki uye nevana vakura venyemba zvinogona kudyiwa. Majanga acho anoshandiswa sechikafu chezvifuyo. Rhizobia inoshandiswa ne nyemba yakawanda muivhu. Nyemba dzinogona kugadzira 120 kg ye nitrogen uye nitrogen zhinji yacho inoshandiswa nechirimwa chinotevera nyemba mwaka unotevera. Mhando dzembeu dzenyemba dziri pa Table 2.



Soya Bhinzi

Soya bhinzi chirimwa chisingatambarari chichireba kusvika pa 120 cm. Midzi ye soya inoreba kupinda muvhu uye ine ma nodules akawanda. Soya dzinorimwa munzvimbo dzakakwirira uye nenzvimbo dzakadzikira dzichigonawo kukura muivhu rinovava. Soya bhinzi dzinorohwa ne chando uye hadzikuri zvakanaka kana pane bvute. Goho rinogona kubva pa 830 kg kusvikira pa 5 tons kg pa hectare. Chirwere che soya bean rust chinokonzerwa kutsvuka kwemashizha (brown) chinoda kudzivirirwa. Asi kune mbeu itsva dzave kuuchikwa dzisingabatwi nechirwere ichi. Pa hectare panoda mbeu inokwana 50 – 80 kg zvichienderana nekukura kwembeu uye mapatsanurirwe embewu mumunda. Soya bhinzi dzinoshandiswa kugadzira zvekudya zvakanawanda ne ma industry mazhinji. Dzinogadzirisa mafuta ekubikisa uye kudya kunovaka muviri. Nhondo dzacho dzinogona kudyiwa dzakabikwa. Soya bhinzi dzinoshandiswawo sechikafu chezvifufuyo pamwe chete nemashanga adzo. Mbeu zhinji dzesoya bhinzi dzine mhando dze rhizobia dzinoita kuti dzigadzire nitrogen. Chirimwa chesoya chinogona kugadzira nitrogen inosvika ku 200 kg pa hectare. Nitrogen iyi inokwanira chirimwa ichi uye chirimwa chemwaka unotevera mumunda. Mhando dzembeu dzesoya dziri, mu Table 2.



Table 2. Mbeu dzebhinzi dsicha shandiswa ne N2Africa mu Southern Africa

Chirimwa	Malawi	Zimbabwe	Mozambique
Shuga Bhinzi	Napilira, Maluwa, Kholophere	Bounty, Pan 148, Pan 159, Speckled Ice, Cardinal, Iris	
Soya Bhinzi	Makwacha, Nasoko, Ocepara-4	Safari, Serenade, Mhofu, Roan, Pan 891, SC Saga, SC Squire, SC Squire 1, Edamane	TGx 1740-2F, TGx 1904-6F, TGx 1908-8F, TGx 1937-1F, TGx 1485-1D, Storm
Nyemba	Sudan-1, IT81E-16	IT 18, CBC2, CBC3, Zim Mix	
Nzungu	JL24, Chitala, CG7, Nsinjiro, Kakoma, Chalimbana	Nyanda, Natal, Mhofu, Roan, Pan 891	Mamane, JL24, Nametil, CG7

Nzungu (Groundnuts)

Ichi chirimwa chinogona kureba kusvika pa 60 cm. Maruva enzungu ndee yellow, uye anobukira padhuze nevhu ozopfekera muvhu kuti aite vana. Nzungu dzine mudzi mumwe murefu usina mimwe midzi inotanda. Nzungu dzinoda mvura inosvika ku 600 mm uye kana dzave kuibva hadzidi mvura yakawanda. Mbeu itsva dzave kuuchikwa hadzibatwi nechirwere che rosette virus. Chirwere ichi chinoderedza goho zvakanyanya kana chabata nzungu. Goho rinowanikwa pa hectare rinogona kusvika pa 950 kg asi kana dzarimwa zvakakanaka dzinogona kuita goho re 2500 kg pa hectare. Mbeu inorema 50 kg inogona kudyarwa pa hectare. Nzungu dzinonyanyorimwa muvhu rakarerereka kujecha. Dzinogona kudyiwa dziri mbishi, dzakabikwa kana kudzikanga. Dzinogadzirisawo dovi. Nzungu chirimwa chinogona kugadzirisisa mafuta zvakare. Mashizha enzungu anoshandiswa sechikafu chezvifufuyo. Nzungu dzinoshandisa rhizobia inogara iri muvhu munzvimbo dzakawanda dzemu Africa. Nitrogen inogadzirwa ne nzungu inosvika ku 150 kg pa hectare. Mhando dzembeu dzenzungu dziri paTable 2.



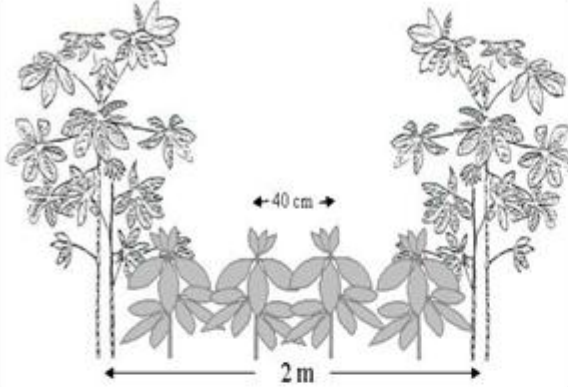
Kurimwa kwe Bhinzi

Nzira zhinji dzinoshandiswa kuwedzera BNF kubudikidza ne kurimwa kwe bhinzi. Zvirimwa zve bhinzi zvinogona kurimwa zvakasangana nezvimwe zvirimwa mumunda mumwe chete (intercrops); zvirimwa mumutevedzanwa wezvirimwa (rotations); kana kudyara chirimwa mumunda une chirimwa chinenge chakura mumwaka mumwe chete (relay crops).

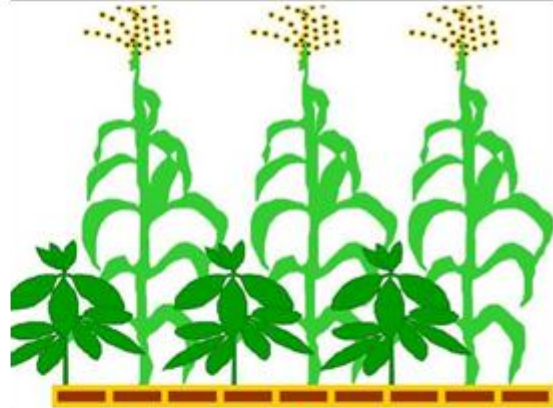
Zvirimwa zvakasanganiswa mumunda mumwe chete (intercropping) zvinobatsira murimi kuti adyare zvirimwa zvakasiyana zvichidzivirira kukukurwa kwevhu mune chimwe chirimwa chakaita se chibage, mhunga, mapfunde kana kuti mufarinya. Nzira inonyanyoshandiswa ndeye kudyara mitsetse yechibage yega ye bhinzi yegawo mumunda. Zvirimwa zvinoshandiswa apa ishuga bhinzi kana kuti nyemba pakati pemitsara (maraini) yechibage. Mhando dze bhinzi idzi dzinogona kukura dziri mubvute rechibage asi goho racho rinenge rakaderera nekuti dzinovhungwa. Imwe nzira inogona kushanda ndeye kusanyanya kuwanza chibage mumunda, saka maraini echibage anenge akati taramukei. Nzira inogona kushanda ndeye kuita maraini maviri echibage nemaraini mana ebhinzi. Izvi zvinobatsira kuti chirimwa chebhinzi hachizonyanyi kuvhungwa nechibage. Uye murimi anogona kushanda zvirimwa nane nezvirimwa zvake. **Mutevedzanwa wezvirimwa (rotation)** - Bhinzi dzinogona kurimwa dziri mumutevedzanwa wezvirimwa munda uchidyarwa chirimwa chebhinzi kamwe chete pamakore matatu kana mana. Mutevedzanwa wezvirimwa unobatsira kuti ivhu rivandudzwe nekushandisa zvirimwa zvakasiyana, unoitawo kuti minda ive nemurakwani wakawanda kana zvirimwa zvinenge zvarimwa zvine mashizha akawanda. Mutevedzanwa unoderedza zvirwere nezvinodya mbeu mumunda.

