



**CIP**  
INTERNATIONAL  
POTATO CENTER



# **Guhinga neza Ibirayi mu Rwanda**

**Igitabo cy' amahugurwa**

### **Byashyizwe ahagaragara na:**

Ikigo mpuzamahanga cyita ku birayi (CIP)

Icyicaro gikuru: Avenida La Molina 1895, La Molina, Apartado Postal 1558, Lima, Peru

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### **Gushimira:**

Iyi mfashanyigisho yakozwe ku bufatanye bw' Ikigo mpuzamahanga cyita ku birayi (CIP), Ikigo cy'igihugu gishinzwe guteza imbere ubuhinzi n'ubworozi mu Rwanda (RAB), n'umuryango w'abahinzi n'aborozi (Agriterra).

Iyi mfashanyigisho ishyizwe ahagaragara hifashishijwe zimwe mu nyandiko nka "Guhinga neza ibirayi muri Kameruni" yatewe inkunga na minisiteri y'Ubudage ishinzwe ubufatanye mu by'Ubukungu n'lterambere (BMZ) igaragara ku <https://hdl.handle.net/10568/108468> under Creative Commons Attribution 4.0 International license (CC BY 4.0); Inyandiko zitandukanye zakozwe ku buhinzi bw'Ibirayi ndetse n'ibitekerezo by'abahinzi b'Ibirayi mu Rwanda.

Turashimira cyane ibitekerezo n'ubufatanye bw'abahagarariye: Umuryango w'Abahinzi n'Aborozi mu Rwanda "Imbaragara", Delphy, SPF-Ikigega, Rwandan Potato Stakeholders Platform, INES-Ruhengeri, UR-CAVM, Horizon-Sopyrwa, Akarere ka Musanze, Holland Greentech, Hollanda Fair Foods, HoReCo Rwanda, amahuriro y'abahinzi b'ibirayi bo mu turere twa Musanze, Nyabihu na Rubavu, n'amakoperative afashwa mu bujyanama na Agriterra ibinyujije mu "Imbaraga".

Iyi mfashanyigisho yateguve ku nkungu y'Umuryango w'Abahinzi n'Aborozi "Agriterra".

### **Ahantu n'itariki byatangarijweho:**

Kigali / Nyakanga 2021

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# **Imiterere y' iyi nyigisho**

## **Ibigize amahugurwa**

Iyi mfashanyigisho ku "Guhinga neza Ibirayi biribwa mu Rwanda" ikozwe n'ibice bine (4) n'insanganyamatsiko 20, nkuko bigaragara hano hasi:

### **Isomo rya 1: Ibyibanze ku gihingwa cy'ibirayi**

Igice cya 1: Akamaro k'igihingwa cy'ibirayi

Igice cya 2: Kumva neza imikurire y'ibirayi

### **Isomo rya 2: Ubutaka, Igihingwa no gukoresha amazi neza**

Igice cya 3: Guhitamo ubutaka no gusimburanya ibihingwa

Igice cya 4: Gutegura umurima/ ubutaka

Igice cya 5: Gufumbira (ifumbire yamatungo, imborera nifumbire mva ruganda)

Igice cya 6: Uburyo bwo gutera

Igice cya 7: Kubagara no gusukira ibirayi

Igice cya 8: Kuvomerera

Igice cya 9: Kuvanga ibirayi nibindi bihingwa

### **Isomo rya 3: Kurwanya indwara n'ibyonnyi**

Igice cya 10: Mpandeshatu y'indwara

Igice cya 11: Kurwanya indwara y'imvura

Igice cya 12: Kurwanya Kirabiranya

Igice cya 13: Kurwanya Kabore

Igice cya 14: Kurwanya Imfunyarazi

Igice cya 15: Kurwanya imungu y'ibirayi

Igice cya 16: Kurwanya amavunja y'ibirayi

Igice cya 17: Gukoresha neza imiti irwanya indwara n'udukoko

### **Isomo rya 4: Imirimo yo gusarura no guhunika**

Igice cya 18: Gusarura

Igice cya 19: Gutoranya no gutondeka ibirayi

Igice cya 20: Guhunika ibirayi byo kurya

Urukurikirane rw'amasomo n'ibice n'insinganyamatsiko ziri muri iyi mfashanyigisho rukurikije imiterere nyakuri yimikurire y'igihingwa cy'ibirayi. Niyo mpamvu, ari ngombwa gukurikiranya neza ibi bice mu gihe cyo gutanga amahugurwa. Iyi mfashanyigisho ishobora gukoreshwa hatangwa amahugurwa kubazahugura abandi (abahugura abahinzi b'ibirayi) cyangwa se igakoreshwa uhugura abahinzi bitanyuze kubazahugura. kuri buri gice, utanga amahugurwa ku bazahugura cg uwahuguwe agomba guteganya nibura iminota 15 yigisha, hanyuma agateganya indi minota 10 ku bibazo n'ibisubizo. Muri rusange, izi nyigisho zimara nibura amasaha 8 kugirango zirangire gutangwa,bihwanye n'iminsi 2 y' amahugurwa kubazahugura abandi cyangwa se ibyiciro 4 by' amasaha 2 uhugura abahinzi. Mu rwego rwo kureba akamaro amahugurwa yagize kuri buri cyiciro, abahugura barakangurirwa gutanga isuzuma bumenyi ryanditse ku bahugurwa yaba mbere cyangwa nyuma y'amahugurwa hifashishijwe ibibazo bimwe. Urugero rw'ibibazo byabazwa ruri ku mugereka. Ni ngombwa ko abazahugura abandi, nibura baba bafite amanota 12/20 mu isuzumwa ryatazwe.

## **Imfashanyigisho z'amahugurwa**

Iyi nyigisho igomba kugira ibyo yifashisha mu mahugurwa kugirango ibashe gutangwa no kumvikana neza. Ibyifashishwa mu mahugurwa bigizwe n'amasomo anyuranye yifashishwa n'abantu batandukanye ku buhinzi bw'ibirayi. Nibura, hari uwoko 4 bw'mfashanyigisho yifashishwa mu guhugura abazahugura abandi ndetse no gukomeza kugera ku mahugurwa y'abahinzi b'ibirayi. Izo mfashanyigisho n'izi zikurikira:

- 1) Igitabo cy'amahugurwa
- 2) Imfashanyigisho yifashisha amashusho
- 3) Imfashanyigisho y'umuhinzi n'
- 4) Imfashanyigisho ikoreshwa ku mirima y'icyitegererezo

## **Igitabo cy'amahugurwa**

Igitabo cy'amahugurwa, ni igitabo gikuru cy'amahugurwa. Kigizwe n'ibice bitatu by'ingenzi: (i) Incamacye y'amasomo, (ii) Amasomo 4 n'ibice 20 nabyo bigaragara mu mfashanyigisho y'umuhinzi, hamwe na (iii) Imigereka. Incamacye igaragaza imiterere y'amahugurwa ndetse n'imfashanyigisho zizifashishwa. Igice cya kabiri cya trainer guide kigaragaza amasomo agize amahugurwa ndetse nuko uhugura agomba kwitwara. Mu gice cya nyuma, iki gitabo kigaragaza ibibazo byatanzwe ndetse n'ubutumwa uhugurwa asigarana kuri buri gice nk'uko bigaragazwa mu mfashanyigisho yifashisha amashusho ndetse no mu isuzumabumenyi rigaragaza ubumenyi abahugurwa basigaranye.

## **Imfashanyigiso yifashisha amashusho**

Imfashanyigiso yifashisha amashusho ni imfashanyigisho-ngiro ifasha uhugura gutanga amahugurwa. Ipaji y'imbere iba iriho ifoto igaragaza igice kigiye guhugurwaho. Ni ifoto abahugurwa baba bareba. Ipaji y'inyuma iba igenewe uhugura kandi iriho ibantu bine by'ingenzi birebana na buri gice uko ari 20: (i) agace gatoya kariho ifoto isa niri kuri paji y'imbere; (ii) incamacye y'inyigisho yerekana iby'ingenzi biganirwaho; (iii) Ibibazo 3 ngenderwaho; (iv) n'ubutumwa bw'ingenzi abahugurwa basigarana. Ifoto ntoya iri inyuma ifasha uhugura kuzirikana igice arimo kwigisha. Mu gihe hasobanurwa ibiri ku ifoto, hifashishwa ifoto iri kuri paji y'imbere. Mu gihe arimo kuvuga ku ncamacye y'isomo, uhugura abaza abahugurwa kwitegereza neza ifoto hanyuma bakamubwira icyo barimo kuyumvaho. Kuri buri shusho, nibura ibibazo 3 bigomba kubazwa kugirango harebwe niba abahugurwa bumvishe cyangwa batumvise neza isomo. Uhugura asoza isomo atanga ubutumwa bwo kuzirikana.

## **Imfashanyigisho y'umuhinzi**

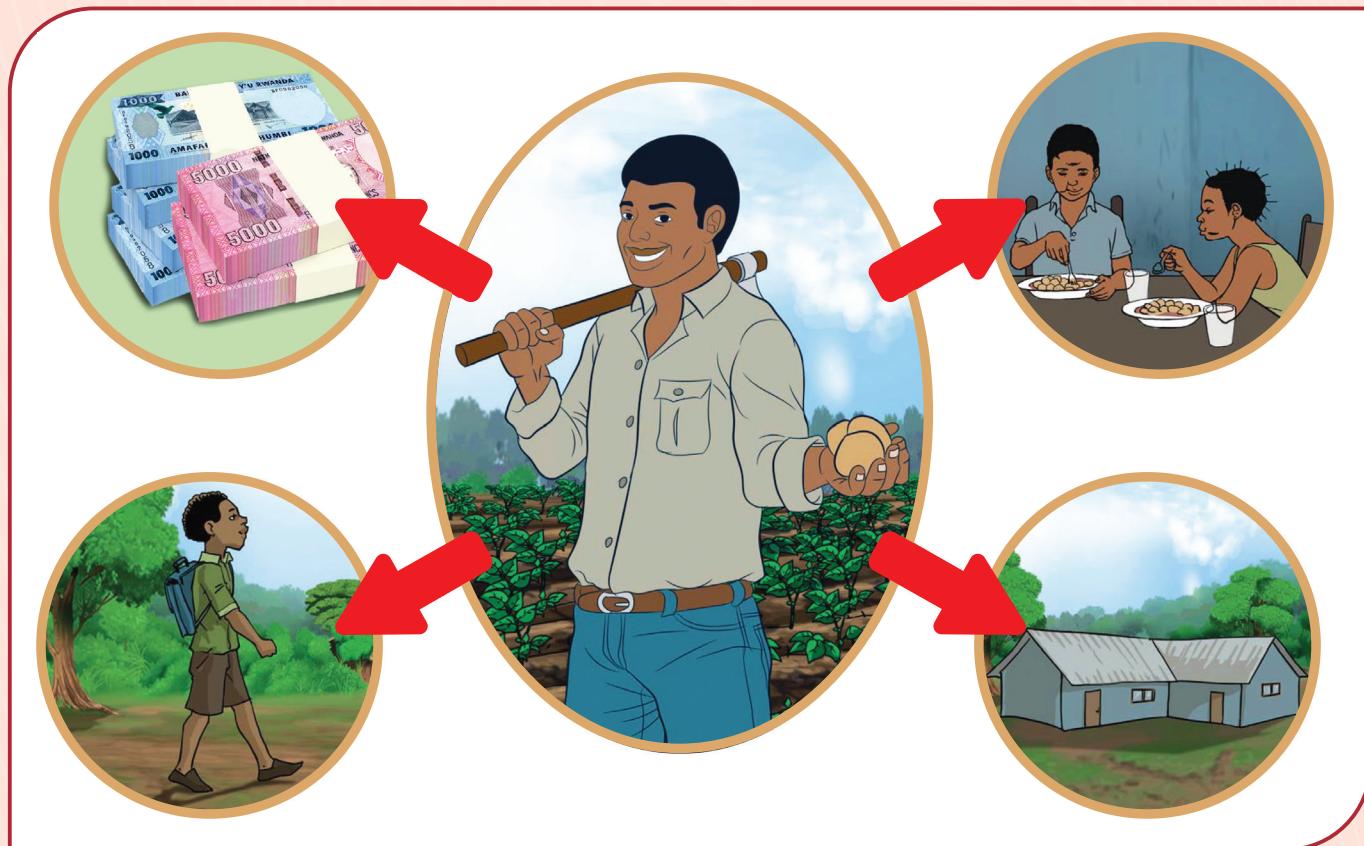
Aka ni agatabo gatoya kakwirwa mu mufuka, niko umuhinzi wahuguweakoresha. Ni ngombwa gutangwa iyi nfashanyigisho umaze gutanga amahugurwa. Niba gutanga iyi imfashanyigisho bibaye mbere y amahugurwa, bishobora guha abitabiriye urwitwazo rwo gusiba amahugurwa cyangwa gutakaza ibitekerezo mu gihe cy'amahugurwa. Ni muri urwo rwego, imfashanyigisho ishobora gufatwa nka kimwe mu byifashishwa mu gushimira abahinzi nyuma yo gusoza amahugurwa.

## **Imfashanyigisho ikoreshwa ku mirima y'icyitegererezo**

Iyi ni imfashanyigisho y'inyongera ifasha mu gutanga amahugurwa. Nyamara, ntabwo bivuze ko yakwifashishwa yonyine. Ifasha abahugura gutunganya no korosha neza amahugurwa mu murima, gutanga inyunganizi ku nyigisho yatanzwe mu magambo iri mu gitabo cy'amahugurwa. Igizwe n'ibantu bitatu byerekana: (i) kwita ku gihingwa, (ii) guhitamo icyiza na (iii) uburyo bwo gukoresha akarima gato. Kuri buri gice, iyi mfashanyigisho itanga ibisubizo ku bibazo bikurikira: Niki, Kubera iki, Ryari, Mu gihe kingana iki, Hamwe niki kandi gute. Ni gute uhuza inyandiko n'amashusho mu rwego rwo gusobanura intambwe zitandukanye zisabwa muri buri cyiciro cy'amahugurwa. Mu gihe utegura amahugurwa wifashishiye iyi mfashanyigisho, uhugura agomba gusuzuma intambwe enye zikurikirana: (i) Intangiriro kuri (cyangwa ibisobanuro bigufi byo kunonosora kuri) ingingo; (ii) imyitozo igaragara muri iyi mfashanyigisho; (iii) umwanya w'ibibazo n'ibisubizo mu bitabiriye amahugurwa; hanyuma (iv) ibikurikiraho mu gutegura amahugurwa ataha.

## Isomo 1 Iby'ibenze ku gihingwa cy'ibirayi

### Igice cya 1. Akamaro k'ighingwa cy'ibirayi



**Baza abitabiriye amahugurwa gukora urutonde rw'ibihingwa nganduraruro bihingwa muri aka gace. Hunyuma, basabe kubiha amanota bakurikije ibibinjiriza amafaranga. Ibi bifasha mu kumenya akamaro ngereranwa k'ibirayi n'ibindi bihingwa**

Ibirayi bikomoka mu misozi miremire yo muri Amerika y'amajyepfo, aho byavuye bikwira isi yose, harimo na Afrika. Ibirayi ni igihingwa cya gatatu ku isi mu bihingwa ngandurarugo nyuma y'Ingano n'Umuceri. Itanga ibitera imbaraga byinshi ku buso n'igihe byahinzweho kurusha ikindi gihingwa icyari cyo cyose gihinzwe mu bice bifite ikirere gikonja.

