

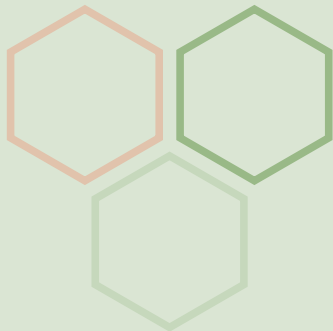


Australian Government
Australian Centre for
International Agricultural Research

Pasifik sandelwud

Kaed blong planem sandelwud long Pasifik rijin







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**Kaed blong planem sandelwud
long Pasifik rijin**

OI Edita

Tony Page

David Bush

Bronwyn Clarke

Lex Thomson



2022

Ostrelian Senta blong Intanasonal Akrikaljarol Risej (ACIAR) i stat long Jun 1982 folem loa blong palem en blong Ostrelia. ACIAR i opereit olsem wan pat blong intanasonal developmen kopereisen prokram blong Ostrelia, wetem wan misen blong ajivim ol moa prodaktif mo sastenebol Akrikaljarol sistem, blong benefitim ol developmen kantri mo Ostrelia. Hemi stap sponsarem ol kolaboratif risej bitwin Ostrelia mo ol narafala kantri long ol eria we Ostrelia i gat risej save long hem. Hemi lukaotem tu kontribusen blong Ostrelia long ol Intanasonal Akrikaljarol Risej Senta.

Long ol ples we oli yusum ol tred nem, hemi no min se oli apruvum o oli akensem eni prodak blong Senta.

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Wok ia hemi kopiraet. apat long eni yus we oli alaoem anda long *Kopiraet Akt 1968*, man i no save riprodusum eni pat blong wok ia sapos hemi no askem fastaem long ACIAR, GPO Box 1571, Canberra ACT 2601, Ostrelia, aciar@aciar.gov.au.

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Fowod

Ol Sandelwud tri (saentifik nem *Santalum* spp.) oli gat bigfala valiu from oel blong natora blong olgeta we ol man oli stap yusum plante yia i pas finis blong ol kastom mo rilijes pepes. Naoia i gat hae diman blong sandelwud oel blong ol mekap, aromaterapi, blong mekem sop i smel gud, ol pefium (senda) mo ol meresin. Natora blong sandelwud we i holem oel oli stap yusum blong ol kaving blong flasem ples mo ol kaving blong ol seremoni. Mo tu oli stap kranem I ko long paoda blong mekem ol stik blong insens.

I gat tred blong sandelwud long Pasifik rijin stat long ol yia 1400 finis, taem ol Jaenis mo Arab tredda oli bin visitim Timor mo ol nara aelan. Tred i bin ekspan long rijin ko kasem Hawai'i, Fiji, French Polynesia, Niu kaledonia, Vanuatu mo Tonga. Sandelwud tred hemi stap olsem wan impoten sos blong inkam blong fulap smolholda long Pasifik rijin, mo ol fama mo indastri tu oli stap wantem sebet aot long wael haves i ko long plantesen prodaksen blong sandelwud.

Ostrelian Senta blong Intanasonal Akrikaljarol Risej (ACIAR) hemi gat mandeit, olsem we i stap talem long ACIAR Act (1982), blong wok wetem ol patna long Indo-Pasifik rijin blong mekem ol save mo teknoloji we i leftemap akrikaljarol produktiviti, sastenabiliti mo resiliens blong ol fud sistem i kamaot. Mifala i mekem hemia tru long ol nekosiesen, fanding mo manejmen blong ol risej patnasip blong benefit blong ol patna kantri mo Ostrelia. Mifala i sapotem tu diseminesen blong save mo eksperiens we mifala karem long ol risej tru long pablikesen blong ol buk, ol kaed mo ol manuel blong ol difren pipol mo okanaesesen.

Long pas 30 yia, ACIAR i invest bigwan long risej mo developmen blong ol bes praktis blong kaltivesen blong sandelwud blong ol smolholda fama, folem ol namba blong olgeta fama we i kro ikam antap kwik taem. Folem invesmen ia wetem ol aotkam blong hem ACIAR hemi pablisim long 2012 *Sandelwud blong Vanuatu - Kaed blong planem sandelwud long Vanuatu*. Fes kaed ia hemi givim ol gudfala praktikol advaes we i kamaot long ol risej we i bin tekem ples, blong stanemap ol produktif sandelwud plot, mo oli yusum gud long Vanuatu, Fiji mo Tonga.