Kudyara chirimwa mune chimwe chirimwa chinenge chatokura (relay cropping) – Iyi inzira inoshanda kana chimwe chezvirimwa chine mwaka mudiki. Chirimwa chinogona kuzodyarwa kana chimwe chakohwewa. Chibage nenyemba ndizvo zvirimwa zvinonyanya kushandiswa. Nyemba dzinogona kuzodyarwa kana chibage chatombokura.

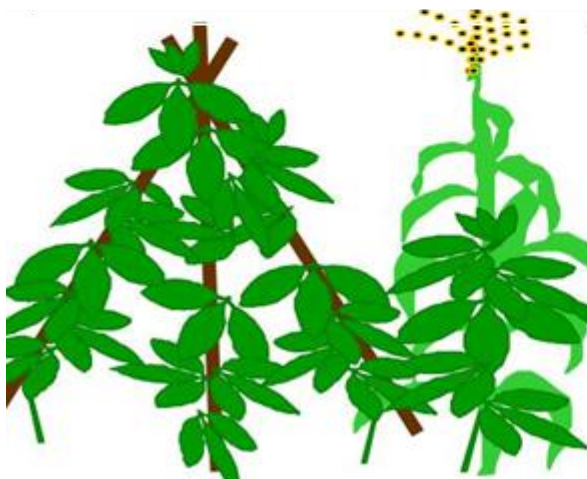
Bhinzi dzinotanda dzinowanzoshandiswa nekuti hadzinyanyo batwa nezvirwere, dzinogadzira nitrogen yakawanda uyewo dzine goho guru kupfuura bhinzi dzisingatandi. Saka mhando dzebhinzi dzinotanda ndidzo dzinonyanya kusevenzeswa muminda yechibage uyewo dzinobva dzatanda pachibage. Dzimwewo mbeu dzinonyanya kutanda dzinozobva dzavhunga chibage.



Cassava may also be intercropped with grain legumes (above). Climbing beans require support from either stakes or companion crops (below).



Intercropping arrangements of maize and grain legumes with alternate (above) and staggered rows (below).



Kuchengetedzwa kwe Biological Nitrogen Fixation

BNF inogona kuchengetedzwa kana varimi vachishandisa minda yavo zvakanaka. Chirimwa che bhinzi chinofanira kurimwa munzvimbo yachinokura zvakanaka. Izvi zvinobubudikidza nekusarudza mhando dzembeu dzakauchikwa zvakanaka, kushandisa ma fertilizer anodikwa nechirimwa zvakanakwana, kushandisa mapatsanurirwe echirimwa zvakanaka mumunda (spacing), tevedzano yezvirimwa yakanaka (crop rotation) uye kusakurira mbeu nguva dzose. Nguva dzakawanda rhizobia inogara iri muvhu haigoni kukwanisa kugadzira nitrogen yakwakana yechirimwa saka mbeu dzebhinzi dzinofanira kusanganiswa ne rhizobia pakudyara. Kushanda kwe BNF kunonyatsoonekwa nemapundu (nodules) pamidzi yezvirimwa zvebhinzi mumunda.

Mamiriro ekunze anogona kukanganisa kusevenza kwe rhizobia zvakananyanya. Kupisisa kwevhu kunoderedza kushanda kwe rhizobia. Zvirimwa zvinogona kushanda chete munzvimbo dzakadai

inyemba nenzungu. Kushaikwa kwemvura kunouraya rhizobia zvakare kuchizopedzisira kwaderedza mashandiro e rhizobia. Nyemba nenzungu dzinogona kurarama nekukura muvhu rinovava (acid soil). Mushure me nitrogen chimwe chikafu chevhu chinonzi phosphorus (P) chinowanikwa chiri chishoma mu nzvimbo dzakawanda mu Africa. Rhizobia inogona kushanda kana phosphorus iri shoma muvhu asi kushaikwa kwayo zvachose kunoita kuti rhizobia isashanda zvakanyanya. Kana phosphorus iri shoma muvhu, zvirimwa zvinosviba (purple colour) pamashizha epasi pezvirimwa uye zvirimwa zvinooondoroka (stunted growth).

Single Super Phosphate (SSP) ndiyo fertilizer inoshandiswa zvakanyanya kuwedzera phosphorus (P) muvhu. Triple Super Phosphate inogona kusevenzeswa zvakare nekuti ine P yakawanda. Pamhando dze fertilizer idzi dziri mbiri varimi vanosarudza yavanoda kushandisa zvibva nekuti ivhu rinoda P yakwanda zvakadini, fertilizer yacho inoita marii uye kuwanikwa kwayo. Zvimwe zvikafu zvezvirimwa zvinokosha zvinosanganisira zinc, molybdenum, cobalt, sulphur ne boron. Izvi zvinoshanda zvisina kuwanda se Nitrogen ne Phosphorus. Nguva zhinji zvikafu izvi zvinowanikwa muvhu.

Bhinzi dzinenge dzasanganiswa ne rhizobia dzinoshandisa nitrogen yabva mu fertilizer asi fertilizer inoderedza kushanda kwe rhizobia. Zvirimwa zvinenge zvave kutora nitrogen yabva mufertilizer saka hazvichagadziri nitrogen kubva mumhepo. Asi chinokosha chinoda kuzivikanwa ndechekuti rhizobia haidhuri kutenga pane fertilizer. Zvakadaro zvirimwa zve bhinzi zvinoda fertilizer shoma inoita kuti rhizobia iwane pekutangira apo mapundu anege asati agadzirwa pamidzi yezvirimwa (10 – 30 kg N per ha). Varimi ngavazive kuti nitrogen yekutangidza iyi inongokosha chete kana ivhu range ragara risina nitrogen zvachose uye kana chirimwa chebhinzi chichifanira kuzopa goho guru.

Kushandiswa kwe pamusoro kwe mishonga yebhinzi (inoculants)

- Shandisa mushonga unofanira bhinzi chaiwo. Tarira zvakanyorwa patsapo, mhando ye bhinzi inofanira kusanganiswa nemushonga uyu, uye kuti unoshanda kusvika riini (expiry date)
- Chengetedza inoculant kubva pazuva kuti irambe ichirarama. Inofanira kuchengetedwa mumamirire ekunze anoita 4° and 26° C.
- Chengetedza inoculant mutsapo dzakavharwa dzisinga pindi mhepo uye shandisa midziyo yakachena.
- Shandisa zvekunamirisa kana uchisanganisa bhinzi ne inoculants. Mbeu diki dzinoda zvekusanganisa zvakati wandei.
- Shandisa uwandu hwe inoculant hwakanyorwa patsapo muhuvandu hwakanyorwa. Usashandisa inoculant iri pasi pe 10 g. Mbeu diki dzinoda inoculant yakawanda.
- Sanganisa mbeu ne inoculant nguva diki usati wadyara. Inoculant haidi kupedza nguva yakawanda isati yashanda. Chengetedza mbeu yasanganiswa ne inoculant kubva pa zuva uye usarega dzichioma.
- Dyara muvhu rine unyoro.