Usibye kuba bifite intungamubiri nyinshi, ibirayi ni kimwe mu bihingwa by'ingenzi byinjiza amafaranga mu bihugu byinshi harimo n'u Rwanda.

Mu Rwanda, umusaruro w'ibirayi uracyari mucye, hasi ya toni 10/ha ugereranije n'umusaruro ugera kuri toni 25/ha

ubonwa n'ababinzi bahinga bya Kijyambere. Nubwo umusaruro ucyiri mucyeya, ababinzi bakomeza guhinga ibirayi kubera ko bitanga amafaranga ugereranije n'ibindi bihingwa mu karere kamwe nabyo.

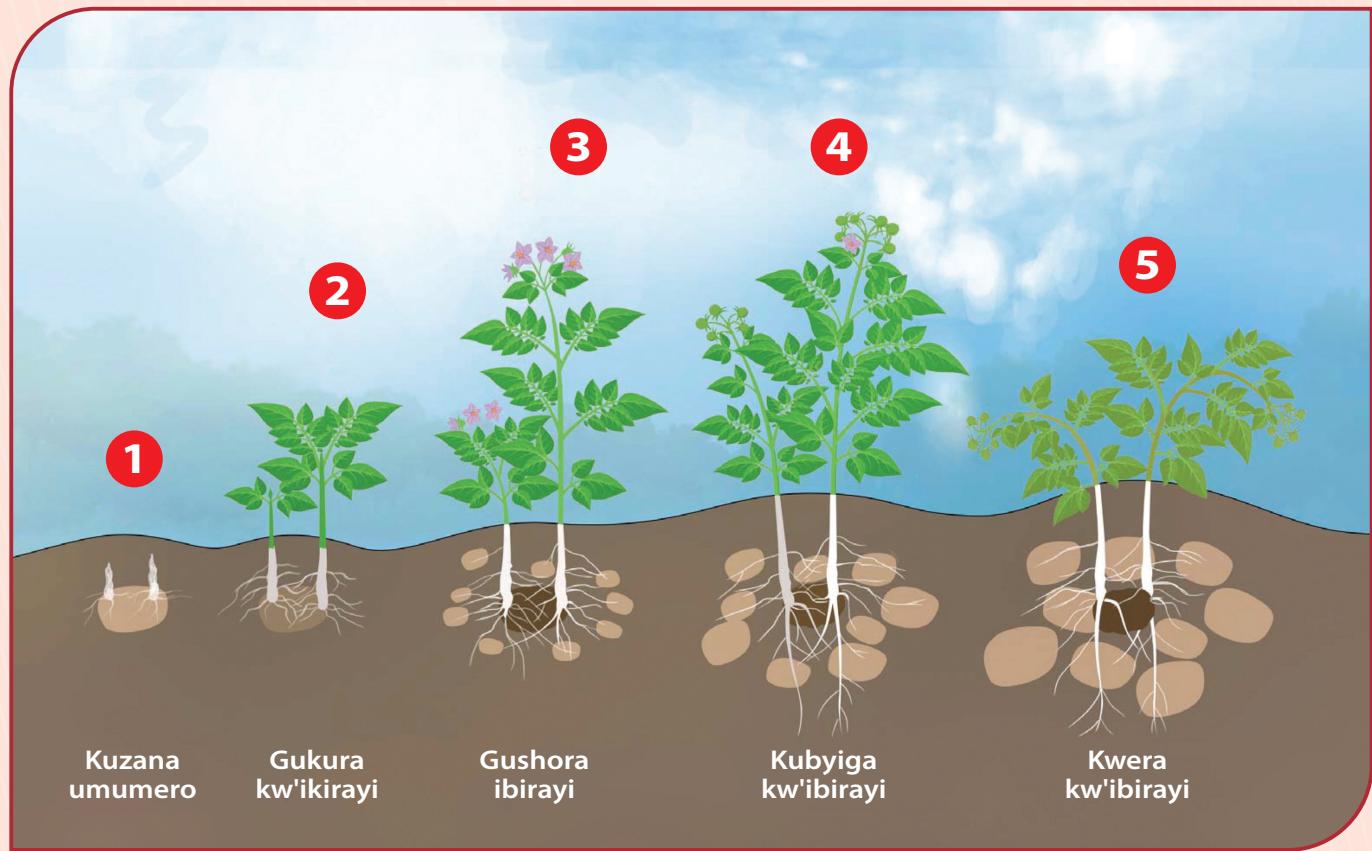
Mu kwinjiza amafaranga agaragara, ubuhinzi bw'ibirayi bufasha abahinzi guteza imbere imbereho yabo, urugero: bubaka inzu nziza, bishyurira abana amafaranga y'ishuri ndetse babona amafaranga yo kwivuza.

Mbere yo kwinjira mu buhinzi bw'ibirayi bugamije inyungu zamafaranga, ibantu bikurikira bigomba kubanza kwitabwaho:

- 1) Nibura kugira ubumenyi bw'ibenze ku mihingire myiza y'ibirayi;
- 2) Kugira ubutaka butarangwamo indwara;
- 3) Kugira ubushobozi bwo kugura Inyongeramusaruro zikenewe, urugero: imbuto, ifumbire n'imiti);
- 4) Kumenya niba imbuto yujuje ubuziranenge y'ubwoko ukeneye ihari kandi iboneka;

- 5) Gukora iteganyabikorwa ry'ibihe by'ihinga bitatu cg birengaho (kwerekana ubutaka buhingwaho kuri buri gihe cy'ihinga ndetse naho imbuto izaturuka);
- 6) Gushaka isoko ry'umusaruro mbere y'uko utera ibirayi;
- 7) Kugira ubuhunikiro ndetse na gahunda yo kwita ku musaruro.

## Igice cya 2. Kumva neza imikurire y'ibirayi



Kumva neza imikurire y'ikirayi, bifasha umuhinzi kumenya igihe nyacyo cyo kukitaho agamije kungera umusaruro.

Imikurire y'ikirayi ishobora kugabanya mu byiciro bitanu (5), kandi buri cyiciro gisaba igihe cyacyo n'umurimo runaka wo kucyitaho.

Ni ngombwa kumva ko uburebure bwa buri cyiciro cy'ikura ryibirayi Kitari ntakuka, ahubwo biterwa n'ubwoko butandukanye, uburyo bwo gutera, uburumbuke bw'ubutaka, ikirere, n'ibindi. Bitandukanye n'ibinyampeke, ibyiciro byo gukura kw'ibirayi biruzuzanya bigatuma bigora kubitandukanya. Urugero, rimwe na rimwe, mu gihe cyo gukura ku ibanze, ikirayi gishobora no gutangira gushora.

**Hamagara umwe mu bahugurwa avuge ibyiciro 5 by'imikurire y'ibirayi akoresheje amagambo ye**

## **Icyiciro cya 1 • Kuzana umumero no kuva mu butaka**

Iki cyiciro gitangira iyo ibirayi bifite umumero bimaze guterwa kikarangira iyo ibirayi byatangiye kumera biva mu butaka (byatangiye kugaragara). Mu bihe bisanzwe, iki cyiciro kimara ibyumweru 2 kugeza kuri 4, ariko birashobora kandi kuba birebire bitewe n'uburyo byatewemo nk'ubwoko bw'ubutaka n'ubuhehere, igihe imbuto imeze, uburebure wateyeho, ubushyuhe bw'ubutaka, n'ibindi. Ni ngombwa cyane gutera ibirayi bimeze neza kandi bifite imimero myinshi (byibuze 3) kandi ikomeye ku girango izabashe kumerera rimwe kandi ari myinshi mu murima. Iki cyiciro kirakomeye cyane mu gihe cyikura ry'ibirayi, kuko umusaruro ufitanye isano cyane n'ubwiza bw'imbuto yakoreshejwe ndetse n'umubare w'imigozi yaje kuri buri kirayi.

## **Icyiciro cya 2 • Gukura kw'ikirayi**

Iki cyiciro gitangira iyo ibirayi bimaze kuva mu butaka kikarangira iyo ibirayi byatangiye gushora. Kimara ibyumweru 2 kugeza kuri 4 nyuma yo kuva mu butaka, ariko iki gihe giterwa cyane n'ubwoko bw'imbuto bwakoreshejwe. Ubwoko bumwe butangira gushora ibirayi hakiri kare kurenza ubundi. Muri iki cyiciro, ni ngombwa kurinda ibihingwa cyane cyane indwara y'имвура.

## **Icyiciro cya 3 • Gushora kw'ibirayi**

Iyi ni intambwe ngufi ugereranije, aho ikirayi gitangira kuza ku mpera y'umuzi (ibirayi bikora imizi) ariko bitarabyimba. Mu moko menshi, iki cyiciro kibera rimwe no kuzana indabyo ku mbuto zirabya hakiri kare, bikerekana iherezo ry'ikura ry'amababi. Ibi bivuze ko amababi yose aremye kandi akuze neza. Igihingwa cyamaze gutwikira ubutaka. Kuri iki cyiciro, ni ngombwa kugira ubutaka buhagije buzengurutse uruti, ibi bikorwa mu gihe cyo gusukira itaka.

## **Icyiciro cya 4 • Kubyiga kw'ikirayi**

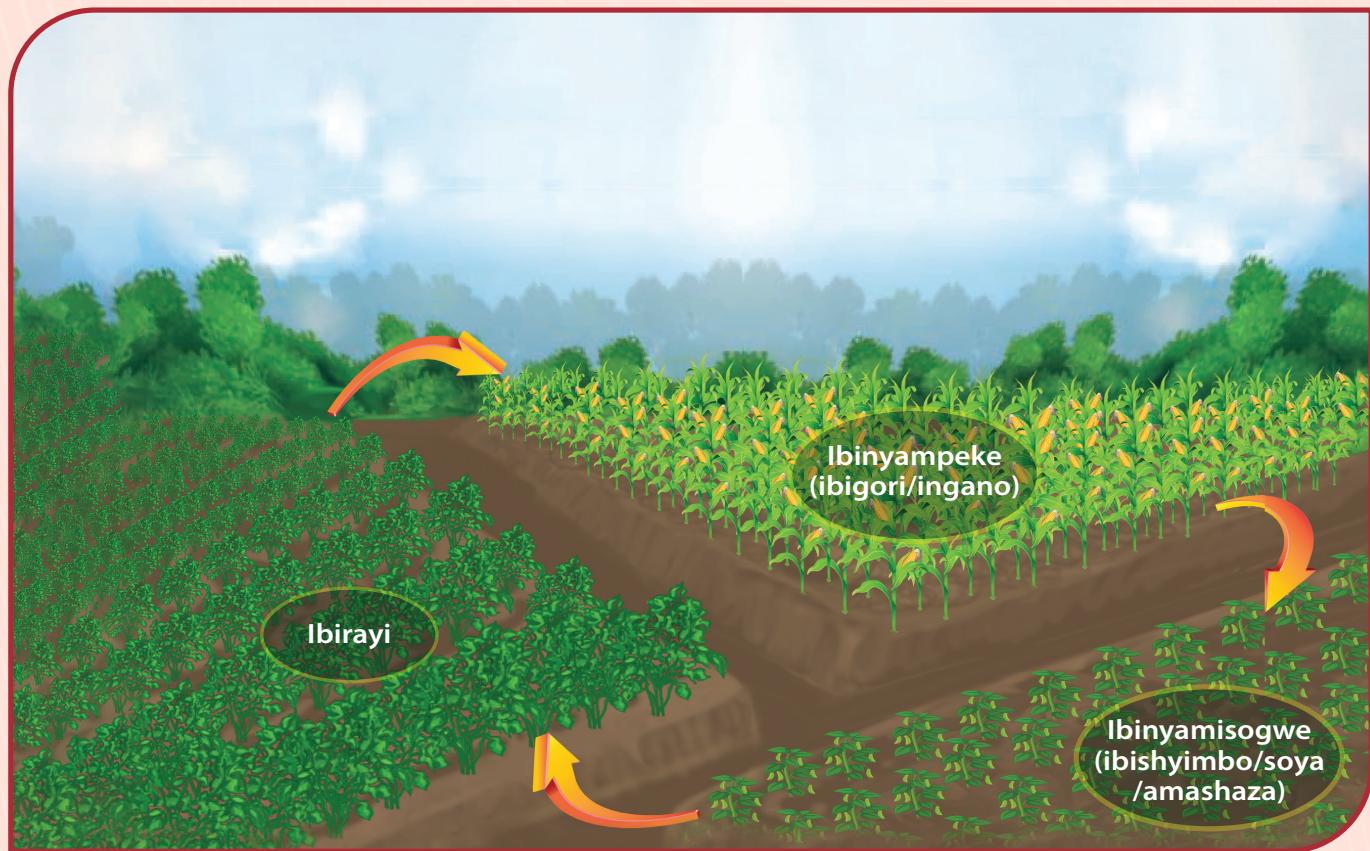
Kuri iki cyiciro, gukura kw'amababi kuba kwahagaze, maze ibirayi bikaba binini. Amababi ahinduka umuhondo akuma. Ni ngombwa gutegereza gusarura kugeza igihe imigozi yose yamaze kuma kuko umusaruro wiyyongera cyane muriki cyiciro. Amababi agomba gukomeza kurindwa udukoko n'indwara kugeza igihe cyo Kunyomora cyangwa yumye ubwayo. Nyamara, imiti ikoreshwa irwanya indwara n'udukoko igomba guhagarikwa nibura mu byumweru 2 - 3 mbere yo gusarura.

## **Icyiciro cya 5 • Kwera kw'ibirayi**

Iki n'icyiciro cyo kwera kw'ibirayi. Imigozi iba umuhondo, ikuma kandi ikirayi kitagikura. Uruhu rw'ikirayi rurakomera buhoro buhoro kubera kwiyongera kw'amafufu.

## Isomo 2 Ubutaka, Igihingwa no gukoresha amazi neza

### Igice cya 3: Guhitamo ubutaka no gusimburanya ibihingwa



Ibirayi bikunda ikirere gikonje (impuzandengo y'ubushuhe bwa  $15 - 20^{\circ}\text{C}$ ). Noneho rero, tera ibirayi ahantu hadashyushye cyane, uhitemo ahantu hisanzuye kandi hatari igicucu. Mu Rwanda, ibirayibihingwa cyane cyane mu turere two mu misozi miremire (hejuru ya metero 1800 z'ubutumburuke) two mu Birunga, Buberuka ndetse no mu ruhererekane rw'imisozi ya Congo Nil. Ubutaka bugomba kuba ari burebure,

bwumutse neza, kandi burekuye kugirango butume imizi ikura neza, igapfundika ndetse n'ibirayi bigakura neza. Ubutaka bugomba kuba butarangwamo udukoko n'indwara zanduza, nk'amavunja y'ikirayi na Kirabiranya. Kugira ngo ugabanye ibyago by'udukoko n'indwara, hitamo ubutaka butahinzwemo ibirayi nibura ibihembwe by'ihinga 2, byaba akarusho bikaba 4 bikurikiranye.

Gusimburanya ibihingwa ni ngombwa cyane kugirango ubungabunge ubwiza bw'ubutaka no kugirango udukoko n'indwara byangiza ibirayi bidakomeza kwiyongera mu murima.