Folem interes blong prodaksen blong sandelwud we i spred i ko long ol nara kantri tu, wan rivi mo apeit blong orijinol kaed i bin tekem ples, blong ol smolholda mo ol advaes blong olgeta long Indonesia, Timor-Leste, Papua Niugini, Ostrelia, Vanuatu, Fiji mo Tonga.

Invesmen blong ACIAR mo nekosiesen blong kolaboretif risej mo developmen, mo tu ekstra invesmen blong ekstendem aotkam blong risej, bae i inkrisim sastenabol saplae blong sandelwud mo impruvum inkam blong ol smolholda fama truaot long Pasifik rijin.



Andrew Campbell

Jif Eksekutif Ofisa, ACIAR



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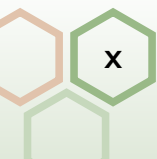
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Ol pikja insaed long kaed ia ol edita i tekem. Sapos i no blong olgeta oli talemaot long kaed.



Ol Akronim mo abrevesen

Term	Mining
2CC	seken kating blong jips
DBH	daeamita long haet blong jes
DBHOB	daeamita long haet blong jes ova long skin blong wud

Ol Yunit

Yunit	Mining
cm	sentemita
cm AGL	sentemita antap long kraon level
g	gram
ha	hekta
kg	kilogram
L	lita
m	Mita
m ²	skwea mita
m AGL	mita antap long kraon level
m ASL	Mita antap long si level
mm	milimita
ppm	pat long wan milien
t	tan, metrik tan (1,000 kg)
°C	dikri selsias



1 Introdaksen

1.1 Ol Sandelwud prodak

Ol Sandelwud tri (saentifik nem *Santalum spp.*) oli gat bigfala valiu from ol oel blong natora blong olgeta (Figa 1.1), mo oli wan long ol mos presies fores prodak we hemi no timba. Ol oel ia oli yusum blong fulap yia blong rilijes mo kastom pepes, mo naoia oli yusum long intanasonal level blong ol mekap, aromaterapi, blong mekem sop i smel gud, ol pefium (senda) mo ol meresin.

Oli stap yusum oel long natora blong sandelwud blong ol kaving blong flasem ples mo ol kaving blong ol seremoni. Mo tu oli stap kranem I ko long paoda blong mekem ol stik blong insens we i gat hae valiu long intanasonal agarbatti (insens) maket.



Figa 1.1 Oel blong natora blong sandelwud

Foto blong Tony Page

1.2 Maket blong sandelwud

Sins long ol yia 1400, taem ol Jaenis mo Arab treda oli stat blong visitim Timor mo ol nara aelan, i gat tred blong sandelwud long Pasifik rijin. Taem ol niu rod blong tred oli open, tred ia hemi spred i ko long ol nara Pasifik aelan olsem Hawai'i, Fiji, French Polynesia, Niu kaledonia, Vanuatu mo Tonga. Tred hemi ko antap mo i kam daon folem avelabiliti blong sandelwud. Taem we tred i slo daon, populesen blong ol tri i kam antap lelebet bakegen. Interes long saed blong planem mo kroem sandelwud blong ol kaljarol mo komesiol risen hemi inkris long ol Pasifik aelan long ol yia ia. Long Vanuatu wan smol indastri hemi opereit sins long yia 1970 wetem wan anuol tanej blong 80 tan. Long ol las 10 yia total amaon blong natora we oli ekspotem i kamaot long Fiji mo Tonga hemi anda long 100 tan long wan yia. Long Timor-Leste oli stopem ekspot blong sandelwud long 2012 blong helpem ol wael sandelwud blong kru bak, be i stil gat sam blak-maket tred. Sandelwud ekspot blong Papua Niugini hemi jam i ko antap bitwin 1997 mo 2002 wetem wan averej blong samples long 36 tan long wan yia. Long 2013-2018 ol haves long wan yia hemi <1 to 5t, eksept long 2019 we oli ekspotem 20t.