Kusanganisa Ma Inoculants ne Mbeu

Munzvimbo zhinji mishonga ye bhinzi (nodule bacteria) haina kukwana muhuwandu kuti ishanda pazvirimwa kuti igadzire nitrogen yakakwana. Saka zvinokosha kusanganisa mbeu ne inoculant yakagadzirwa. Bacteria iyi inotogadzirwa neunyanzvi, yosanganiswa nezviputiro zvakafanana nemurakwani, ivhu, uye dhaka kuti pabudiswe inoculant. Kusanganiswa kwe mbeu ne inoculant kunonzi *inoculation*. *Rhizobia* inoshanda ne soya bhinzi mukugadzira nitrogen kubva mumhepo ishoma muivhu renzvimbo dzemu Africa zhinji. Munzvimbo dzinopisa uye dzine mvura inonaya iri shoma mune rhizobia shoma saka zvirimwa zve bhinzi zvinobatsirwa nekusanganisa bhinzi idzi ne inoculant. Kana bhinzi dzichitanga kurimwa munzvimbo itsva zvinotoda kuti mbeu dzisanganiswe ne inoculant. Munzvimbo dzinenge dzanyanyawo kurimwa bhinzi, inoculant yacho inenge iri shoma zvakare. Asi zvakadaro munzvimbo dze mu Africa zhinji munowanikwa mhando dze rhizobia asi mhando idzi hadzinyanyoshanda zvakasimba mukugadzira nitrogen. Mainoculants ari nyore kushandisa asi anokurumidza kufa kana akaiswa panzvimbo dzinodziya kusvika pa 40⁰ C. Anogona kugara kwemwedzi inoita mitanhatu (6) kana kupfuura kana akaiswa mu fridge. Mishonga yekunamirisa ma *inoculant* pa mbeu inofanira kugona kunamira zvakakwana. Gomarara (gum arabic) rinowanikwa mumiunga rinoshanda kana rasanganiswa nemvura. Methyethyl cellulose inobva munzimbe inogonao kushandiswa. Uwandu hwe mishonga inonamirisa hwunosiyawo zvekare zvichienderana nekukura kwembeu. Zvimwe zvekunamirisa zvinosanganisira shuga yakasanganiswa nemvura (10 %) ne uchi hwakasanganiswa nemvura. Huwandu hwe *Rhizobia* pa mbeu kuchishandiswa zvekunamirisa zvakasayana.

Chekunamirisa	Cells per seed
Gum arabic	2,500,000
ME cellulose	2,000,000
Uchi	500,000
Mvura	450,000
Shuga	400,000



Figure 2. Kushandiswa kwe slurry technique mukusanganisa bhinzi ne inoculant.

Pane nzira mbiri dzekusanganisa inoculant nembeu dzinoshandiswa. Chekunamirisa ne inoculant zvinosanganiswa pamwe chete zvino kwave kusanganisa nembeu pachishandiswa usvusvu (*slurry solution*) hwagadzirwa, kana kuti kusanganisa mbeu ne inoculant kwave kudira mbeu ne inoculant mune chekunamirisa (*two –step method*).

Slurry Inoculation (Kusanganisa chekunamirisa ne inoculant kwave kuzosanganisa nembeu) Figure 2

1. Sanganisa 100 g ye inoculant ne 300 ml dzechekunamirisa (sticker solution)
2. Durura 10 kg dzembeu ye soya bhinzi mumugoro we 20 litres
3. Sanganisa 400 ml yemusanganiswa wechinamiriso ne inoculant mumugoro.
4. Shandisa mugwaku kukurunga kuti zvisangane.
5. Dyara pakarepo wapedza kusanganisa kana kuti waridzira mbeu kuti dziwome.
6. Omesa mbeu pamumvuri wobva wadyara pakarepo kana kuti munguva diki.

Mu two-step approach mbeu dzinotanga dzanamirwa ne inoculant. (tarira pa Figure 3).

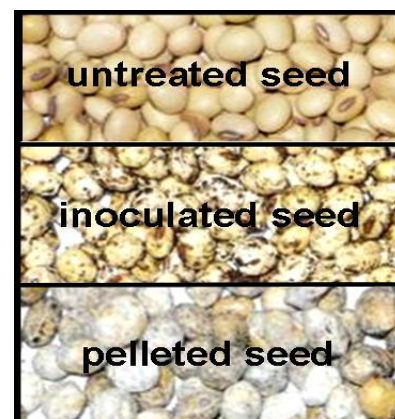
1. Durura mbeu dze bhinzi (5 kg) mupepa re plastic.
2. Wedzera 100 ml dzechinamiriso (gum arabic sticker).
3. Furidza pepa wobva wamona kuti rizare mhopeo rakavharwa..
4. Sanganisa mbeu nechinamiriso kwe minute imwe chete zvinyoro.
5. Vhura pepa wobva wadurura 50 g dze inoculant, sanganisa zvakare kwe minute imwe chete.
6. Kana mishonga wanamira pa bhinzi, ibva wadyara kana kuti dziwaridze pasi kuti dziwome dziri pamumvuri. Bhinzi dzave nemushonga dzinofanira kudyarwa nekukasika.

Nzira ye two step inoda chekunamirisa chisina kuwanda uye bhinzi dzakawanda dzinowana mushonga. Kusanganisa kwakanyanya kana kukurunga zvakananyanya zvinoita kuti mushonga upedzisire wabva pa bhinzi. Kana mbeu dzine mishonga yekuuraya tumbuyu chenjerera kufema mushonga uyu paunofuridza pepa kuti rizare mweya. Usashandisa zvekunamirisa zvinozoita kuti mbeu dzibumbame kana dzaoma.



Figure 3. Kushandiswa kwe two-step technique pakusanganisa bhinzi ne inoculant.

Zvinokwanisika kusanganisa fertilizer shomanana ne bhinzi dzine inoculant. Izvi zvinoshanda nekusanganisawo bhinzi idzi nedombo re phosphorus kana kuti limestone zvakagaiwa kwave kushandisa slurry kana two step. Nzira iyi inonzi **pelleting**. Inoculant inoshanda inoramba iri 10 g pa 1 kg ye mbeu asi chekunamirisa chinofanira kuti wandei zvisoma. Huwandu hwe chinamiriso hwunowanda zvichienderana nekukura kwe mbeu (Table 3). Super phosphate, sulphur kana hydrated lime



hazvifaniri kushandiswa nekuti zvinouraya rhizobia. Izvi zvinovava (acidic or alkaline).

Table 3: Chinamiriso ne inoculant zvinoshandiswa pakusanganisa bhinzi ne inoculant

Chirimwa	Huremu hwembeu g/seed	----- two-step pelleting -----		
		Namo ml/kg seed	inoculant g/kg seed	Zvekunamirisa g/kg seed
Soya bhinzi	0.15	28	10	200
Shuga Bhinzi	0.42	26	10	160
Nzungu	0.50	20	10	120
Nyemba	0.12	30	10	220

Nzira Dzinoshandiswa Muminda Kuwongorora netsvakiridzo ye marimirwe e Bhinzi (Field Demonstrations)

Vachibatsirana ne vaongorori vezvekurima nevarimisi, vatungamiriri vevarimi vanofanira kugadzira, nekugona kududzira ma *demo* anenge ari muminda yavo. Ma *demo* aya ari kuitirwa kuti varimi vazive zvinetso zvinowanikwa mukurima bhinzi uye kuti inzira dzipi dzingashandiswa kuti matambudziko aya apedzwe. Saka ma *demo* aya mazhinji acho anofanira kuitwa kwese kune chirongwa che N2Africa. Chikwata chimwe nechimwe chevarimi chinofanira kuva ne *demo*. Vanofanira kutungamirirwa nemutungamiri wevarimi mushure make mune varimi vanoita 15 kana 20. Vachapiwa mbeu nezvinodikanwa zvese pa *demo* yavo. Vanofanira kuzanisa zviri kuitika muminda yavo nezvinenge zvichiitwa pa *demo*. Chimwe chinokosha kuongorora musiyano une bhinzi dzisina *rhizobia* nedzasanganiswa ne *rhizobia*. Saka vanofanirawo kuwongorora bhinzi dzine phosphorus nedzisina *phosphorus*. Vanogura munda wavo voita zvindima zvina mumunda umu (Figure 4). Chindima chimwe nechimwe chinofanira kuiswa zvinyorwa zvinoratidza kuti chichadyarwa sei uye chinofanira kuva chine 25m² pakukura kwacho.