**Baza abahugurwa ibindibihingwa bishobora gusimburanwa n'ibirayi mu karere batuyemo. Ibande cyane ku kamaro ko gusimburanya ibihingwa mu kurwanya igabanuka ry'umusaruro bitewe n'indwara n'ibyonnyi**

Teganya gahunda yo gusimburanya ibihingwa byibuze ibihembwe 3, aho ibirayibihinduranwa n'ibindibihingwa, uzirikana ko ibirayi bitagomba gukurikira ibirayi cyangwa ibindibihingwa byo mumuryango umwe byoroshye kwibasirwa n'indwara zimwe cyangwa kubika izo ndwara mumurima. Ingero z'ibihingwa biva mu muryango umwe n'ibirayi ni: ikibiringanya, urusenda, inyanya, n'itabi. Irinde gutera ibigori mbere y'ibirayi mu murima wari ufite ubwandumu bwa nematode cyangwa uburumbuke buke bw'ubutaka.

Mu Rwanda, uburyo bwiza bwigishwa mu gusimburanya ibihingwa n'ibirayi ni ugu simburanya n'ibinyamisogwe n'ibinyampeke (urugero: ibirayi - ibishyimbo / soja / amashaza - ibigori / ingano - ibirayi) mu gihe cy'ibihe by'ibihingwa 3. Mu gihe uhinga ibindi bihingwa bisimburana hamwe nibirayi, Ningombwa ko mugihingwa gikurikiyeho kimeza zose zirandurwa. Izo cyimeza z'ibirayi ziba indiri yúburwayi bugenda bukwirakwira mubihembwe by'ihinga bikurikiraho.

Rimwe na rimwe, abahinzi bahitamo kutubahiriza ibisabwa mu gusimburanya ibirayi níbindi bihingwa kuko baba bakeneye inyungu mu guhinga ibirayi. Ni ngombwa kumenya ko ibyo bizatuma habaho igabanuka ry'umusaruro w'ibirayi, no kugabanya inyungu mu gihe kirekire. Gusimburanya neza ibihingwa bitanga umusaruro mwinshi kandi urambye.

## Igice cya 4: Gutegura umurima



Ni ngombwa gutegura ubutaka hakiri kare, byibura ibyumweru bibiri mbere yo gutera, mu gihe ubutaka bwaba bucyoroshye kugirango biburinde kuma. Ubutaka bugomba gutegurwa mu gihe cy'izuba ntabwo ari mu gihe imvura iguye. Ibirayi bisaba ubutaka bworoshye kugirango bikure neza, bibyimbe cyane, bityo umusaruro wiyongere. Ni byiza rero guhinga ubutaka hagati ya 30-40cm z' ubujyakuzimu. Tegura umurima kugeza ubutaka bworoshye, butarimo ibinonko. Wibuke ko ubutaka bwateguwe ku bujyakuzimu butarenze cm 30 butanga umusaruro muke.

Gutegura ubutaka bigizwe na:

- 1) Gutema ibyatsi/ ibiti, kubivanamo no kuvanamo amabuye
- 2) Kurima, gutabira hakorwa imitabo cg amabimba mu cyerekezo cyokurwanya isura, Gusanza, hagacibwa imirongo iromberereje. (ukoreshje isuka cyangwa imashini)
- 3) Gusanza.
- 4) Gukora imitabo cg amabimba (mu rwego rwo kurwanya isuri cyangwa hatarakamuwe neza)

**Muganire n'abahugurwa  
niba bishoboka mu karere  
k'iwabo gutegura  
umurima ukoresheje  
imashini, ibyiza n'ibibi  
by'ubu buryo**

## Igice cya 5: Gufumbira (ifumbire yamatungo, imborera nifumbire mva-ruganda)



**Menyesha abitabiriye amahugurwa ko  
inzira nziza yo kumenya ingano n'ubwoko  
bw'ifumbire mvaruganda igomba  
gukoreshwa ari ukubona inama zitangwa  
hashingiye Ku bipimo by'ubutaka  
n'amateka yo mu murima. Muganire niba  
hari byihariye ku karere runaka bihari  
nuburyo bishobora kuboneka**

Kimwe n'ibindi bihingwa byose, ibirayi bisaba imyuniyo ihagije iva mu bimera (imborera cg iyamatungo) nifumbire mvaruganda kugi-rango bikure neza. Azote (N), fosifore (P) na potasiyumu (K) ni intungagihingwa / imyuniyo zingenzi ku gihingwa cyibirayi. Igihihingwa cyibirayi gitanga toni 10 kuri hegitare, Kiba cyakuruye kg 40 za Azote, kg 10 za fosifore na kg 50 za potasiyumu mu butaka, kandi iyo myumyu igomba gusimburwa kugira ngo uburumbuke bw'ubutaka butagabanuka.

Azote na Fosifore ni lmyumyu yingenzi mu gihe cyikura ryibirayi, mu gihe Potasiyumu ikenerwa

cyane mu gihe cyibyimba ryibirayi. Ukurikije imiterere y'ubutaka, Nibyiza gukoresha imyuniyo yo mu rwego rwa kabiri nka Ca, Mg, S na Zn.

Gukoresha ifumbire nyinshi irenze ibipimo bishobora kwangiza ibimera n'ibidukikije kandi ni ugutakaza amafaranga bitari ngombwa. Mugihe ukoreshheje ifumbire nkeya cyane irimunsi yibipimo byagenwe, bituma igihingwa kidakura neza, bityo numusaruro ukagabanuka. Umuhinzi agomba kwitondera kurenza ibipimo byagenwe mugihe afumbira akoresheje amafumbire arimo azote kuko bishobora gutuma igihingwa kiyuyumba kumababi, uruti ntirukomere bityo ntigitange ibirayi hasi mubutaka. Akamaro kifumbire kagaragara mu gihe ubwinshi n'ubwoko bwifumbire igomba gukoreshwa bigenwe n'ubwoko bw'ubutaka ndetse n'amateka y'umurima. Ibi byitwa "Kugena ifumbire ikwiye hagendewe ku karere runaka". Uburyo bwo gutanga ifumbire yihariye ku karere hashingiye ku isesengura ry'ubutaka cyangwa ikarita y'ubutaka bugenda burushaho kuboneka, kandi abahinzi bagomba gushaka inama ikwiye, iboneka kandi ya vuba, mbere yuko igihembwe cyihinga gitangira.

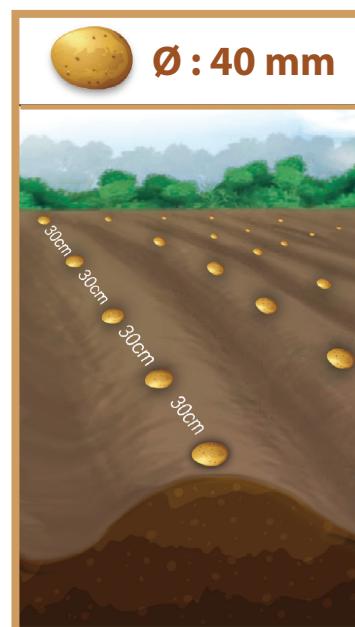
Mu gihe inama ku ifumbire ikenewe ku karere runaka itaraboneka, ni byiza gukoresha kg 3 ya NPK 17-17-17 kuri ari 1 (metero kare 100) igabanijwemo ibice 2 (kg 1.5 kg mu gutera na kg 1.5 mu gihe cyo kubagara). Mu buryo bufatika, koresha ifumbire yuzuye mu gafuniko kamwe k'icupa ry'amazi cg rya fanta ku birayi 2 kuri buri gihe uyishyiramo, nukuvuga mu gihe cyo gutera no mu gihe cyo gusukiira ubutaka, hagati y'icyumweru 1-2 ibirayi bisohotse mu butaka. Abahinzi badashoboye gukoresha ifumbire mu gihe cyo gusukira, bashobora kuyiterera rimwe mu gihe cyo gutera. Nanone, niba umuhinzi ananiwe gukoresha ifumbire mu gutera, arashobora kuyikoreshereza rimwe mu gihe cyo gusukira.

Ni byiza cyane kuyikoresha hamwe ni'fumbire mborera. Ifumbire mborera iboze neza yuzuye mu biganza 2 ishobora gukoreshwa kuri buri kirayi. Ibi bihwanye na 200-300 kg by'ifumbire kuri ari 1. Ibi ni ingirakamaro cyane kubutaka budafite ifumbire. Ibi si ngombwa ku butaka bukize nk'ubutaka bw'amashyamba. Ifumbire mborera igomba gukoreshwa mugihe cyo gутегура umurima cyangwa mu gutera. Ifumbire yo mu gikoni irimo ibirayi, inyanya, intoryi, urusenda, cyangwa ibindi bihingwa biri mu bwoko bumwe n'ibirayi ntibigomba gukoreshwa kuko bishobora gutera indwara yibirayi.

Ifumbire yamatungo, imborera, n'ifumbire mvaruganda bigomba kuvangwa neza n'ubutaka kugirango birinde gukoranaho n'ikirayi cyatewe. Banza ushyiremo ifumbire mborera, ukurikizeho ifumbire mvaruganda, hanyuma utwikirizeho itaka rifite hagati ya cm 5-10. Noneho utere ibirayi by'imbuto. Kugira ngo ushyiremo ifumbire nyuma yo kugaragara, cukura agafege karombereje kuri cm 10-15 uvuye ku gihingwa ukoreshheje inkoni. Shyiramo ifumbire hanyuma wuzuze ukoreshheje intoki cyangwa inkoni.

Mu butaka busharira (ubutaka bufite pH munsi ya 5.5), usibye ifumbire mborera n'fumbire mva ruganda, hagomba kongerwamo n'ishwagara kugirango hirindwe imyunu micye ndetse n'ubusharire mu butaka. Ishwagara igomba gukoreshwa mu gihe cyo gутегура ubutaka ku gipimo cya kg 25 - 50 kuri ari 1 (metero kare 100). Mu murima aho hashyizwemo Ishwagara mbere, igipimo cya pH y'ubutaka kigomba gupimwa buri gihe cyo'ihinga kugirango ibe yakongerwamo mu gihe pH igabanutse munsi ya 5.5. Ishwagara itetse cyangwa idatetse ishobora gukoreshwa, ariko itayunguruye (travertine) niyo ibyara inyungu kuko iba idahenze. Gukoresha ifumbire mvaruganda zongera ubusharire mu butaka nka ire, nka urea, di-ammonium fosfate na fosfate ya ammonium bigomba kwirindwa mu butaka kuko zongera ubusharire mu butaka.

## Igice cya 6: Uburyo bwo gutera



Igiingwa cyiza gitangirana n'imbuto nziza. Tera imbuto nziza y'ubwoko bukunzwe ku isoko. Kugeza ubu, ubwoko bwinshi bwakunzwe mu Rwanda ni Sangema, Cruza, Mabondo, Victoria, Kirundo, Mizero, Kigega, Ngunda, Nderera, Gikungu, Kinigi na Twihaze. Imbuto z'ubwoko bunyuranye ntizigomba na rimwe kuvangwa.

Koresha imbuto zemewe cyangwa imbuto nziza yaguzwe kubatanga imbuto bazwi. Tekinike yo gutubura imbuto ukoresheje akarimo gato yakoreshwa kugirango wongere ubwinshi bw'imbuto waguze ahantu hizewe (reba imfashanyigisho yabyo). Ibi bizagabanya cyane ingano y'imbuto nziza zikenewe kugurwa n'umuhinzi. Niba ukoresheje imbuto wihingiye, ibirayi byasaruwe bivuye ku migozi myiza nibyo byiza gukoreshwa. Ubu buhanga bwitwa "Guhitamo icyiza" kandi busaba imyitozo ngiro mu murima (reba imfashanyigisho yabyo). Ntugakoreshe ibirayi bito byo ku isoko nk'imbuto, ntibiba byaguzwe kuko ari bito kandi akenshi biba bifite uburwayi.

Menya neza ko ibirayi by'imbuto biba bifite imimero imeze kimwe, ingana mu bunini bwa cm 1-2. Mu gihe cy'ibyumweru 4 kugeza kuri 6 mbere yo gutera, umumero wabanje ushobora gukurwaho kugirango ikirayi kizane indi mimero myinshi. Irinde ibirayi bishaje kandi byumye hamwe n'imimero miremire, akenshi iyi mimero ivaho mu gihe cyo gutera. Imimero migufi, y'icyatsi kandi ikomeye yizeza ko n'imikurire y'ikirayi izihuta, imeze kimwe kandi umusaruro uzaba mwinshi. Ni ngombwa gufata neza ibirayi by'imbuto iyo bimaze kumera, mugihe cyo kuyitwara, gupakira no gupakurura no gutera, kugirango wirinde kwangirika kw'imimero. Imbuto y'ibirayi yangijwe n'udukoko cyangwa indwara ntigomba na rimwe gukoreshwa mu gutera. Menya neza ko ibirayi by'imbuto bingana (icyiciro) biterwa hamwe. Ibi bizagaragaza isura imwe mu murima kandi bizorohereza imirimo yose yo kubyitaho.

Hari uburyo bubiri bushoboka bwo gutera ibirayi: gutera mu duferegi gatoya cyangwa mu myobo. Ubu uburyo bubiri bushobora gutanga umusaruro umwe.

**Shimangira ko gukoresha imbuto  
zitarwaye, zifite ubuziranenge aribwo  
buryo bwingenzi bugena umusaruro ku  
birayi. Ganira n'abahinzi uburyo  
butandukanye bwo kubona imbuto nziza**

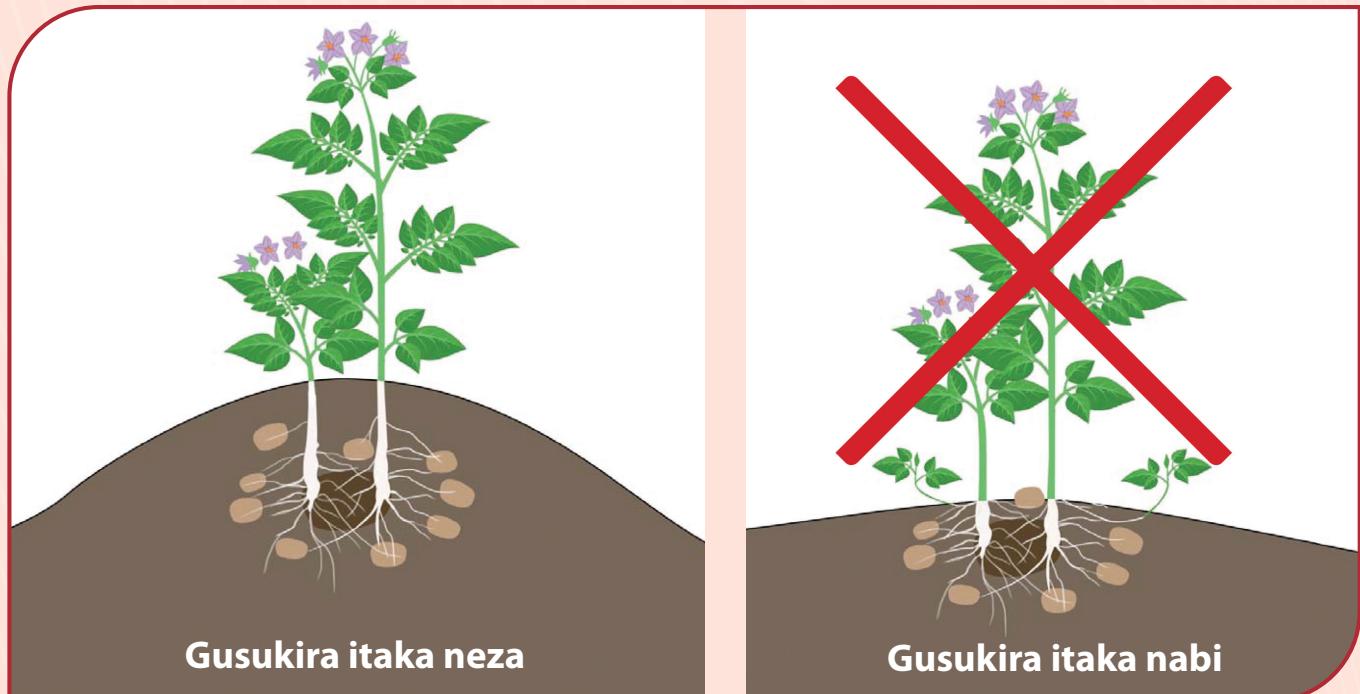
Kubw'ibyo, abahinzi bahitamo uburyo bworoshye. Gutera ku mayogi (ridges) cyangwa imirenzo (beds) bikorwa akensi mu mirima ifite ibyago byinshi byo gutwarwa n'isuri (ahantu hahanamye n'imvura nyinshi) na / cyangwa hari amazi menshii. Tegura imirongo cyangwa imyobo hagati hari intera ya cm 75 - 80. Niba ubwoko bwave butanga amababi menshi kandi / cyangwa hahanamye, intera iri hagati y'umurongo nundi irashobora kwiyongera kugera kuri cm 90.