Muchindima umu munofanisa kuva ne maraini 10 anozodyarwa bhinzi. Zvirimwa zviri mundima imwe neimwe inozowongororwa zvichitariswa makurire e mbeu, kusvika kwadzo, goho richabuda, uyewo huwandu nekukura kwema *nodules*. Kana zvirimwa zvoze zvakafanana zvinenge zvichireva kuti hapana musiyano uripo pakushandisa *rhizobia* nekusaishandisa uyewo hapana musiyano uri pakushandisa phosphorus nekusaishandisa. Kana ndima dzine *rhizobia* dzine zvirimwa zvakasvika pakukura kwazo zvinoreva kuti varimi ngavashandise *rhizobia* mukurima kwavo. Kana ndima ine phosphorus ichiratidza mbeu dzine goho guru, varimi

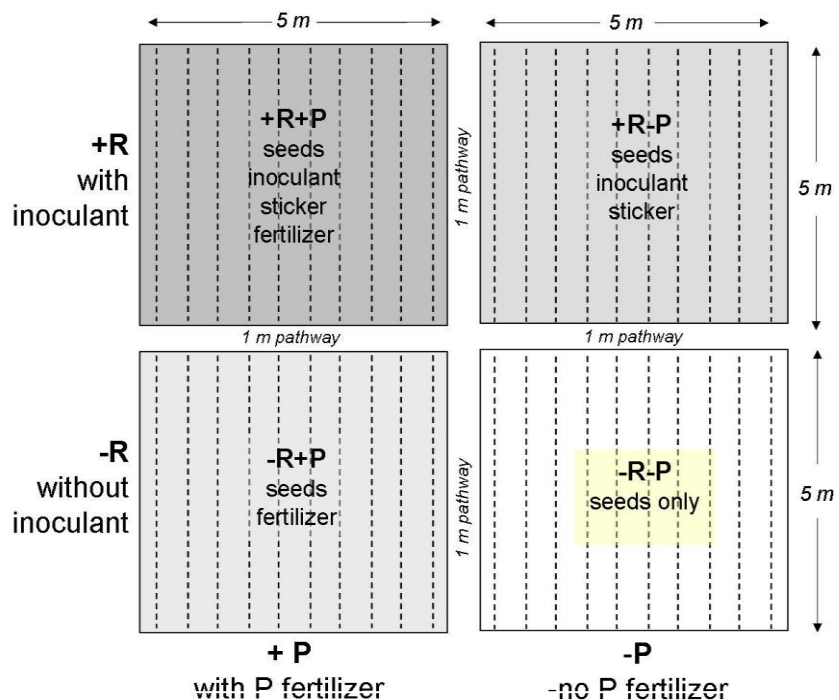


Figure 4. Demo yekuongorora kuti rhizobia ne phosphorus dzinoshanda sei mu soya bhinzi.

vanenge vachikurudzirwa kushandisa ma fertilizer ane phosphorus. Kana ndima inenge ine rhizobia ne phosphorus iri iyo ine mbeu dzakanyanyonakisa muku kura kwadzo, zvinoreva kuti rhizobia ne phosphorus zvinobatsira kuti mbeu dze bhinzi dzibudise goho guru. Wongororo yemuminda inoenzanisa mashandire e rhizobia ne fertilizer inenge ine nitrogen anobatsira kuti varimi vaone ukoshi hwe rhizobia kana nitrogen.

Ma *demo* anoitwa nevarimi anofanira kuva nyore uye ngaave nedonzvo rekubatsira kupedza matambudziko evarimi. *Demo* imwe neimwe ngaive nenzira nhatu dzemarimirwe akasiyana kuti varimi vagone kudzidza. Varimi vanogona *kuwongorora* musiyano uripo pakudyara nyemba munguva dzakasiyana mumwaka (A). Vanogona kuwongororawo musiyano uripo pakushandisa maraini echibage neshuga bhinzi zvakasiyana vachiona kuvhungwa kwebhinzi (B). Vanogonawo kuwona musiyano pakushandisa Triple Super Phosphate kana gypsum mukurima nzungu (C.) Vanogonao zvakare kutarisa makurire e soya bhinzi dzine inoculant mumunda une phosphorus neusina (D). Mamwe ma *demo* anoitwa zvichitariswa kuti varimi vari munharaunda vanoda kudzidza nekunzwisisa chii pakurimwa kwe bhinzi.

Nhaurirano pakati pevarimi nevawongorori vezvirimwa vachibvumirana zvinoita kuti varimi vadzidze pane zvavanenge vawona muma demo avo. Varimi vanofanira kuita wongororo dzavo dzavanotaurira vadzidzi nevawongorori vezvirimwa. Varimi vanofanira kuronga ma field day anoratidza kuti vaiwongorora chii mumwaka uyeo vadzidza chii pane zvakarima muma *demo* avo. Varimi vanokurudzirwa kutaura nemazvo kwete zvisiri izvo pane zvavanenge vawona. Havakurudzirwi zvakare kudzura zvirimwa mumunda iyi pasina ruzivo rweva wongorori vezvirimwa. Vawongorori vanofanirawo kushanda nevarimi pane zvole kubva mukuronga uyewo votaura kuti ndiani anenge achiita basa ripi panguva yekurima nekuchengetedza zvinyorwa uyewo kuzo dudzira zvinenge zvabuda muma *demo* avo. Vatungamiri vevarimi pavano wana ruzivo rwakadai, vanokurudzirwa kuti vazoitawo ma *demo* avo zvichienderana nekuti vanenge vachida kudzidza chii munzvimbo.