Mu murongo, koresha interairi hagati ya cm 25-35 ukurikije ubunini bw'imbuto, cm 25 mu gihe ibirayi ari bito (hafi mm 30 z'umurambararo), cm 30 mu gihe ibirayi bifite ubunini bugereranije (hafi mm 40), na cm 35 ku birayi binini (nka mm 50 z'umurambararo). Abahinzi bagomba kwirinda gutema ibirayi binini byimbuto, kuko ibyo bishobora gukwirakwiza indwara mu mbuto mu gihe hakoreshejwe ibikoresho byanduye.

Menya ko ahantu hahanamye, uduferegi cyangwa umwobo bigomba gukorwa mu buryo bugabanya isuri kandi bifasha kugumana amazi atemba mu mirongo. Nyuma yo gutera, ibirayi bigom- ba gutwikirwa n'ubutaka buhagije (cm 10 - 15). Imyobo cyangwa imirongo idatwikiriwe igomba kwirindwa buri gihe.

Ubwinski bw'imbuto zigomba gukoreshwa kuri buri ngano y'ubutaka biterwa n'impamvu nyinshi, nk'intera hagati y'umurongo nundi ndetse n'ubunini bw'imbuto. Ingano ya toni 2 kuri hegitari niyo isanzwe ikoreshwa, iyi ngano iboneka hatewe ku ntera ya cm 80 x 30, hamwe n'imbuto iringaniye ya garama 50 kuri buri kirayi. Icyi gice gisaba imyitozo ngiro mu murima (reba imfashanyigisho yabyo).

## Igice cya 7: Kubagara no gusukira



**Shimangira ko gusukira itaka ari  
kimwe mu bikorwa by'ingenzi bituma  
umusaruro wibirayi wiyongera**

Igingwa cy'ibirayi kigomba kubagarwa hakiri kare kugirango bigabanye guhatanira n'ibindi byatsi, urumuri, intungamubiri, n'amazi, no kwirinda ko ibyo byatsi byabika udukoko n'indwara. Kubagara bwa mbere bigomba kubaho nyuma yuko ibirayi bivuye mu butaka, mu gihe bifite cm 10-15 z'uburebure.

Ibyatsi bibi bigomba guhita birandurwa mu butaka hakoreshejwe isuka, bikegeranwa hanyuma bigatabwa cyangwa bikarundwa ahantu hamwe kugirango bizatange ifumbire. Niiyo nta byatsi byinshi birimo ndetse n'ibihari bikaba bitangiza, ibyaranduwe bishobora kurundarundwa hafi y'ibirayi. Umurima ugomba kuguma utarimo ibyatsi kugeza amababi yumye. Irinde gutera ibirayi mu murima urimo icyatsi kigoye kwirinda cyangwa kuva mu murima.

Gusukira itaka ni ukuryongera ahakikije uruti rw'ikirayi kugirango bifashe imizi kubyara ibirayi aho kuba hejuru y'ubutaka. Kubirayi byatewe ku butaka bushashe, gusukira itaka bigomba gukorwa inshuro nibura 2-3. Gusukira ibirayi ku nshuro ya mbere bigomba gukorerwa rimwe no kubagara bwa mbere nibura nyuma y'ibyumweru 2-3 ibirayi bimaze kumera, cyane cyane iyo ibimera bikura vuba. Gusukira

byongera kandi bikorosha ubutaka bukijje uruti, bituma igihingwa kizana ibirayi byinshi. Uburebure bw' ibimba nyuma yo gusukira itaka bwa mbere, bugomba kuba bugera kuri cm 15. Gusukira bwa kabiri, bigomba kuba nibura nyuma y'ibyumweru 2-3, bitewe n'imikurire y'ibirayi. Uburebure bw' ibimba nyuma yo gusukira itaka bwa kabiri, bugomba kuba bugera kuri cm 30. Kuhirwa bwa gatatu cyangwa bwa nyuma nabyo bikorwa ku byumweru 2-3 nyuma y'iya kabiri, cyane cyane iyo hahanamye cyangwa imvura yabaye nyinshi. Umenya neza buri gihe ko ibirayi biriho itaka. Ku birayi byatewe ku mabimba cyangwa imirenzo, kuhira itaka bishobora gukorwa rimwe gusa. Iyi ngingo yo kuhira itaka isaba imyitozo ngiro ikorerwa mu murima (tubisanga mu mfashanyigisho yabyo).

Mu gihe cyo gusukira itaka, wirinda kwangiza imizi n'ibirayi. Niba bishoboka, koresha isuka ntoya, ugereranije niyo wakoreshejwe mu bindi bikorwa.

Ibyiza byo gusukira itaka ku birayi, harimo:

- 1) Kubungabunga ubutaka bworoshye kugirango bifashe gukura neza ku ibirayi.
- 2) Gufasha ko imizi itanga ibirayi yabitanzé ndetse no kuyirinda ko iva mu butaka ikajya hejuru iyo ihuye n'urumuri.
- 3) Bifasha igihingwa gufata imyunu neza ndetse no kurinda ibibazo byaterwa n'amazi yireste.
- 4) Kugabanya ubushyuhe ahakikije ibirayi birimo gukura.

- 5) Kurinda ibirayi guhura n'imirasire y'izuba ituma bihinduka icyatsi. Ibirayi byabaye icyatsi ntabwo biribwa kuko biba bifite uburozi.
- 6) Kurinda ibirayi guhura n'indwara n'ibyonnyi nk'isazi itera urunyo rushobora gutera igihombo kinini mu murima no mu buhunikiro.

## Igice cya 8: Kuvomerera



Ni ngombwa kumenyako ighingwa kizabona amazi ahagije mugihe cyo gukura kwacyo. Ibirayi bikenera amazi ari hagati ya milimetro 500 na 800 mu gihe cy'ihinga kimwe kugirango bikure neza. Ibirayi bikenera cyane amazi iyo ibirayi bitangiye kuzaho. Iyo amazi abuze kuri kiriya cyciro, igihe cyo gukora ibirayi kiriyongera bigatuma umusaruro ugabanuka. Kimwe cya kabiri cy'umusaruro uteganijwe ushobora gutakara.

Mu Rwanda birashoboka guhinga ibirayi mu gihe cy'izuba (kuva Gicurasi kugeza Kanama), mu gihe amazi yatanzwe binyuze mu kuvomerera. Abahinzi bashobora kubona amazi barashishikarizwa gushora imari muri gahunda yo kuvomerera. Nimwe mu ngamba nziza zo kurwanya ingaruka z'imihindagurikire y'ikirere.

**Muganire ku bikoresho n'ibikorwa remezo biboneka muri ako gace cyangwa amahirwe aboneka n'ibikenewe gushyiraho uburyo burambye bwo kuvomerera**

Kuvomerera n'amazi atemba igahe cyose bishoboka nuburyo bwizewe kandi buhendutse. Nyamara, amazi atembera mu murima binyuze mu miyoboro bigomba kwirindwa mugihe hari kirabiranya mu murima, kugirango idakwirakwira.

Iyo bihari, ibikoresho bitanga ingufu ziturutse ku mirasire, bishobora kwifashishwa mu gutanga ingufu zikurura amazi uyavanye ku isoko. Ibi bishobora gutanga inyungu kuruta gukoresha lisansi/mazutu mu kuvomerera ndetse bigatanga icyizere ko niyo lisansi/mazutu bitaboneka, ibihingwa byakomeza kuvomererwa.

## Igice cya 9: Kuvanga ibirayi n'ibindibihingwa



Ibikorwa byo gutegura ubutaka bwo guhinga ibirayi bihungabanya cyane ubutaka, bikongera ibyago byo gutwarwa n'isuri, cyane cyane ahantu hahanamye kandi hagwa imvura nyinshi.

Kuvanga ibindibihingwa hagati y'imirongo y'ibirayi bitwikira ubutaka kandi bikagabanya ubwinshi bw'ubutaka bujyanwa n'isuri. Ahantu hagwa imvura nkeya, gutwikirwa ku butaka bitewe n'ivangwa ry'ibirayi, byongera ubuhehere bw'ubutaka no kwirinda ko ubutaka bwuma. Mu turere dushyha, gitwikirwa k'ubutaka nabyo bigabanya ubushyuhe mu butaka bigafasha ibirayi gushora ibyinshi.

Iyo ibirayi bivanze n'ibinyamisogwe bikungahaye kuri azote cyangwa ibirayi bigaburirwa amatungo nka Soya cyangwa lupine, Ibirayi byungukira mukongera uburumbuke bw'ubutaka bitewe na azote yongerewe ibyo binyamisogwe. Ibi birasabwa cyane cyane ku butaka bufite uburumbuke bucye cyangwa iyo hakoreshejwe igipimo gito cyangwa giciriritse cyifumbire ya azote.

Kuvanga ibirayi bishobora kandi kugabanya ubukana bw'dukoko n'indwara bifata ibirayi

**Ganira nabatabiriye amahugurwa niba  
ibirayi bivangwa nibindi bihingwa muri  
kariya gace, ndetse ari irihe vanga  
ry'ibirayi ribagirira akamaro cyane**

bishyiraho uruzitiro hagati y'ibirayi cyangwa se bimeze nk'umutego w'udukoko twangiza ibirayi.

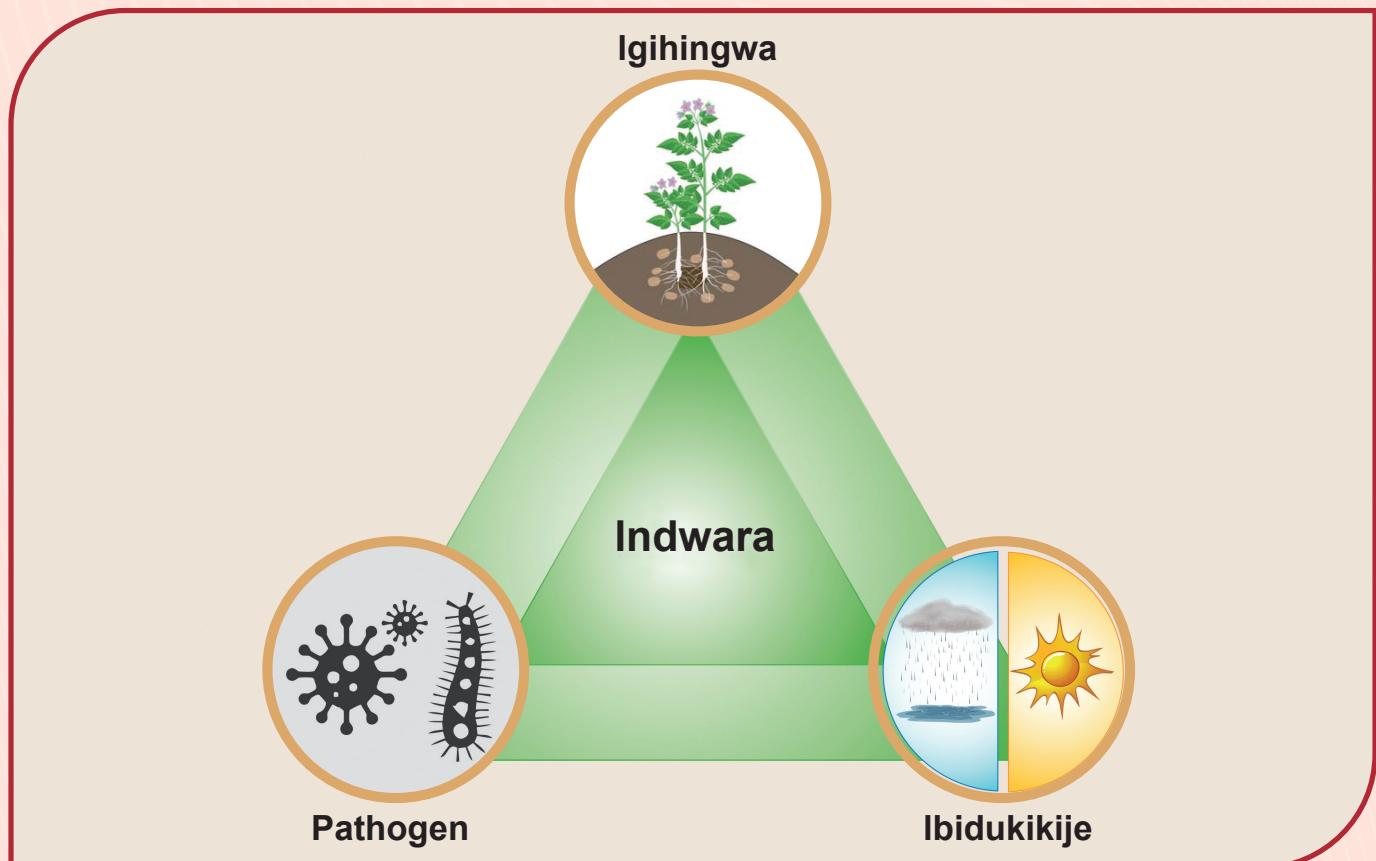
Muri make, kuvanga ibirayi hamwe n'ibindi bihingwa bishobora kugira inyungu nyinshi, bigatuma umusaruro w'ibirayi wiyyongera kandi ku buryo burambye, binyuze:

- 1) Kurwanya isuri no kurinda igabanuka ry'imyunyu mu butaka
- 2) Kubungabunga ubuhehere bwubutaka.
- 3) Gutuma ubutaka bugira igipimo cy'ubushyuhe kiringaniye.
- 4) Kongera imyunyu-ngugu n'ubwiza bw'ubutaka.
- 5) Kugabanya ubukana by'indwara n'ibyonnyi.

Ni ngombwa guhitamo neza uburyo bwiza bwo kuvanga ibirayi, gahunda n'amatariki yo gutera kugirango wirinde bishoboka gucuranywa imyunyu n'amazi bitunga igihingwa.

## Isomo 3 Ubutaka, Igihingwa no gukoresha amazi neza

### Igice cya 10: Mpandeshatu y'indwara



**Ganiriza abahugurwa ku mpamu zituma habaho ubwando bukwirakwiza indwara zihishe n'akamaro ko gukoresha imbuto nziza ndetse no gusimburanya ibihingwa**

Kimwe n'ibindi bihingwa byose, ni ngombwa kurinda ibirayi ibyonnyi n'indwara kuko bigabanya ubwiza n'umusaruro. Igihombo gishobora kuba cyose (100%). Ibirayi bitinya cyane indwara n'ibyonnyi kuko ni igihingwa kiyongera bivuye ku kindi.

Indwara ikunda kwigaragaza iyo habayeho imikoranire myiza hagati y'igitera indwara (patogene), imiterere y' igihingwa n'ibidukikije. Izi ngingo uko ari eshatu zifitanye isano nkuko bigaragara muri MPANDESHATU Y'INDWARA.

Gukura kw'indwara n'ibyonnyi biterwa na:

- 1) Igihingwa kimeze nabi bitewe n'imiterere karemano yacyo, icyiciro cy'imikurire kigoye, cyangwa ubuzima bubi kubera imyunya idahagije.
- 2) Kubaho kw'ibitera indwara (ibinyabuzima bitera indwara).
- 3) Ibidukikije bifasha indwara kubaho. nk'ubushyuhe n'ubukonje ndetse no kuba hari ibitwara indwara nk'umuyaga, amazi, ibikoresho byo guhinga cyangwa udukoko.

Ingamba zo kurwanya indwara zishobora gutegurwa hagamijwe guhindura kimwe muri ibi bintu, bibuza indwara kubaho. Lyi mpandeshatu rero niyo shingiro ryo kurwanya indwara n'ibyonnyi. Ingamba zose zo kurwanya indwara n'ibyonnyi bigomba kuba bigamije guca iyi mikoranire mibi. Nyamuneka menya ko indwara ishobora kuguma mu gihingwa cyangwa mu kirayi igihe kirekire nta bimenyetso, igihe cyose ibidukikije bidatuma indwara yigaragaza. Ubu buryo buzwi nk'indwara yihishe, bukunze kugaragara cyane ku ndwara ya Kirabiranya.

Ibuntu bibiri ni ingenzi cyane mu kurwanya indwara n'ibyonnyi byangiza ibirayi:

- 1) Gukoresha imbuto nziza, zujuje ubuziranenge zitarangwaho indwara n'ibyonnyi.
- 2) Gusimburanya ibihingwa, aho igihingwa cy'ibirayi kigaruka nibura nyuma y'ibihembwe 2 by'ihinga, kandi uhora ukura mu murima za cyimeza zigaragara mu biningwa byakurikiyeho. Kuvana cyimeza mu murima n'ingirakamaro kugirango wirinde ko indwara n'ibyonnyi byongera kuza mu murima.

Abahinzi bagomba kurwanya indwara n'ibyonnyi kugirango barinde ayo bashoye mu mbuto nziza. Nubwo zaba zidafite uburwayi, imbuto nziza ishobora kurwara bitewe n'ibikorwa bibi.

## Igice cya 11: Kurwanya indwara y'imvura



Indwara y'imvura n'indwara y'uduhumyo itera igihingwa kunanirwa, ikangiza amababi, uruti n'ibijumba. Amababi n'uruti byanduye biba umukara, bikunkunja ukaba wagirango byababutse. Indwara y'imvura kandi ituma ibibabi ku runde bujya gusa numuhondo werurutse ndetse bikazana n'uruhumbu rwera ku gice cyo hasi cy'ibibabi. Indwara y'imvura iterwa

Muri rusange, igihingwa kimeze neza, gitoshye, gihinzwe ku butaka bufumbiye, kihanganira ndetse kikarwanya indwara n'ibyonnyi. Kubw'ibyo, kubona imyunyu itunga igihingwa ihagije binyuze mu ifumbire mborera na mvaruganda bifasha igihingwa kurwanya indwara n'ibyonnyi. Gukoresha ifumbire mborera bifasha kandi guteza imbere mikorobe ngirakamaro mu butaka ziirwanya mikorobe zo mu butaka.

Mu bika bikurikira, imfashanyigisho itanga ibisobanuro kuri bimwe mu ndwara n'ibyonnyi bibileka mu Rwanda, hamwe n'inama zihariye z'uburyo bwo kubirwanya.

**Shimangira akamaro ko gukoresha imbuto nziza n'ubwoko bwihanganiraindwara.  
Ganira n'abahinzi ku bwoko butandukanye bwihanganira indwara bubasha kuboneka muri kariya gace**

n'uduhumyo dukwirakwizwa n'umuyaga n'amazi kandi ikaguma mu birayi byanduye. Iyi ndwara irashobora gukwirakwira mu birayi kandi ibyafashwe birabora bikanuka.

Uburwayi buikomeye bubaho mu bihe bikonje iyo ubuhehere bw'umwuka buri hejuru (hejuru ya 90%). Indwara ikwirakwira vuba mu murima kandi, iyo itagenzuwe, ibihingwa byanduye bipfa mu cyumweru kimwe.

Indwara y'lmvura ishobora kurwanya binyuze mu:

- 1) Gutera imbuto nziza itarwaye.
- 2) Gukoresha amoko yihanganira indwara (niba aboneka).
- 3) Gukusanya no gutwika imigozi y'ibirayi nyuma yo gusarura.
- 4) Guhinga ushyira intera nini hagati y'ibirayi kugirango ugabanye ubuhehere mu murima.
- 5) Gutera umuti urwanya ubuhumyo ku gihe kugirango wirinde kwandura ndetse wice n'indwara nyuma yo kwandura uyrinde gukwirakwira.

Imiti myinshi irwanya uduhumyo izwiho kurwanya indwara y'lmvura iyo ikoreshewe nkuko byateganijwe. Amatsinda abiri y'ingenzi y'imiti yica udukoko asanzwe akoreshwu mu guhashya iyi ndwara. Itsinda rya mbere ririmo imiti urwanya udukoko dutera indwara iyo uhuye n'igihingwa. Urugero rw'yo miti ikoreshwa n'abahinzi b'ibirayi mu Rwanda ni Mancozeb (Ditane). Iyo miti irinda uduhumyo (Detani) ni byiza kuyikoresha hakiri kare ibirayi bikimera murwego rwo kubikingira cyane cyane mu gihe cy'lmvura nyinshi, ariko ntigira icyo ikora iyo ibirayi byamaze kwandura. Itsinda rya kabiri rigizwe n'imiti ihura n'igihingwa, ikinjiramo imbere, ikazenguruka kugirango yice udukoko dutera indwara. Iyi miti ikoreshwa nyuma kugirango irwanye indwara mu gihe imaze kwanduza igihingwa ndetse n'ibimenyetso byagaragaye. Nyamara ariko, iyi miti ynjira mu gihingwa imbere ishobora nayo gukoreshwa hakiri kare mu gihe bigaragarako indwara y'lmvura ishobora kuhibasira (lmvura nyinshi, hamwe n'indwara biboneka aho hantu ndetse no mu kirere). Urugero rwiyo miti ynjira mu gihingwa imbere kandi ikoreshwa kenshi n'abahinzi b'ibirayi mu Rwanda ni Ridomil.

Ni ngombwa kudahora ukoresha imiti imwe kuko igihe kigera uwo muti ntushobora gukomeza kurwanya cyangwa kugabanya indwara. Niyo mpamvu, ari ngombwa guhinduranya imiti ikoreshwa ndetse

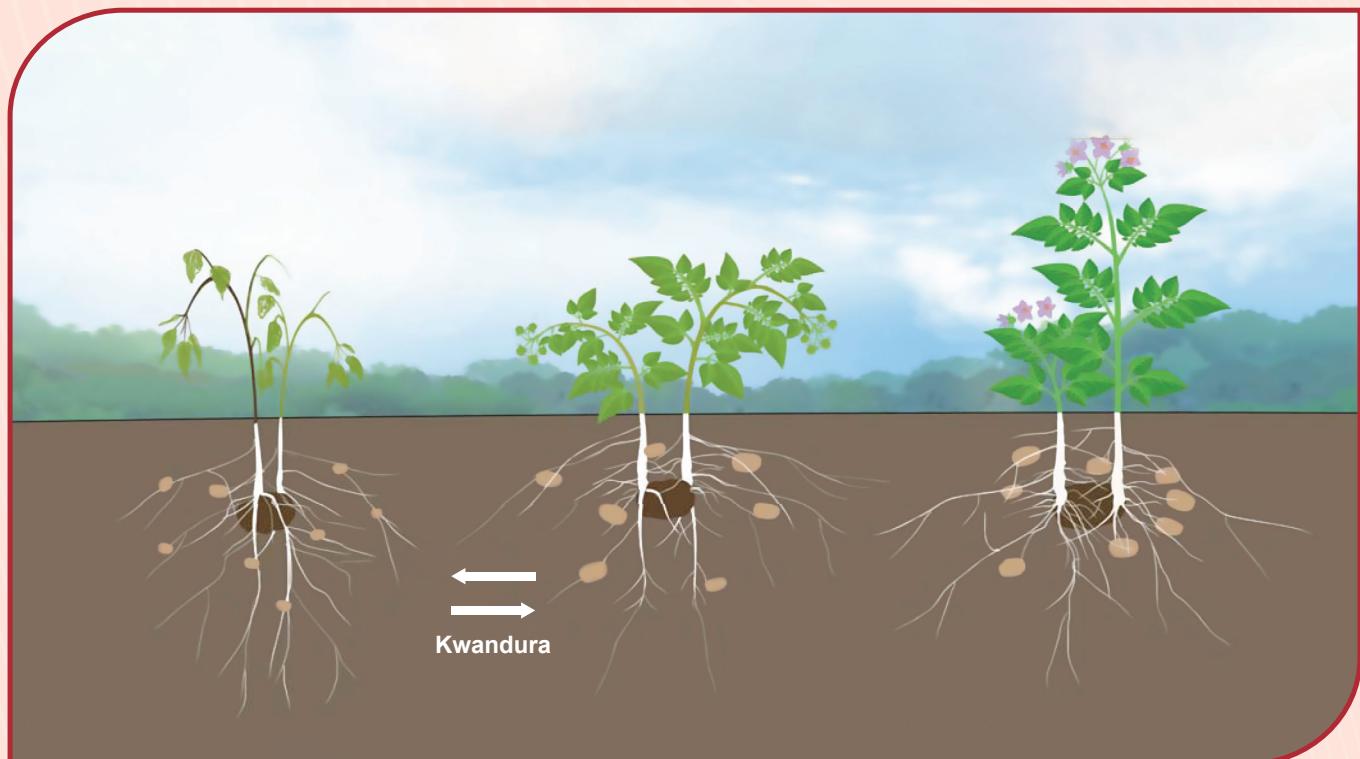
n'ubwoko butandukanye hagati ya buri uko uteye. Ntukavange imiti itandukanye mu gihe kimwe cyitera. Imiti yica udukoko igira ingaruka mbi ku buzima bw'uyitera ndetse n'ibidukikije, kandi byongeye, irahenze. Niyo mpamvu, ari ngombwa gukurikiza gahunda isabwa yo gutera imiti yica udukoko kugirango ikore neza. Gahunda isabwa yo gutera imiti irwanya indwara y'lmvura niyi ikurikira:

- 1) Bwa mbere, koresha umuti urinda indwara, ibirayi bimaze kumera bifite uburebure bwa cm 10. Igihe cyo gutera umuti n'ingenzi cyane. Bikwiye kuba kare bihagije kugirango wirinde ko ibirayi bito byakwandura.
- 2) Tera Umuti urwanya indwara nyuma y'ibumweru bibiri, ni ukuvuga, nyuma yiminsi 40 - 45 nyuma yo gutera, gihe bigaragarako indwara y'lmvura ishobora kuhibasira (lmvura nyinshi, hamwe n'indwara biboneka aho hantu ndetse no mu kirere).
- 3) Gutera umuti bikurikiyeho, koresha umuti urwanyiriza indwara inyuma y'igihingwa buri nyuma y'ibumweru 2 kugeza igihe amababi azahinduka umuhondo bitewe no kwera, usibye ariko mugihe ibimenyetso by'indwara bikigaragara mu murima.
- 4) Mu gihe ibimenyetso by'indwara bikigaragara mu murima, tera umuti urwanya indwara. Ibimenyetso nibimara gushira, subira gutera mu gihe cy'ibumweru 2 umuti usanzwe urwanyiza indwara inyuma.

Mu byukuri, imbuto zibirayi zihanganira indwara ntizagombye gaterwa umuti winjira imbere mu gihingwa inshuro zirenze ebyiri mu gihe cy'ihinga. Ibi biterwa nuko iyo miti ihenze kandi yatera ubudahangarwa udukoko dutera indwara, byongeyeho iba ari n'uburozi ku bidukikije.

Buri uko uteye, koresha ibipimo by'umuti nkuko bisabwa nuwawukoze. Menya ko kurenza urugero rwateganijwe bidatanga inyungu zinyongera ahubwo ni ingaruka mbi zitifuzwa. Umuti urwanyiriza indwara inyuma (nka Mancozeb) igomba gukoreshwa byibuze amasaha 6 mbere yuko imvura igwa kugirango wirinde ko imvura iwukura ku mababi. Umuti winjira mu gihingwa imbere (nka Ridomil) igomba gukoreshwa byibura amasaha 3 mbere yuko imvura igwa. Amababi agomba kuba yumutse adafite urume. Gutera umuti ntibigomba gukorwa ahagana saa sita, mu gihe hari izuba ryinshi.

## Igice cya 12: Indwara ya Kirabiranya



Indwara ya Kirabiranya ituma igihingwa cyuma igice cyangwa cyose nubwo haba hari amazi ahagije mu butaka. Mu kuma igice, imigozi y'ibirayi imwe iruma, iyindi isagaye ikagaragara neza nkitarwaye. Iyo indwara ikiri nkeya, igihingwa kirisubiza mu ijoro ariko nyuma cyanduye, igihingwa ntigisubirana. Iyo ikirayi cyanduye ugiciyemo kabiri, ubona impeta zisa n'umukara cyangwa zirabuye. Rimwe na rimwe, ubona amata ameze nk'amazi ava mu maso y'ibirayi ndetse n'ubutaka bufashe ku maso y'ibirayi mu gihe cyo gusarura.

Indwara ya Kirabiranya ishobora kwanduza igihingwa mu byiciro byose by'imikurire yacyo kandi igihingwa kikuma cyose. N'indwara iba mu butaka n'imbuto icyarimwe. Udukoko dutera iyi ndwara dushobora kuba mu butaka imyaka myinshi. Umugozi n'ibirayi bishobora kwandura ariko ntibigaragaze ibimenyetso, ibi byitwa "Ubwandu bwihishe". Gukoresha ibirayi byavuye kuri iyo migozi bishobora gukwirakwiza indwara. Indwara ya Kirabiranya kandi yanduza ibihingwa byo mu muryango umwe n'ibirayi nka chili, urusenda, inyanya, itabi, n'intory, ndetse n'ubwoko bwinshi bw'ibyatsi. Ishobora gusuzumwa mu gihingwa winjiza agace gato k'uruti mu kirahure cy'amazi (reba imfashanyigisho). Indwara ya Kirabiranya umwihariko wo gusohora ururenda ku ruti rukumanuka mu mazi.

**Shimangira ko Kirabiranya ishobora gukwirakwiza n'imbuto, ubutaka, ibikoresho byo guhinga, amazi, amatungo n'abantu. Twabibutsa kandi ko atari buri gihe mu murima, icyumye cyose kiba giterwa na Kirabiranya. Ni ngombwa gukora isuzuma mu murima n'ikirahure (reba imfashanyigisho)**

Indwara irashobora gukwirakwira iva mu murima ijya mu wundi cyangwa kuva migozi imwe ijya ku yindi mu murima bitewe nimbuto zanduye, amazi, ubutaka, ibikoresho byo guhinga, amatungo n'abantu.