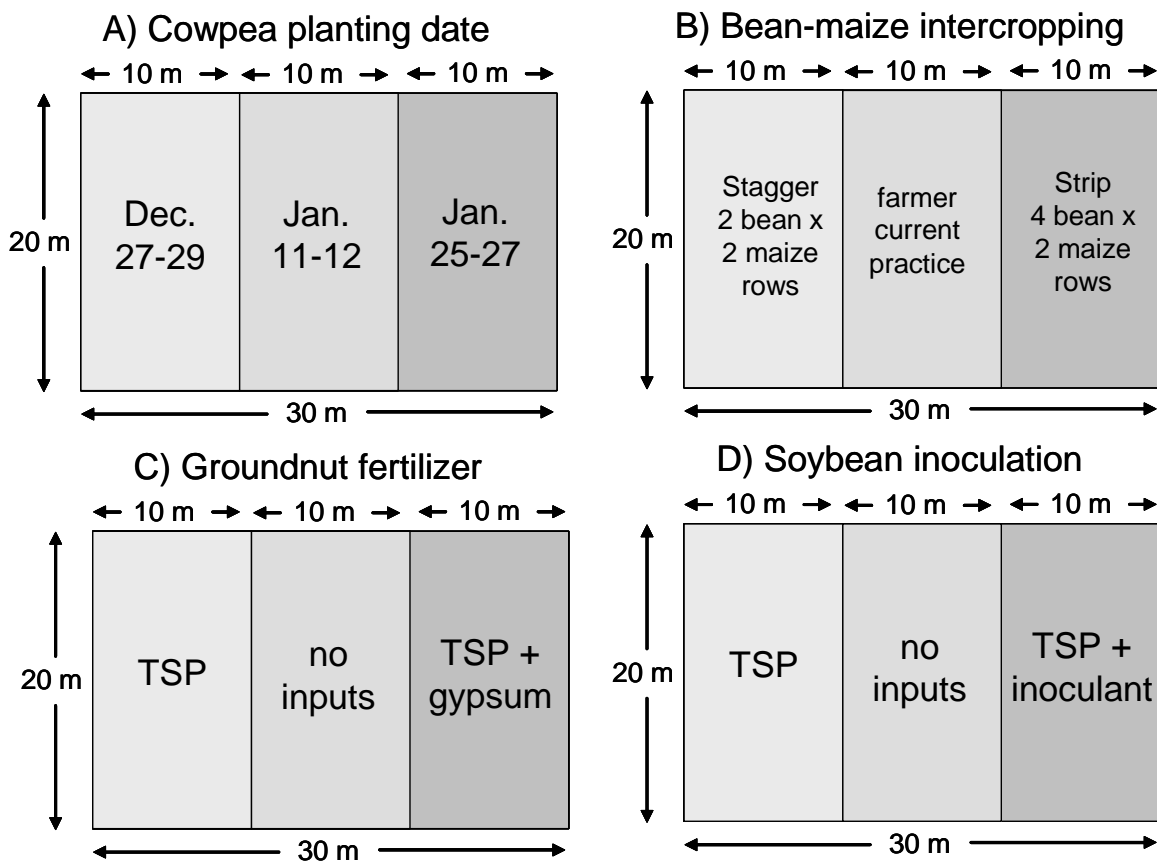


Figure 5. Options for technology testing with cowpea planting date (A), bean intercropping system (B), groundnut fertilization (C) and soybean inoculation (D).

Kudzidziswa Kwe nzira Itsva dzekurimwa Kwebhinzi

(Disseminating BNF Technologies)

Ma *field day* anorongwa nezvikwata zvevarimi senzira ye kuparidzira zvidzidzo kune mamwe mapato evarimi uye munharaunda. *Field day* rimwe chete rinogona kubatsira vanhu vakawanda: varimi, vadzidzisi, vana vechikoro, vezve mabhizimusi venharaunda, varimi vedzimwe nzvimbo uye vari muhurumende nevanopa rubatsiro kuvarimi. Zvirongwa zvema field day zvinoita kuti varimi vabatane pamabasa avo uye varimi vanopemberera goho ravo vakabatana vachiyanana nevavakidzani. Zviri pazasi zvinogona kutevedzerwa pama field day aya azadzise donzvo guru.



Ma *field day* anorongwa nezvikwata zvevarimi senzira ye kuparidzira zvidzidzo kune mamwe mapato evarimi uye munharaunda. *Field day* rimwe chete rinogona kubatsira vanhu vakawanda: varimi, vadzidzisi, vana vechikoro, vezve mabhizimusi venharaunda, varimi vedzimwe nzvimbo uye vari muhurumende nevanopa rubatsiro kuvarimi. Zvirongwa zvema field day zvinoita kuti varimi vabatane pamabasa avo uye varimi vanopemberera goho ravo vakabatana vachiyanana nevavakidzani. Zviri pazasi zvinogona kutevedzerwa pama field day aya azadzise donzvo guru.

- Kuumba komiti inoronga, kutsvaka nekubudisa nzvimbo yekuitira field day racho uye kutsvaka mari nevanhu vanoda kukokwa.
- Kuronga nekuzivisa zuva nguva ichiripo.
- Kugadzira zvekuzoratidzira pa field day iri.
- Kutsvaka vane zvekuita kubva muzvikoro, mabhizimusi, varimisi nezvimwe zvikwata zvevarimi.
- Kugadzira zvinyorwa zvinoratidza kune field day racho nekuzivisawo (posters).
- Kugadzira pekugara pevanhu vose nevanoremekedzwa. Kugadzira nzvimbo dzinodyirwa nevanhu uye peku itira mitambo. Havasungirirwi kupa chikafu.
- Kufamba nevanhu vachiratidza vanhu kuminda nekutsanangura zvavanenge vadzidza
- Kutsvaka zvinyorwa nekutsvaka vanotsanangura paminda yema *demo*.

Musanonoke pakutangisa field day pamusoro pevakokwi vanononoka kana kuzoramba vanhu voita zvinofadza vanhu nemimhanzi. Izvi zvinoita kuti vanhu vasazonzwa zvinokosha zvekudzidza. Nguva zhinji vanhu kana vari vashoma vanobatsirika chaizvo. Field day rakatsanangurika rinogona kurongwa nevarimi vari muchikwata vachibva vaita musanganano wavo vachikurukura nezvidzidzo zvavo.

Zvikuru zvinogona kubuda pakutsanangura zvinobatsira vanhukadzi kuti vatungamirire zvirongwa izvi uye kuti vagadzire misha yavo. Zvekudya zvakarerekera kuvanhukadzi. Misha mizhinji inofanira kuvandudza mabasa emadzimai nekodzero dzavo pakukurudzira kuita sarudzo vari mhuri. Chirongwa chinogonawo kurerutsa mabasa emadzimai nekudzidzisa nzira dzekuita basa dzisingaremi kana kurwadza. Vezvemabhizimusi vanogona kutengesa mbeu nezvinodikanwa pakurima zviri tsapo diki dzinogona kutengwa nevarimi vane mari shoma. Vanhukadzi vanofanira kuwaniswa mikana yekuva vatungamiriri vezvikwata zvevarimi (lead farmers) uye vadzidzisewo kuva vana chipanga mazano muchirongwa che N2Africa. Kupa vanhukadzi masimba mune zvekurima hazvifaniri kuwonekwa senzira yekukuridza kusagadzikana mudzimba asi kuti inzira yekuti misha mizhinji igone kuzviriritira. Vanhukadzi vanofanira kuve chikamu ($\frac{1}{2}$) chihombe muN2Africa. Vanhukadzi ava vanofanira kuve vakadzidziswa kuti vave vatungamiriri.

Kurimwa kwe Mbeu Mumisha (Community Based Seed Production)

Mbeu dzebhini dzakauchikwa dziri kukurudzirwa kubudikidza nechirongwa che N2Africa. Chirongwa ichi chiri kukuridzira kuti varimi vazvirimire nekuwedzera mbeu dzekuzoshandisa mwaka inotevera. Mbeu idzi dzinosanganisira soya bhini, shuga bhini, nzungu uye nyemba.

Soya bhinzi dzinofanira kunge dzichishandisa ma rhizobia akawanda muvhu. Shuga bhinzi dzinofanira kunge dzisingabatwi nezvirwere, uye nzungu dzinokurudzirwa dzisingabatwi nechirwere che rosette. Nyemba ngadzive dzichigona kukura munzvimbo dzine mvura shoma. Makambani anouchika mbeu mu Africa anononoka kutengesa mbeu dzavanenge vauchika nekuti vanenge vachiti dzavanenge vauchika dziri kushandiswa hadzizotengwi nevarimi. N2Africa ine donzvo rekuti mbeu dzebhinzi dzakauchikwa zvine hunyanzvi dzisvike kuvarimi, asi zvakare inokurudzira kuti varimi vazvirimire mbeu dzavo vega kuti chirongwa chikwanise zvinangwa zvachakavambirwa.

Zvikwata zvevarimi zvinogona kuzvirimira mbeu dzavanoda kushandisa, kana vasingazotengesi zvebhisimusi. Varimi vanofanira kuve vachitungamirira zvirongwa zve mbeu, vachibatsirwa neN2Africa. Varimi vanofanira kusarudza pakati pavo vanhu vanodzidziswa kurimwa kwe mbeu. Vasarudzwa ava ngavave vashoma, vane minda mikuru kuitira kuti zvirwere zvigone kudzivirirwa muminda yavo. Varimi vembeu ava ngavave vanodzidziswa nemakambani anouchika mbeu uye nevanotengesa mbeu munzvimbo dzavo. Pasarudzo dzembeu, mbeu dzine zvirwere kana kuti dzakadyiwa nemakonye ngadzibviswe. Mbeu dzinenge dzachengeterwa mwaka unotevera ngadzidzivirirwe nekumwaya mishonga yekudzivirira zvirwere. Zvinofanira kutevedzerwa nevarimi vembeu zviri pazasi:

1. Ngakuve nekomiti inotsvakurudza mbeu dzinoda kurimwa. Vanofanira kubvunza varimi kuti vanoda mbeu dzipi, uye vanofanira kuve neruzivo nezvemutemo wekurima mbeu.
2. Kugadzira bumbiro rezvinofanira kutevedzerwa pakuzogovana mbeu dzacho zviri pachena.
3. Kubuda negoho rinodiwa (expected yield) kuti vagone kuhwerengedza kukura kwenzvimbo yavanoda kushandisa kurima mbeu dzavo. (Huwandu hwembeu inodiwa/goho rinotarirwa pa hectare = kukura kwenzvimbo inodiwa) - seed target/expected yield = land area.
4. Kutsvaga varimi vanozvipira kurima mbeu idzi zvichienderana nekukura kwenzvimbo inoda kushandiswa. Nzvimbo ngaikure ne 20%. Kutsvaga mbeu (40-60 kg pa ha) fertilizer (2 bags P fertilizer pa ha) inoculant (400 -600 g pa ha) ne chinamiriso (800 -1600 ml pa ha).
5. Kushevedzera musangano nevarimi vose kuti vatange zviri pamutemo kubuda nevarimi vembeu, nekugova mbeu dzacho. Vobuda nenzira yekuongorora minda yacho uye kugamuchira nekusagamuchira mbeu dzinenge dzarimwa.
6. Varimi vonyorerana pasi chibvumirano uye minda yotanga kugadzirirwa.
7. Varimi vanofanira kuongorora nguva nenguva kuti mbeu dzavo dzakafanana zvakanini nedzimwe, vachidzura mbeu dzakasiyana nedzimwe. Kutsvaga rubatsiro kubva kuvatungamiriri vevarimi, varimisi, uye kubva kuma kamambani anouchika mbeu.
8. Varimi vanofanira kuongorora minda yavo vachitarisa utano hwembeu dzavo, zvirwere uye zvinodya mbeu; vodzivirira zvose izvi. Kutsvaga ruzivo kubva kuvatungamiriri vevarimi, varimisi, vawongorori vembeu (researchers).
9. Kugadzirira kuzokohwa, kutsvaga masaga, nemishonga yembeu uye zvinyorwa zvinoratidza kuti mbeu ipi (labels) nemishonga iri kuchengetedza mbeu (variety and chemical seed treatment).
10. Kutora mbeu kubva kuvarimi, kuwongorora mbeu, kuisa mbeu mishonga, kuunganidza mbeu nekuzivisa huwandu hwembeu inenge yarimwa mumwaka.
11. Kugovera mbeu kuvarimi vose vari muchirongwa zvichienderana nebumbiro remutemo wavo, uye kutevedzera mitemo yezvembeu nekuchengetedza mbeu kubva kuzvirwere.

Kuchengetedzwa Kwe Goho

Kuchengetedzwa kwegoho kunobatsira kuti goho rizoshandiswa rakanaka uye rigotengeseka. Goho rakanaka harina mwando wakawanda, harina zvipfukuto, harina mbeu dzisina kuzara, harina mbeu dzine mavara mavara uyeo harina marara, kunyanya mabwe kana ivhu. Mwando wakawanda unoita kuti mbeu iwore uye mbeu yacho inobatwa nezvirwere nekukurumidza. Mbeu inofanira kuwaridzirwa kuti iwome uyewo zvinoita kuti marara abviswe. Matombo anokuvadza

zvigayo kana asina kubviswa. Zvinodya mbeu ichiri mumunda zvinofanira kuurayiwa nekuti zvinogona kupfukuta mbeu yave mudura. Mbeu dzine mavara akasiyana dzino deredza mutengo wegoho. Saga rimwe nerimwe rinofanira kunge rine huremu hunotarisirwa nevatengi. Zvinodikanwa kuti zvirimwa zvikwanise kutengwa nema industry zvinosanganisira ma scale, zvekutora mwando (moisture meters), masefa anobvisa marara uye zvekuwomesera mbeu.

Kutengesa Zvirimwa (Bhinzi)

Goho rebhinzi rinogona kutengeswa kuvatengi vanotenga chirimwa chakawanda pamwe chete, mabhizimusi ari pedyo uye pamisika. Shuga bhinzi, nyemba ne nesoya bhinzi dzinowanzotengeswa dziri muma saga anorema 90 kg asi nzungu mumasaga e 110 kg. Pamisika nzungu, nyemba ne shuga bhinzi zvinotengeswa zvirimwa muma saga e 5 kg. Mu Zimbabwe mugoro ye 20 litres ndiyo inonyanyoshandiswa kutengesera zvirimwa izvi pamusika mikuru mumadhorobha. Soya bhinzi zhinji inotengwa kubva kunze kwenyika ichiunzwa mu Africa saka pane mukana mukuru wekuti kana varimi vakabatana vachirima bhinzi vanogona kubudirira chaizvo. Kubatana kwe varimi kuti vatengese zvirimwa zvavo muzvikwata kunogoneka kana vadzidziswa kuti zvinoitwa sei. Chokutanga ndechekuti chikwata chimwe nechimwete chinoda kuwona kuti chotengesei, uye chotengesa kupi. Zvino varimi vanofanira kuziva kuti vanobhadharwa sei saka vanotsvaka vamiriri vavo vanozotaura nevatengesi uye kuziva kuti vatengi vanotarisirwa zvipi pane zvavanoda kutenga. Varimi vanofanira kuchenjerera nguva dzekutengesa nekuti mitengo inosiyana-siyana gore rose (Figure 6). Varimi vanosarudza nzvimbo yekutengesera, voronga kuti goho avo rinotakurwa sei, uye voronga pekuchengetera goho ravo. Vanofanira kuronga kuti vanobhadharwa sei; kana vakatora mbeu dzechikwereti

vanofanira kuziva kuti vanodzose sei chikwereti ichi. Vanofanira kutakura goho kuenda kuvatengesi vobva vabhadharwa mari dzavo. Kana vatengesa vanofanira kuzouya votaura kune vamwe vose kuti zvinenge zvafamba sei. Varimi vanofanira kungwarira kuti vatengese goho risina zvinoshoreka pariri nekuti izvi zvinogona kuderedza mutengo we goho ravo. Kana varimi vakatengesa vari muzvikwata zvinoita kuti vatengerwe zvirimwa zvavo nekukurumidza uye nemitengo iri pamusoro.