Nta miti y'ubucuruzi irwanya Kirabiranya. Ku bwibyo, inzira imwe rukumbi ni ukuyirwanya binyuze mu buryo bw'imihingire bukurikira:

- 1) Gutera imbuto itarwaye mu murima utarimo Kirabiranya.
- 2) Guhinga imbuto zihanganira indwara.
- 3) Guhinduranya ibirayi n'ibindi bihingwa bitari mu muryango umwe nk'ibinyampeke n'ibinyamisogwe nibura mu gihe cy'ibihembwe by'ihingwa 2 kugera kuri 4.
- 4) Gukoresha ifumbire mborera itarimo Kirabiranya.
- 5) Kurandura imigozi n'ibirayi biyiraho byose bigashyirwa mumufuka, igitabo cyangwa ibase, kuko

ubutaka buvuyeho ibyanduye buguye kubindi birayi bizima byahita byandura. Imigozi yaranduwe n'ubutaka bigomba gukusanyirizwa mu mufuka cyangwa mu gitebo, bikavanwa mu murima w'ibirayi, bikajugunywa mu rwobo kure y'imirima y'ubuhinzi, hanyuma bigatwika. Ubu buhanga bwo kurandura ibirwaye wabureba mu mfashanyigisho ngiro. Ntugashyre imigozi yanduye aho uri gukorera ifumbire. Ishwagara cyangwa ivu ryo mu gikoni bishobora gukoreswa mu mwobo aho igihingwa cyaranduwe kugira ngo byice indwara.

- 6) Nibiza ko umuhinzi yajya abanza gukora imirimo y'ubuhinzi mumirima mizima itarimo

uburwayi, noneho agasoreza kuri yamirima ifite uburwayi. Mugihe ari umurima umwe urimo ibirayi bizima n'ibirwaye kirabiranya, nibiza kubanza yakorera ibizima noneho agasoreza kubirayi birwaye. Ikindi umuhinzi aba asabwa kudakorakora kumababi y'ibirayi bizima mugihe yakoze kubirwaye kirabiranya. Imyenda, inkweto n'ibindi bikoresho yakoranye mumurima urimo kirabiranya ntabwo agomba kubijana tuyindi mirima mugihe atarabyoza neza. Umuhinzi yirinda guca mumirima yabandi bahinzi bibirayi mugihe atashye cyangwa ajya mumurima we.

Gusukura ibikoresho byakoreshejwe mu buhinzi nk'amasuka kugirango birinde gukwirakwiza ubwandu (wakoresha umuriro cyangwa iyindi miti nka Jik).

### Igice cya 13: Kurwanya Kabore



**Ni ngombwa kuvuga ko nubwo Kabore ari indwara mbi, ntabwo ikwirakwira cyane nka Kirabiranya. Shimangira cyane itandukaniro riri hagati y'izi ndwara zombi**

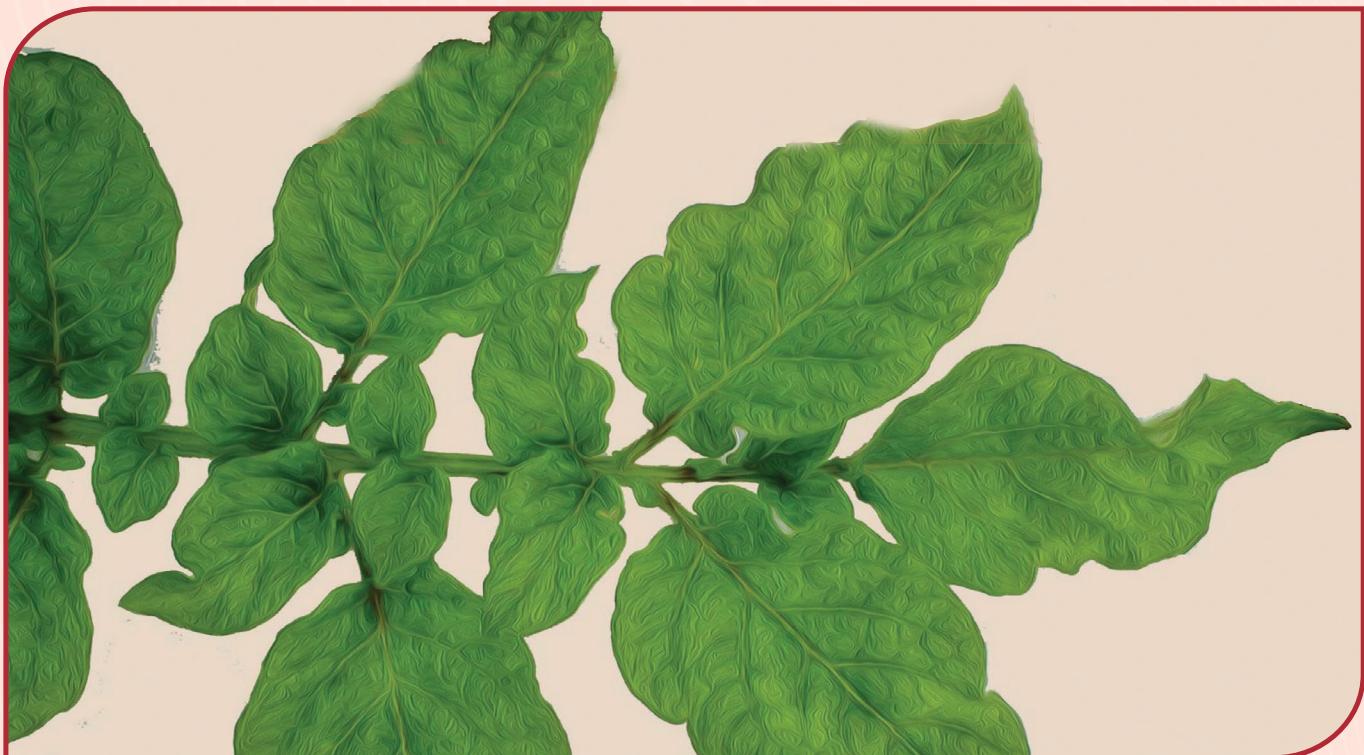
Kabore iterwa n'uduhumyo dufite umwihariko wo guhindura ingira buzima fatizo mu mazi cyangwa kubora byoroshye. Ibimenyetso ku kirayi byibanda

cyane ku gice cyo hepfo y'uruti, bigatera ibikomere byirabura munsi y'uruti.

Ibirayi birwaye birabora haba mu murima cyangwa mu buhunkiro kandi bigatanga impumuro mbi. Ubushuhe bwinshi bw'ubutaka butuma udukoko dufata ibirayi n'uruti, bigatera igihombo kinini.

Indwara ikwirakwiza mu buryo busa nubwa Kirabiranya. Indwara rero irashobora kurwanywa kandi hakoreshejwe ingamba zimwe nkiza Kirabiranya.

## Igice cya 14: Kurwanya indwara y'imfunyarazi



**Kumenya indwara y'imfunyarazi biragoye ku babinzi. Kubw'ibyo, gusura imirima y'ibirayi no kwerekana bimwe mu bimenyetso byayo bishobora Kubafasha**

Ikibazo gikunze kugaragara iyo guhinga ibirayi, ni igabannuka ry' umusaruro kuva ku mbuto z'icyiciro kimwe ujya ku kindi. Iri gabannuka ry' umusaruro akenshi riterwa n'indwara z'imfunyarazi ziba mu birayi by'imbuto kubera ingeso y'abahinzi yo guhitamo ibirayi bito bigakoreshwa nk'imbuto. Muri rusange, imfunyarazi zituma ibirayi biba bito. Kubera iyo mpamvu, iyo ibirayi byatoranijwe kuba imbuto hagendewe ku bunini bwabyo, ibirayi byinshi by'imbuto byatoranijwe biba bitise indwara.

Indwara z'imfunyarazi ziragoye kuzimenza mu murima. Iyo indwara yoroheje, igihingwa ntigishobora kwerekana ibimenyetso byayo na gato.

Indwara z'imfunyarazi ni gake zitera igihingwa gupfa. Ibimenyetso, iyo bihari,bihindura imiterere nyayo y'igihingwa. Muri byo harimo amababi ahinduka, akibumbabumba, amababi aba magufi kandi menshi, amababi areruruka ndetse agahinduka n'umuhondo.

Imwe mu ndwara z'imfunyarazi y'ibirayi ishobora kumenyekana byoroshye ni virusi itera amababi gupfunyarara, akibumbabumba. Igihingwa cyanduye iyi

virusi cyerekana amababi mato yibumbye, tureba hejuru tugahinduka umuhondo wijimye kandi iyo udukanze wumva yoroshye kandi avunagurika.

Indi ndwara y'imfunyarazi ishobora kumenyekana byoroshye ni iterwa na virusi ya mozayike. Amababi yafashwe areruruka agahinduka umuhondo (reba imfashanyigisho ikoreshwa ku mirima y'icyitegererezo).

Hariho ubwoko bwinshi bwa virusi kandi akensi umurima cyangwa igihingwa byanduye virusi zirenze imwe zitera ingaruka. Kubera ko nta ngamba zihariye zo kugenzura buri virusi, ntukishinje kuba utazi virusi zitandukanye. Icyangombwa ni ugushobora gutandukanya igihingwa gisanzwe (kitarwaye) n'ighingwa kirwaye.

Indwara z'imfunyarazi zirwanywa mu buryo bukomatanije, burimo:

- 1) Gukoresha imbuto nziza. Bitera ingaruka cyane guhitamo ibirayi by'imbuto ukurikije ubunini bwabyo (guhitamo ibirayi bito nk'imbuto), Nk'ibirayi byanduye muri rusange byera ibindi ibirayi bito.
- 2) Gutera ubwoko bw'ibirayi byihanganira indwara za virusi.
- 3) Kurandura no kuvanaho iibirayi byanduye mu murima, hanyuma ubitwike mu rwobo rurerure. Ntugashyire ibirayi byanduye nkibizavamo ifumbire mborera.

- 4) Sukura ibikoresho by'ubuhinzi nkamasuka mbere na nyuma yo kuyikoresha kugirango wirinde gukwirakwiza ubwandum (urugero: koresha umuriro cyangwa Jik).
- 5) Kurinda umurima hamwe n'ibyatsi bibi biwukikije nibiwukikije kuko bishobora kubika virusi zanduza ibirayi.
- 6) Kurwanya udukoko dushobora gukwirakwiza indwara za virusi. Udukoko nk'uduhunduguru (aphids) dukwirakwiza indwara ya virusi iyo turumye amababi y'ikirayi kirwaye tukongera tukaruma amababi y'ikirayi kizima. Bityo dusigamo amatembabuzi cyavanye mu kirayi kirwaye. Kubw'ibyo, kurinda utwo dukoko utera imiti, cyangwa kuyifata n'imitego bigabanya ikwirakwizwa ry'indwara za virusi. Menya ko imiti yica udukoko, yangiza ubuzima bw'abantu n'ibidukikije kandi igomba gukoreshwa gusa nk'uburyo bwa nyuma mu gihe uburwayi bukomeye.

## Igice cya 15: Kurwanya imungu y'ibirayi



**Shimangira akamaro ko kuhira itaka no kurinda ubutaka kwiyasa mu gihe ibirayi biri kubyiga bikaba byagaragara hejuru ku butaka**

Imungu y'ibirayi iterwa n'ikinyugunyugu na none hamwe bayita urunyo rw'ibirayi, yangiza igihingwa mu murima kandi ikimukana n'ibirayi kugera mu bubiko. Urunyo rwinjira mu kirayi runyuze mu maso rugakora umwenge mu kirayi. Urunyo rushobora kandi gukora imyenge mu ruti. Zikomeza kororoka no mu birayi bibitswe bigatera igihombo kinini. Mu kigega, ibirayi byanduye biba byumye ugereranijwe n'ibitarwaye.

Imungu y'ibirayi ishobora kurwanya hakoreshejwe:

- 1) Irinde gutera mu butaka bworoshye cyane, kuko ibi bituma ibirayi bijya hejuru ku butaka maze ibinyugunyugu bigateraho amagi yazo;
- 2) Gusukira ubutaka cyane kugirango urinde ibirayi. Birinda ibirayi guhura n'umwuka unyuze mu butaka;
- 3) Irinde kubika ibirayi byerekana imyobo cyangwa ibisigazwa by'imungu. Imungu mu kigega zishobora kwangiza byinshi mu bindi birayi no mu mirima bituranye;
- 4) Gukoresha ibimera nka Lantana n'inturusu bitera utunyugunyugu kuguruka tukajya kure y'ububiko.
- 5) Gutera umuti wabugenewe mu murima. Menya ko imiti yica udukoko, yangiza ubuzima bw'abantu n'ibidukikije kandi igomba gukoreshwa gusa nk'uburyo bwa nyuma mu gihe uburwayi bukomeye.

## Igice cya 16: Kurwanya Sempeshyi / amavunja y'ibirayi



Ibirayi byarwaye amavunja (nematode) bishobora kwerekana urwego rutandukanye rwo kugwingira, amababi akaba umuhondo ndetse ikirayi kikamera nk'icyumye mu gihe hari ikibazo cy'ubuhehere. Ubwoko bubiri bw'amavunja buzwi mu buhinzi bw'ibirayi ni: Knot nematodes (Soma Noti nematode) na cyst nematodes (Soma Siste nematode).

Noti nematode nizo zikwirakwiriye kw'isi yose. Bifata ibirayi bikabitera inenge ituma bidashora kugurishwa ku isoko. Ibirayi byayirwaye, bishobora kwandura indwara ya Kirabiranya byihuse.

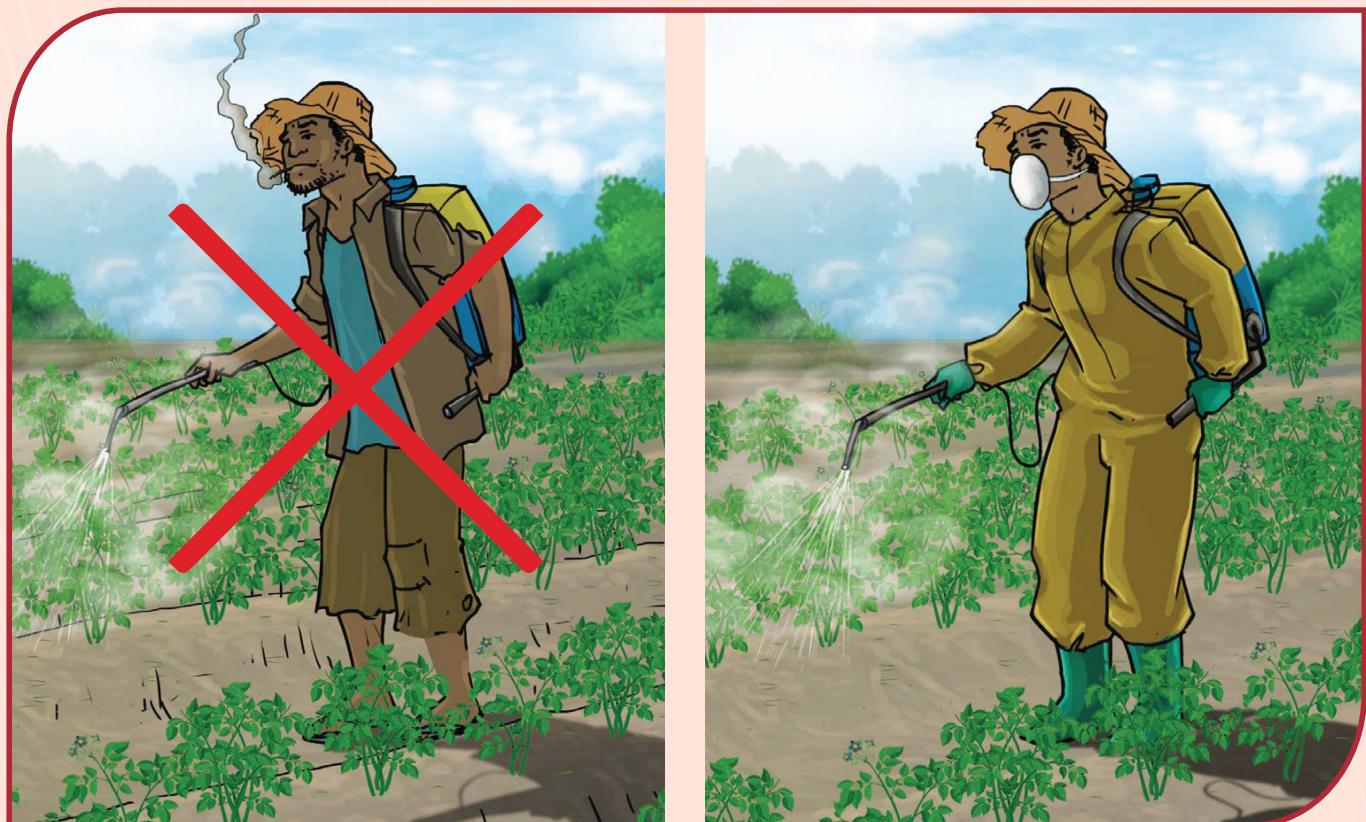
Kwangizwa kwa Siste nematode bikunda kwigaragaza cyane mu murima urimo ibirayi bikura. Igihingwa kiragwingira, kikeruruka cyangwa kigagira umuhondo wera ndeste cyikuma. Ibi bimenyetso biganisha ku igabanuka ry'umusaruro n'ibirayi bito. Hashobora gushira imyaka 20 kuva nematode yinjiye mu murima kugeza ibimenyetso bigaragaye mu murima. Menya kandi ko ntacyo bitwaye kurya ibirayi birwaye nematode. Ntuzigereukoresha nk'imbuto ibirayi byatewe na nematode.

**Indwara y'amavunja ntabwo  
yoroshye kuyisobanura keretse ufite  
ingeri zimwe zo kugreranya**

Kurwanya nematode, ni ukugerageza nibura guhagarika kororoka kwazo ukageza ku kigero cyo hasi gituma zitakwangiza. Kuzirwanya kwiza ni ukuzirinda kuko biragoye kuzivana mu murima iyo zamaze kuboneka. Ibikorwa byo kuzirinda harimo:

- 1) Guhitamo neza imirima itanduye.
- 2) Guhinga ibirayi byimbuto nziza. Ntuzigereukoresha ibirayi byimbuto byasarwe mu murima wanduye.
- 3) Niba nematode imaze kuboneka mu murima, tegereza nibura imyaka 5 mbere yo kongera guteramo ibirayi kandi wirinda ibihingwa biri mu muryango umwe n'ibirayi, urugero, inyanya, intoryi, urusenda.
- 4) Guhinga ubwoko bw'ibirayi bwihanganira indwara ya nematode.

## Igice cya 17: Gukoresha neza imiti irwanya indwara n'ibyonnyi



**Ni ngombwa kugaragaza ko imiti yica udukoko ari myiza ariko inafite ingaruka mbi ku gihingwa. Ganira n'abahugurwa ku nyungu n'ingaruka ndetse n'imigenzereze myiza n'imibi ku byerekeranye n'ikoreshwa ry'imiti yica udukoko**

Imiti irwanya indwara n'ibyonnyi (irimo irwanya indwara, udukoko n'ibyatsi bibi) igomba gukoreshwa neza kugirango wirinde kwangiza ubuzima bw'uyikoresha n'abaturanyi, ndetse n'ibidukikije. Imiti yose yangiza abantu n'ibidukikije kandi igomba gukoreshwa mu bwitonze. Hari ingero nyinshi z'ibibazo mu babinzi. Gukoresha imiti rero bigomba kuba inzira ya nyuma umuhinzi akoresha amaze gukoresha ubundi buryo bwose bwo kurwanya indwara n'ibyonnyi. Harimo gukoresha, ubwoko bw'ibirayi bwihanganira indwara, imbuto nziza, guhinduranya ibihingwa, imiti yica udukoko itangiza (urugero, neem) hamwe no gucunga neza ubutaka.

Intego yo gukoresha imiti yica indwara n'ibyonnyi ni ukurindira izo ndwara n'ibyonnyi ku rwego itabasha

kwangiza kandi ikoreshwa ry'yo miti naryo riri ku rwego rudateza igihombo ndetse rutangiza ubuzima bw'abantu n'ibidukikije.

Iyo kwirinda ikoreshwa ry'imiti bidashobora, amabwiriza akurikira agomba kubahirizwa kugirango hirindwe ingaruka mbi ku buzima bw'abantu no ku bidukikije:

- 1) Buri gihe soma ku cyapa amabwiriza yatanzwe n'uwakoze umuti.
- 2) Ntutere umuti uri hejuru y'urugero rwasabwe n'uwawukoze.
- 3) Kwambara ibikoresho birinda, harimo isarubeti y'akazi itwikiriye amaboko n'amaguru, agapfukamunwa, bote ndetse n'uturinda-ntoki.
- 4) Irinde igihe cy'umuyaga mwinshi kandi ntutere mu cyerekezo cy'umuyaga.
- 5) Gutera imiti irwanya indwara n'ibyonnyi ntibigomba gukorwa n'abagore batwite cyangwa abana. Abagore batwite n'abana ntibagomba kwinjira mu murima mu gihe cyo gutera umuti cyangwa iminsi micye nyuma yaho.
- 6) Ntuzigere utera umuti imyaka mbere yo gusarura. Ibi birabujijwe rwose kandi byatera uburozi abaguzi. Nta muti ugomba gukoreshwa mu gihe cy'ibyumweru 2-3 mbere y'isarura.

- 7) Bika imiti ahantu hizewe aho itagerwaho n'abana kandi kure y'ibyo kurya cyangwa ahantu mu nzu hategurirwa ibiryo.
- 8) Ntukajugunye ibisigisigi by'umuti ahantu hose ubonye. Ntuzigere ujugunya imiti yica udukoko mu mazi aho ayo mazi ashobora gukoreshwa mu rugo.
- 9) Ugomba kujugunya ahabugenewe ibikoresho byarimo imiti; wikongere kubikoresha ku bindi bikorwa.

## Isomo 4 Imirimo yo gusarura no guhunika

### Igice cya 18: Gusarura



Gusarura bigomba gukorwa mu gihe ibirayi byeze neza, imigozi yamaze kuma neza, kandi uruhu rw'ibirayi rukomeye rudashobora gukurwaho byoroheje n'intoki zawe. Ni byiza kunyomora nibura iminsi 10-15 mbere yo gusarura.

Kunyomora ni ukuvano igice cyo hejuru y'ubutaka, mu gihe ibirayi byeze neza (reba imfashanyigisho ngiro). Kunyomora ni ngombwa niba ibirayi bigomba guhunikwa kuko ibi bituma uruhu rukomera kugirango birinde gukomereka mu gihe cyo kubitwara, no kwirirnda indwara ziboneka nyuma yo gusarurwa.

**Umuhinzi ntabyuka ngo atangire gusarura umurima w'ibirayi. Hariho gahunda yuzuye yo kwitegura ibikoresho byo kugeza ibirayi ku isoko. Igihombo kinini gishobora kubaho hagati yo gusarura no kugurisha**

Gusarura bigomba gukorwa mu gihe hari umucyo ntabwo ari igihe imvura igwa, kuko gusarura mu mvura bishobora gutera ibirayi kubora. Gusarura bigomba gukorwa buhoro buhoro kuva mu ruhande rumwe

rwumurima kugera ku rundi ku buryo mu gihe imvura  
igiye kugwa, abahinzi bashobora guhagarara  
bagatangira kwegeranya ibirayi byasaruve kugirango  
birinde ko binyagirwa. Gusarura ku gihe bishobora  
gufasha kwirinda igihombo giterwa nindwara  
n'ibyonnyi.

Uburyo bwo gusarura bushobora kugira ingaruka ku  
bwiza bw'ibirayi. Ni ngombwa gucukura buhoro  
ibirayi kugirango wirinde kubikomeretsa. Ibirayi  
bishobora gusarurwa ukoresheje amaboko cyangwa  
hakoreshejwe imashini. Iyo usurura n'amaboko, hari  
inzira ebyiri: gusarura n'intoki cyangwa gukoresha  
isuka. Gusarura n'intoki bifata igehe kirekire kandi  
bisaba akazi cyane, ariko bitanga umusaruro mwiza  
kandi utangiritse. Gukoresha isuka ntibitwara igehe  
kinini kandi bisaba akazi kenshi, ariko ibirayi bimwe bishobora  
kwangirika mu gikorwa. Gukoresha  
imashini ni uburyo busaba akazi gacye kandi burihuta  
kuruta gusarura n'intoki, cyane cyane iyo umurima ari  
munini (hejuru ya ha 1).

Gusarura bigomba gukorwa mu gihe hari umucyo  
ntabwo ari igehe imvura igwa, kuko gusarura mu  
mvura bishobora gutera ibirayi kubora. Gusarura  
bigomba gukorwa buhoro buhoro kuva mu ruhande  
rumwe rwumurima kugera ku rundi ku buryo mu  
gihe imvura igiye kugwa, abahinzi bashobora  
guhagarara bagatangira kwegeranya ibirayi  
byasaruve kugirango birinde ko binyagirwa.  
Gusarura ku gihe bishobora gufasha kwirinda  
igihombo giterwa nindwara n'ibyonnyi.

Uburyo bwo gusarura bushobora kugira ingaruka  
ku bwiza bw'ibirayi. Ni ngombwa gucukura buhoro  
ibirayi kugirango wirinde kubikomeretsa. Ibirayi  
birashobora gusarurwa ukoresheje amaboko  
cyangwa hakoreshejwe imashini. Iyo usurura  
n'amaboko, hari inzira ebyiri: gusarura n'intoki  
cyangwa gukoresha isuka. Gusarura n'intoki bifata  
igehe kirekire kandi bisaba akazi cyane, ariko  
bitanga umusaruro mwiza kandi utangiritse.  
Gukoresha isuka ntibitwara igehe kinini kandi  
bisaba akazi kenshi, ariko ibirayi bimwe bishobora  
kwangirika mu gikorwa. Gukoresha imashini ni  
uburyo busaba akazi gacye kandi burihuta kuruta  
gusarura n'intoki, cyane cyane iyo umurima ari  
munini (hejuru ya ha 1).

Kugira ngo wirinde kwangirika, ntuterere ibirayi  
kure. Nyuma yo gukura ibirayi, bigomba gusigara  
hasi mu gihe gito kugirango ubutaka bwafasheho  
bwumuke kandi buveho. Nyamara, ibirayi  
ntibigomba kuguma ku zuba ryinshi igehe kirenze  
igisabwa kugirango byumuke (bitarenze nibura  
amasaha 2).

Nyuma yo gusarura, ugomba gusukura umurima,  
ukusanya no gusenya ibisigazwa byibisaruwe  
nk'ibisigazwa by'imigozi n'ibirayi byaboze.  
Iki n'igice cy'ingenzi mu kurwanya indwara  
n'ibyonnyi bitandukanye, ukuraho ibintu byose  
byakwandumza igihingwa mu bihe by'ihinga bitaha.

## Igice cya 19: Gutoranya no gutondeka ibirayi



### Shimangira icyifuzo cyo gutondeka no gupakira ibirayi kugirango bitandukanye ibiciro

Ibirayi bivuye ku migozi irwaye bigomba gusarurwa nyuma bigakusanywa, bikabikwa ku ruhande. Uyu murimo witwa gutoranya. Ibirayi biva mu migozi mizima bigomba gutondekwa, ibi bivuze gutandukanya ibirayi binini n'ibito. Mu byukuri, umuhinzi agomba kwita ku byiciro bitandukanye by'ibirayi mu gihe ashyiraho ibiciro, bitewe nibyo isoko risaba.

Ibirayi byose singombwa gutunganywamo ibindi biribwa. Ibirayi binini gusa (hejuru ya mm 60) mu bisanzwe nibyo bikoresha mu gukora amafiriti.

Umuco wo gushukana, herekanwa ibirayi binini hejuru mu mufuka mu gihe uhisha uturayi duto hasi ugomba gucika. Na none, gukoresha indobo nk'igipimo cy'ibirayi bishobora kuvamo uburiganya. Gukoresha umunzani wo gupima ingano y'ibirayi, n'uburyo butera kwizerana hagati yugurisha nuwaguze.

## Igice cya 20: Guhunika ibirayi byo kurya



Akensi, abahinzi ntibita cyane guhunika ibirayi byo kurya nk'uko babikora ku birayi by'imbuto. Ariko, kubika neza ibirayi byo kurya bishobora gufasha abahinzi kubika ibiryo byo kurya mu rugo igihe kirekire, cyangwa kubona igiciro kinini ku birayi byabitswe kugeza mu gihe cy'isarura nyamukuru kirangiye.

Ibirayi byiza nibyo bigomba gusa kubikwa. Ibirayi byose bibora, byangiritse cyangwa biva mumrima irwaye bigomba kuribwa cyangwa kugurishwa mugihe cyo gusarura. Guhunika ibirayi niyo yaba bicye biboze bikwirakwiza ububore mu bindi birayi maze igihombo kikaba kinini mu bubiko.

Ibirayi byo kuribwa mu rugo cyangwa kugurisha bishobora guhunikwa igihe kirekire kandi bikagumana ubwiza bwabyo. Mugihe ibintu bitatu by'ingenzi bikurikira byujuje: ubushyuhe buri hasi (munsi ya 20°C), umwijima, n'ubuhumekero. Ibirayi byigerwaho n'mirasire y'izuba cyangwa ubushyuhe bwinshi bishobora guhinduka icyatsi, bigahinduka uburozi, bitangira kumera. Kugirango ugumane ubukonje n'umwijima mu kigega, funga imiryango kumanywa. Nyamara, inzugi zirashobora gukingurwa nijoro iyo hakonje kugirango bihumeke. Kubura ubuhumekero bitera ibirayi kubora. Koresha ibikoresho byo gusakara bifasha kugumana ubukonje muhunikiro mu masaha yo kumanywa.

Nta kibi kirimo guhunika ibirayi byo kurya niyo byaba ari byinshi, hasi mu buhunikiro iyo hari isuku.

**Ganiriza abahugurwa ku buryo butandukanye  
bwo guhunika ibirayi byo kurya ndetse  
n'ibigenewe kujyanwa ku isoko**

Ariko, kubika ibirayi mu bisanduku cyangwa muma kureti byongera ubuhumecyero. Guhunika mu masanduku bigabanya ikwirakwiza ryinshi mububiko mugihe haba harimo ibirayi biboze biri mubisanduku. Ibirayi bigomba kubikwa mumifuka gusa iyo bibikwa igihe gito (ibyumweru 3 ntarengwa) kuko imifuka igabanya kunyiramo k'umwuka kandi igatera kubora. Udukoko n'indwara zishobora kwibasira ibirayi mu buhunikiro ni imungu y'ibirayi, kubora ndetse n'uruhumbu. Utwo dukoko n'indwara bizanwa mu mu buhunikiro n'ibirayi ubwabyo cyangwa bigafatirwamo. Buri gihe ugomba guhora ushakisha ibirayi birwaye. Ibirayi birwaye bigomba kuvanwa mubuhunikiro, bikajugunyuwa.