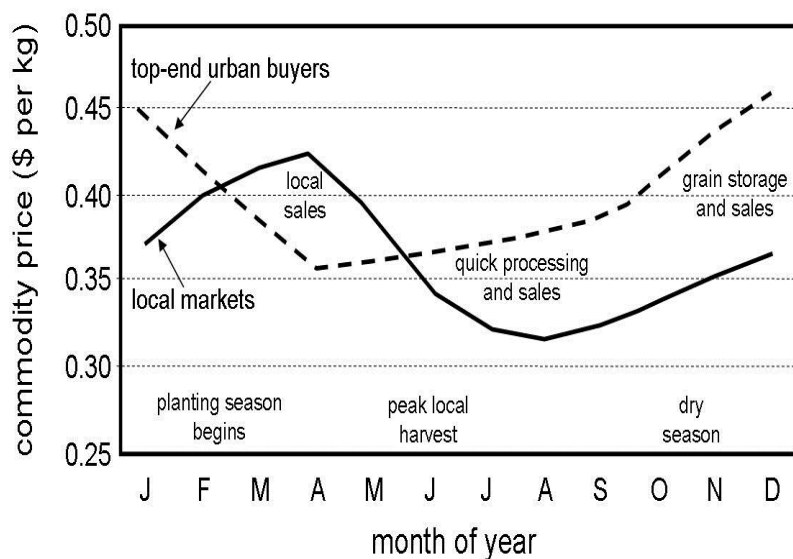


Figure 6. Kushanduka kwemitengo kunofanira kutariswa kana varimi vachida kutengesa Goho ravo.

Tsanangudzo Dzemaswi Akashandiswa Muchinyorwa (Lead Farmer's Glossary)

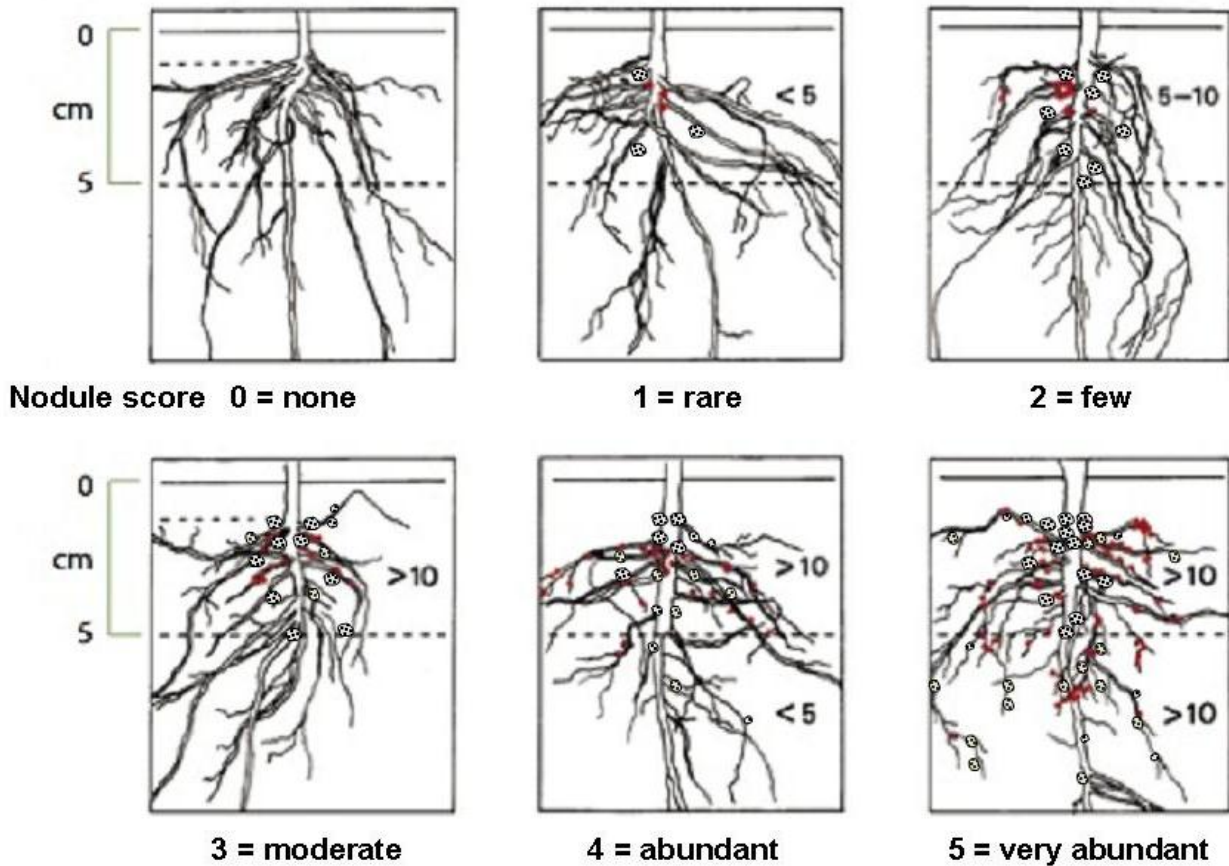
- Namo** (adhesive): namo kana kuti chinamiso chinoshandiswa kuti rhizobia inamire pa mbeu ye bhinzi
- Biological nitrogen fixation (BNF)**: kudya kwezvirimwa kunobva mumhepo zvichikonzerwa ne tumbuyu twe muvhu.
- Zviputiro** (Carrier material): Upfu hunotakura tumbuyu tunonzi rhizobia tunobvisa chikafu mumhepo kuti chishandiswe ne bhinzi. Upfu hunobva pakugaiwa kwenzimbe ndihwo unoshandiswa sezviputiro.
- Nzvimbo yakabvumiranwa yekutakurira zvirimwa (collection points)**: Nzvimbo dzakaranganwa kuti varimi vapiwirwe mbesa kana kuti vatakurirwe kuendesa kunotengeswa.
- Mapoka etumbuyu (cross-inoculation groups)**: Mapoka etumbuyu zvichienderana kuti tunoshanda zvakanaka pa mbeu ipi yebhinzi
- Mapundu pamudzi muhombe webhinzi (crown nodulation)**: Mapundu e tumbuyu tunonzi rhizobia anowanikwa kumusoro kwemudzi muhombe wezvirimwa zvebhinzi.
- Zvibvumirano (forward contracts)**: Zvibvumirano zvakanoreranwa pasi pakati pevarimi nevatengi vezvirimwa pamusoro pemutengo, huwandu, hunaku uye nguva yekutengeswa.
- Zvirimwa Zvebhinzi (grain legumes)**: Mbeu dzinokwanisa kushandisa chikafu chemumhepo. Mhando yembeu inobatana netumbuyu (rhizobia) twemuvhu zvichishandisa chikafu chemumhepo. N2Africa inoshanda nezvirimwa zvina, zvinoti, shuga bhinzi, nyemba, soya bhinzi uye nzungu.
- Gomarara (gum Arabic)**: Namo inowanikwa mumiti inenge yakura. Gomarara rinonyanyoshandiswa ku West Africa senamo pakusanganisa mbeu ne rhizobia.
- Zvinotarisirwa nama industry (Industry standards)**: hunaku hunotarisirwa kunge huri pambeu padzinotengeswa (hunoro, kubandika, kusvava, kusviba, kuora uyeo nekusawanikwa kwemarara mumbeu ndizvo zvinotarisirwa navatengi.
- Rhizobia**: tumbuyu tunotora chikafu chezvirimwa (nitrogen) kubva mumhepo twakabatana nemidzi yebhinzi.
- Rhizobia isingagadzire mapundu (ineffective nodulation)**: tumapundu twemidzi yebhinzi tusingagadzire chikafu chinobva mumhepo tune mukati makachena kana me green.
- Inoculant**: tumbuyu tunobatana nemidzi yebhinzi twakasanganisa nemarisha ekuti tuwane mabatirwo
- Inoculation**: Kusanganisa tumbuyu (rhizobia) pambeu pachishandiswa chinamiso
- Vatungamiriri vevarimi**: murimi anotungamirira vamwe varimi muchirongwa che N2Africa. Chirongwa che N2Africa chinobatsirwa nevatungamiriri vevarimi kuti varimi vose vawane zivo. Master Farmer: see Lead Farmer.
- N2Africa**: Chidimbu chezita rechirongwa chinodzidzisa varimi kuti vashandise nzira itsva dzekurimwa kwebhinzi munyika dzemu Africa. Chirongwa ichi chiri kupiwa mari nerubatsiro ne Bill and Melinda Gates Foundation.
- Nitrogen (N)**: chikafu chembeu chinowanikwa mumhepo chichizoshandiswa ne bhinzi muvhu. Chikafu ichi ndicho chinoshandiswa nezvipfuyo nezvirimwa sechikafu chinovaka muviri (protein). Ndicho zve chinoshandiswa ne BNF.
- Phosphorus (P)**: chikafu chinodiwa kuti mbesa dzikure zvakanaka zvikuru midzi. Chikafu ichi chinowananzoshaikwa muvhu zhinji remu Africa.
- Kushandiswa kwe Goho**: Mabatirwo egoho zvinosanganisira kumenya, kutsokonyora, kupepeta, kuisa mumasaga kana mudura uye kuchengetedza zvinoita kuti zvigozotengeseka nemitengo iri pamusoro.
- Kuchengetedza Hukoshi hwembeu**: kucherechedza nekuchengetedza hunaku wegoho kuti zvifadze vanotenga.
- Rhizobium**: Tumbuyu tunowanikwa muvhu tunobatana nemidzi ye bhinzi zvichizobatsira kuti chikafu chiri mumhepo (nitrogen) chigone kushandiswa nebhinzi zvichizobatsirao zvirimwa zvinotevera.
- Mapundu emidzi yebhinzi**: mapundu anowanikwa pamidzi kana tumbuyu twabatana nemudzi webhinzi.
- Slurry**: Usvusvu hunogadzirwa nekusanganisa chinamiriso ne rhizobia kuti tumbuyu tubatire pabhinzi.
- Sticker**: (Namo) Ichi chinamiriso chinoshandiswa kuitira kuti mbeu yebhinzi isanganiswe nerhizobia.
- Two-step**: Inzira yekusanganisa mbeu nenamo mushonga we rhizobia usati wasanganiswa nembeu yacho.
- Lime**: mhando ye fertilizer inoshandiswa kurapa ivhu kuti risavave kana zvirimwa zvadyarwa mariri.

Zvinobatsira Vatungamiriri Vevarimi Pabasa Ravo

(Zvinofanira kuzivikanwa nekugonekwa nevatungamiriri vevarimi (Lead farmers)

- Kuti vawane mbeu dzauchikwa itsva dzebhinzi.
- Vagone kupatsanura nekuziva zvikwere netumbuyu tunodya bhinzi
- Vawane mukana wekupiwa ma fetiraiza anodiwa paku rimwa kwe bhinzi.
- Vagone kuziva zvinoperevera pazvirimwa zvavo (chikafu chezvirimwa zvavo)
- Vazive zvirimwa zvinogona kurimwa pamwe chete nebhinzi uye ma crop rotations.
- Vazive, kutsanangura nekukukuridzira zvekuchengetedzwa kwe ivhu
- Vakurudzire mashandindisirwe emiti yekutsigira bhinzi dzinotanda pasi
- Vazive mapundu (root nodules) anoshanda pabhinzi neasingashandi
- Vagone kusarudza mishonga yegodza ivhu inonyanyoshanda pabhinzi (inoculants), nekuichengetedza zvakanaka.
- Kugadzira mishonga yema inoculants nekuisanganisa ne bhinzi.
- Kusanganisa ma inoculants nebhinzi uye nekugona kuziva kuti ma inoculants achiri kushanda here kana kuti haachashandi.
- Kusanganisa mbeu dze bhinzi dzave nema inoculants ne fertilizer
- Kugadzira, kuronga nekududzira zvinotora zvimbo muminda yavo ine zvirimwa kana kuti mafertilizer akasiyaniswa.
- Kugona kuziva kuti ivhu ravo rinoda lime here kana kuti dzimwe mhando dze fertiliser kuti rikudze mbeu zvakanaka.
- Kugona kuzadzisa zvinodiwa nevatengi uye vanoshandisa goho vari munzvimbo dzavo kana kuti munyika mavo. Vagone kuzadzisa zvinotarisiswa nema industry anotenga bhinzi dzavo.
- Kuchengetedza goho kuti rirambe rine ukoshi hwaro.
- Kuronga vamwe kuti varime mbeu dzekushandisa mwaka inotevera munzvimbo dzavo.
- Kuronga zvikwata zvekuti vatengese goho vakawanda.
- Kutsanangura zvinangwa, donzvo, nezvinofanira kuitwa muchirongwa che N2Africa.
- Vazadzise zvinotarisiswa nevarimi vechimadzimai muchirongwa che N2Africa.
- Kutsanangura nekudzidzisa vamwe varimi vose zvavanenge vadzidza muchirongwa che N2Africa.
- Kutsvaga rumwe rubatsiro runodikanwa kubva kune varimisi neva vawongorori vezvirimwa kana ku N2africa.

Zvinogona kuverenga ma nodules kwave kua isa muzvikamu kubva pa 0 -5



Kuwanda kwe ma nodules kunogona kutsvetwa muzvikamu kubva pa 0 kusvika pa 5 kuitira kuti murimi azive kuti chirimwa chake chiri kugadzira nitrogen yakawanda zvakadini. Zvina zvezvikamu izvi zviri pamusoro apo. Zvikamu 4 ne 5 zvinoreva kuti chirimwa chiri kugadzira nitrogen yakawanda. Kuwedzera kwe ma nodules nekufamba kwenguva mumunda zvinoreva kuti chirimwa chiri kuita BNF zvakakanaka uye murimi ari kugona kuchengetdza chirimwa chake mumunda. Kuverenga ma nodules kwenzira iyi kunoshanda chete mu nyemba, soya bhinzi ne shuga bhinzi nekuti nzungu dzine ma nodules akawanda uye ari madiki uye akabatana nemidzi zvakanyanya.



Chirongwa che N2Africa chinosevenza mukutsvakiridza nekubatsira varimi kuti varime zvirimwa zvebhinzi ne unyanzvi muAfrica. Muchirongwa che N2Africa varimi vanodzidziswa kurima bhinzi kuchishandiswa nzira dze kutorwa kwe Nitrogen mumhepo nezvirimwa zvebhinzi. Rubatsiro rwe mari ruri kubva ku boka re Bill and Melinda Gates Foundation kubudikidza nebazi re Plant Production Systems riri Ku Wageningen University munyika ye Netherlands. Utungamiriri hwechirongwa ichi huri ku University ye Wageningen huchishandidzana ne CIAT –TSBF, IITA. Chirongwa che N2Africa chiri munyika dzinoti Democratic Republic of Congo, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda uyewo ne Zimbabwe. Munyika idzi N2Africa inosevenza nemasangano akazvimirira ega (NGOs) ari munyika idzodzi kuti rubatsiro rwusvike kuvarimi. Mukupera kwemakore mana chirongwa chinenge chaita zvinotevera: kutsvagurudza nekushandisa zvirimwa zvebhinzi zvinounza nitrogen kubva mumhepo, kuongorora zvirimwa zvebhinzi kuti zvikwanise kuva chikafu chevanhu, zvipfuyo uye kuti zvishande senzira dzegodzavhu, kukurudzira kurimwa kwebhinzi nevarimi vemumaruwa, kubatsira kugadzirwa kwema inoculants uyeo kushanda pamwe chete nema kambani kuti ruzivo rwe bhinzi rusvike kwarwunofanira. Pamusoro peizvi, chirongwa ichi chichabatsira varimi vemumaruwa vanosvika 225 000 pachishandiswa vatungamiriri vevarimi vanenge vasarudzwa. Kutu muzive zvakanwanda munogona ku enda pa dandemutande remumhepo pa www.N2Africa.org.



Putting nitrogen fixation to work for smallholder farmers in Africa