Gukoresha Ibimera nka Lantana n'inturusu byirukana imungu n'ibinyugunyugu kandi bigatuma ibnyugunyugu biguruka kure yububiko. Ibi biti bishobora guterwa hafi y'ubuhunikiro cyangwa amababi yabyo n'amashami ashobora gukoreshwa mugupfuka ibirayi. Iyo utwikiriye ibirayi n'amashami y'ibibyo biti, ni ngombwa kumenya neza ko ibirayi bishobora guhumeka kandi ubuhehere ntibube bwinshi cyane munsi y'amashami kuko ibyo bitera kubora.

# IMIGEREKA

## Umugereka wa 1: Ibibazo n'ubutumwa bwo kuzirikana

Igice	Ikigwa	Ibibazo	Ubutumwa bwo kuzirikana
1	Akamaro k'igihingwa cy'ibirayi	<ul style="list-style-type: none"> <li>Ni hehe igihingwa cy'ibirayi gikomoka?</li> <li>Vuga ibihingwa bibiri byonyinebihingwa cyane kuruta ibirayi ku isi?</li> <li>Kuki ibirayi bifatwa nk'igihingwa cy'ingenzi?</li> </ul>	Amafaranga yinjizwa no guhinga ibirayi mu bisanzwe ni menshi ugereranje naboneka mu bindi bihingwa bitanga ibiribwa.
2	Kumva neza imikurire y'ibirayi	<ul style="list-style-type: none"> <li>Ni ibihe byiciro bitanu by'imikurire y'igihingwa cy'ibirayi?</li> <li>Ni ibihe bintu bifite ingaruka ku burebure bw'icyiro cyo gukura?</li> <li>Ni ryari bikwiye gusarurwa umurima w'ibirayi?</li> </ul>	Iki cyiciro cyo kuzana imimero no kumera bivuye mu butaka ni ingenzi kuko umusarura w'ibirayi uitanye isano cyane n'umubare w'ibiti kuri buri kirayi
3	Guhitamo ubutaka no gusimburan ya ibihingwa	<ul style="list-style-type: none"> <li>Ni ibihe bintu biranga ikirere cyiza cyo guhingamo ibirayi?</li> <li>Nibyiza kongera gutera ibirayi aho wabisaruye cyangwa ibindi bihingwa biri mu muryango umwe mugihe cyashize? Kubera iki?</li> <li>Ni ibihe bihingwa byo mu muryango umwe n'ibirayi bihingwa mu karere kanyu?</li> </ul>	Ningombwa cyane gutegereza nibura ibihe 2 by'ihingwa mbere yuko wongera gutera ibirayi mu murima umwe.
4	Gutegura umurima	<ul style="list-style-type: none"> <li>Ni ukugeza ku buhe bujyakuzimu (byibuze) ukeneye guhingaho ubutaka mu gihe cyo gutegura umurima kandi kuki?</li> <li>Ni izihe ntambwe zitandukanye mu gutegura ubutaka bwo guhinga ibirzayi?</li> <li>NI gihe ki gukora imitabo bigomba kwitabwaho?</li> </ul>	Gukoresha imashini zihinga bishobora kugabanya umutwaro mu gutegura ubutaka

Igice	Ikigwa	Ibibazo	Ubutumwa bwo kuzirikana
5	Gufumbira (ifumbire yamatungo, imborera n'ifumbire mva ruganda)	<ul style="list-style-type: none"> <li>Kuki ari ngombwa kubona igipimo cy'ifumbire kihariye kuri hantu runaka?</li> <li>Ni ubuhebwoko bw'ifumbire mvaruganda isabwa ku gihingwa cy'ibirayi mu karere kanyu? Ni ikihe gipimo?</li> <li>Ni ikihe gipimo cy'ifumbire mborera isabwa gufumbira ibirayi ku buso bwa ari 1 (<math>m^2</math>-100)</li> </ul>	Gutera ibirayi ku butaka bubi ufashyizemo ifumbir ei y'imborera n'imvaruganda ni uguta igihe n'amafaranga.
6	Uburyo bwo gutera	<ul style="list-style-type: none"> <li>Ni ayahe mazina y'ubwoko bw'ibirayi ahingwa mu karere kanyu?</li> <li>Ni gute wagena imirongo yo guteraho ahantu hahanamye?</li> <li>Ni iyihe ntera yo guteraho ibirayi yatuma ugira umusaruro mwinshi mu birayi?</li> </ul>	Ubwoko bw'ibirayi, ingano y'ibirayi by'imbuto, n'ubuhaname ni ibuntu by'ingenzi ugomba kwitaho mu gihe utegura imbuto yo gutera.
7	Kubagara no gusukira itaka	<ul style="list-style-type: none"> <li>Kuki umurima w'ibirayi ugomba kugira ufite isuku, nta byatsi birimo, kugeza igihe cyo gusarura?</li> <li>Kuki ari ngombwa gusukira itaka ku birayi?</li> <li>Ni ryari ibirayi bigomba gusukirwa itaka?</li> </ul>	Bitandukanye n'ibindibihingwa nk'ibinyampeke, umusaruro w'ibirayi uturuka munsi y'ubutaka. Ntugomba guhinga ibirayi udasukiye itaka.
8	Kuvomerera	<ul style="list-style-type: none"> <li>Ni ikihe cyiciro cyo gukura kw'ibirayi amazi akenerwa cyan?</li> <li>Niki wakora niba ushaka gutera ibirayi mu gihe cyizuba?</li> <li>Niki wakora mu gihe ugomba gukoresha pompe kugirango uvomerere umurima wawe ahantu hataboneka lisansi?</li> </ul>	Nyamuneka, mbere yo gutera ibirayi, reba neza ko hazabaho imvura ihajije cyangwa amazi yo kuhira kugeza igihembwe kirangiye
9	Kuvanga ibirayi n'ibindi bihingwa	<ul style="list-style-type: none"> <li>Ni izihe nyungu zo kuvanga ibirayi n'ibindi bihingwa ahantu hahanamye kandi hagwa imvura nyinshi?</li> <li>Ni iyihe mvange y'ibihingwa ibereye ubutaka bubu budafite ifumbire ihagihe?</li> <li>Ni izihe nyungu zo guhinga ibirayi bivanze n'ibindi bihingwa ahantu hashyushye?</li> </ul>	Iyo uhinga ibirayi hamwe n'ibindi bihingwa, ubwoko bw'ibirayi, amatariki yo gutera n'uburyo bwo gutera bigomba kwitonderwa kugirango urinde icuranwa hagati y'ibihingwa.

Igice	Ikigwa	Ibibazo	Ubutumwa bwo kuzirikana
10	<b>Mpandeshatu y'indwara</b>	<ul style="list-style-type: none"> <li>Kuki ari ngombwa kurwanya indwara n'ibyonnyi?</li> <li>Ni ibihe bintu bitatu bigize mpandeshatu y'indwara?</li> <li>Nigute wita uburwayi bw'igihingwa cyibirayi butagaragaza ibimenyetso?</li> </ul>	Kubasha gutandukanya imigozi n'ibirayi birwaye ugereranje nibitarwaye mu murima no mubuhunikiro n'intambwe y'ingenzi yo kurwanya udukoko nindwara.
11	<b>Kurwanya indwara y'imvura</b>	<ul style="list-style-type: none"> <li>Ni ibihe bimenyetso by'ingenzi byerekana indwara y'lmvura mu murima? N'ibihe bintu by'ingenzi bituma ibaho?</li> <li>Ni izihe ngamba zifatika zo kurwanya indwara y'lmvura mu murima?</li> <li>Ni irihe tandukaniro riri hagati y'umuti urwanya indwara uhereye inyuma ku gihingwa ndetse n'umuti winjiramo imbere mu gihingwa</li> </ul>	Indwara y'imvura, n indwara yangiza cyane yibirayi. Banza umena neza ko ushobora kubona imbuto nziza kandi uzi uburyo bwo kurwanya indwara mbere yo gutera.
12	<b>Kurwanya Kirabiranya</b>	<ul style="list-style-type: none"> <li>Ni ibihe bimenyetso bya Kirabiranya ku mugosi no ku birayi?</li> <li>Ni gute ushobora kumenya Kirabiranya mu murima?</li> <li>Ni ubuhe buryo bwiza bwo kurwanya Kirabiranya?</li> </ul>	Nta miti ku isoko irwanya Kirabiranyai. Biragoye kurwanya burundi indwara iyo yageze mu butaka.
13	<b>Kurwanya Kabore</b>	<ul style="list-style-type: none"> <li>Ni iki Kabore y'ibirayi kandi ni ibihe bimenyetso byayo?</li> <li>Ni gute ushobora gutandukanya Kabore na Kirabiranya ku migozi n'ibirayi?</li> </ul>	Nta miti ku isoko irwanya Kabore. Biragoye kurwanya burundi indwara iyo yageze mu butaka.
14	<b>Kurwanya indwara y'imfunyarazi</b>	<ul style="list-style-type: none"> <li>Kuki ingaruka mbi z'indwara z'imfunyarazi zikunze kuza nyuma yo kubona ibimenyetso by'ighembwe cya mbere mu murima?</li> <li>Ni izihe ngamba zifatika zo kurwanya Imfunyarazi?</li> <li>Kuki ari ngombwa guhitamo imbuto udakurikije gusa ubunini bwazo?</li> </ul>	Si ngombwa kumenya amazina y'ubwoko bw'imfunyarazi (virusi). Icyangombwa ni ugushobora gutandukanya igihingwa kizima (kitarwaye) n'ikirwaye.

Igice	Ikigwa	Ibibazo	Ubutumwa bwo kuzirikana
15	Kurwanya imungu y'ibirayi	<ul style="list-style-type: none"> <li>Ni iki imungu y'ibirayi?</li> <li>Ni ibihe bimenyetso by'imungu ku birayi buhunikiro?</li> <li>Ni izihe ngamba zifatika zo kurwanya Imungu mu buhunikiro?</li> </ul>	Gutera ibiti byirukana imungu hafi y'ubuhunikiro bw'ibirayi nka Lantana bishobora gufasha kugabanya ingaruka z'imungu mu birayi.
16	Kurwanya amavunja y'ibirayi	<ul style="list-style-type: none"> <li>Niki amavunja y'ibirayii?</li> <li>Ni ibihe bimenyetso bya amavunja ku birayi?</li> <li>Ni izihe ngamba zifatika kurwanya amavunja y'ibirayi?</li> </ul>	Amavunja y'ibirayi aragoye kuyarwanya iyo yamaze kugera mu butaka. Ingamba zo gukumira kuyakumira nibwo buryo bwiza kandi buboneye
17	Gukoresha neza imiti irwanya indwara n'ibyonnyi	<ul style="list-style-type: none"> <li>Kuki ari ngombwa cyane kwitonda mugihe ukoresheje imiti irwanya indwara n'ibyonnyi?</li> <li>Ni he ushabora gukura ibimenyetso byihariye byerekana uburyo wakoresha imiti irwanya indwara n'ibyonnyi?</li> <li>Ni gute ushabora kwirinda wowe n'umuryango wawe ingaruka mbi ziterwa n'imiti irwanya indwara n'ibyonnyi?</li> </ul>	Nyamuneka, tera umuti GUSA mu gihe bibaye ngombwa kandi utarenza igipimo n'inshuro byasabwe.
18	Gusarura	<ul style="list-style-type: none"> <li>Ni ryari, igihe gikwiye cyo gusarura umurima w'ibirayi kugirango ugire umusaruro mwinshi?</li> <li>Ni ubuhe buryo butandukanye bukoreshwa mu gusarura ibirayi mu murima?</li> <li>Ese hari igikwiye kwitabwaho nyuma yo gusarura umurima w'ibirayi? Kubera iki?</li> </ul>	Ntuzigere usurura mbere yuko imigozi yose yuma niba ushaka umusaruro mwinshi.

Igice	Ikigwa	Ibibazo	Ubutumwa bwo kuzirikana
19	Gutoranya no gutondeka ibirayi	<ul style="list-style-type: none"> <li>Kuki ari ngombwa gutoranya ibirayi nyuma yo gusarura?</li> <li>Kuki ari ngombwa gutondeka ibirayi mu buryo butandukanye nyuma yo gusarura?</li> <li>Ni izihe ngaruka zishobora guterwa no gukoresha indobo aho kuba umunzani mukugurisha ibirayi?</li> </ul>	Ibirayi byose byasarwe mu murima ntabwo bigenewe gukoreshwa kimwe, bityo byose ntibifite agaciro kamwe. Nyamuneka tondeka mu buryo butandukanye ibirayi byawe kandi ubigenere igiciro gitandukanye ige cyose bishoboka.
20	Guhunika ibirayi byo kurya	<ul style="list-style-type: none"> <li>Ese ni ngombwa kwita ku bubiko bw' ibirayi byo kurya? Kubera iki?</li> <li>Ni ubuhe buryo bwiza bwo kugunika ige kirekire ibirayi byo kurya?</li> <li>Ni ukubera iki bisabwa kudashyira ibirayi ahari imirasirey'ibzuba ige kirekire?</li> </ul>	Ntuzigere urya cyangwa ugurisha ibirayi by'icyatsi cyangwa biriho ibidomo by'icyatsi. Ni uburozi.

## **Umugereka wa 2: Urugero rw'isuzumabumenyi rya mbere na nyuma y'amahugurwaassessment**

### **Isuzumabumenyi ku buhinzi bw'ibirayi byo kurya**

Amazina: \_\_\_\_\_

Itarilki:

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Zirikana ko: buri gisubizo cyiza, gifite inota 1 kuri 20

#### **Isomo rya 1 Ibyibanze ku gihingwa cy'ibirayi**

- 1.** Ni ibihe byiciro 5 by'imikurire y'ibirayi?

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#### **Isomo rya 2 Ubutaka, igihingwa no kubungabunga amazi**

- 2.** Ni ikihe kirere cyiza cyo guhingaho ibirayi?

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- 3.** Kuki ari ingenzi gusimburanya ibirayi n'ibindi bihingwa mu murima

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**4.** Ni ayahe mafumbire mvaruganda agenewe gukoreshwa mu birayi mu karere kanyu?

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**5.** Ni iyihe ntera ikwiye gutterwaho ibirayi kugirango ugire umusaruro mwinshi?

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**6.** Kuki ari ingenzi gusukira ubutaka ibirayi?

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**7.** Ni ku kihe cyiciro cy'imikurire y'ibirayi amazi aba acyenewe cyane?

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**8.** Ni akahe kamaro k'ingenzi mu kuvanga ibirayi n'ibindi bihingwa?

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### Isomo rya 3

### Kurwanya indwara n'ibyonnyi

9. Ni ibihe bintu bitatu bigize mpandeshatu y'indwara?

10. Ni rihe tandukaniro riri hagati y'umuti urwanya indwara uhoreye inyuma ku gihingwa ndetse n'umuti winjiramo imbere mu gihingwa

11. Ni izihe ngamba zingenzi zo kurwanya Kirabiranya y'ibirayi?

12. Ni gute watandukanya Kabore na Kirabiranya ku birayi no ku migozi w'ibirayi?

13. Ni Izihe ngamba z'ingenzi zo kurwanya Mfunyarazi y'ibirayi?

**14.** Ni ibihe bimenyetso byo kurwanya imungu y'ibirayi mu buhunikiro?

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**15.** Ni ibihe bimenyetso by'amavunja y'ibirayi?

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**16.** Ni ryari imiti irwanya indwara n'ibyonnyi ibujijwe gukoreshwa mu murima? Kubera iki?

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