Oli yusum sandelwud menli long India, Jaena, Taiwan, Hong Kong mo long Medel Is, wetem ol bigfala maket long Yurop, Japan, Saot Korea, Not Amerika mo sam nara ples. Hae diman blong ol sandelwud prodak mo lo-level prodaksen blong ol tri i mekem se i gat wan big drop long ol najuro! saplae blong fulap spisis blong sandelwud. Mo i mekem tu se ol intanasonal praes oli stap klaem long wan konsisten reit long ol pas 10 o 20 yia. Be praes blong prodak hemi dipen fulap long kwaliti. Long pas ol praes we oli stap givim long ol vilij long Vanuatu blong 1kg natora hemi bin stap klaem long wan reit blong 10% sins long 1990. Be ol praes blong sandelwud naoia oli stap jenis from lo kwaliti blong prodak we i avelabol. Naoia we ol yang tri oli stap kam antap mo developem gudfala natora, yumi save luk se praes bae i ko antap bakegen.



Fig 1.2 Bigfala sandelwud kaving blong flasem ples (lef pej) mo ol insens bena long wan tempol (antap)
Ol foto blong Tony Page



2 Ol Sandelwud spisis

2.1 Distribiusen mo saes

Ol sandelwud tri oli difren long saes folem spisis blong sandelwud, ples we hemi kro long hem mo sam nara risen bakegen.

Santalum album

Indian sandelwud hemi wan smol tri, bitwin 4 mo 10m tol. Hemi stap kro long ol drae ples blong saot India; Sri Lanka; Indonesia (Aceh long not-wes Sumatra, Wes Timor mo ol Lesser Sunda aelan); Timor-Leste; mo long not - kos blong Noten Teritori, Ostrelia.

Santalum austrocaledonicum

Hemi kro long Vanuatu mo Niu kaledonia. Hemi wan smol tri (5-10m tol) we i stap kro long wes-kos Santo, wes Malakula, not - wes Efate, Erromango, Tanna, Aniwa, Futuna mo Aneityum long Vanuatu; mo long Grande-Terre, Ile des Pins, mo Iles Loyauté, Niu kaledonia.

Santalum lanceolatum

Noten sandelwud hemi wan smol tri we i kasem 8m hae. Hemi wan tropikol spisis we i stap long ol noten pat blong Ostrelia (ol latitude not long 20°), long Kwinslan, mo Noten Teritori mo Westen Ostrelia.

Santalum macgregorii

Papua Niugini sandelwud hemi wan mediom-saes tri we hemi stap kru anda long 8m hae, be samtaem hemi kasem 20m hae mo wan daeamita blong 25cm. Hemi wan najurolo tri blong Papua Niugini, mo oli stap faenem long Sentrol mo Kalf Provins stat klosap long si level i ko kasem 750m ASL. Sam risej we oli jes mekem i soem se sam sandelwud populesen long Westen Provins blong Papua Niugini we oli bin ting se hemi *S. macgregorii* hemi rili *S. lanceolatum* mo wan klos famili blong hem *S. lanceolatum*.

Santalum yasi

Long Fiji, Tonga mo Niue sandelwud ia hemi wan smol tri we i kru kasem 9m hae, mo ol lif blong hem oli spredaot long top. Hemi stap long Niue kasem 'Eua, Tongatapu, Ha'apai, Vava'u mo Niuas (Tonga) wetem ol aelan blong Fiji (Lau Islands, i ko long ol provins blong Bua mo Macuata (Vanua Levu), Udu Peninsula (notis Vanua Levu), Nausori Highlands (wes Viti Levu) mo Kadavu).

2.2 Baeoloji

Sandelwud hemi wan 'obligate hemiparasite' we i minim se nomata se ol tri blong hem oli save fotosintesis, oli mas kro wetem ol nara spisis blong I save laef. Ol rus blong olgeta i gat ol spesel kru ('haustoria') we oli kro tru ol rus blong ol nara tri klosap mo oli tekem wota mo ol mineral blong olgeta (Figa 2.1).



Figa 2.1 Haustorial koneksen blong sandelwud rus (lef saed) mo kros-seksen blong haustoria we i ko insaed long host rus (raet saed)









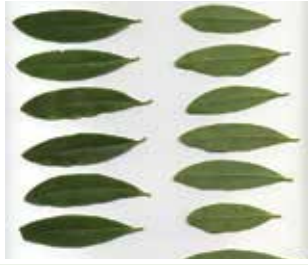






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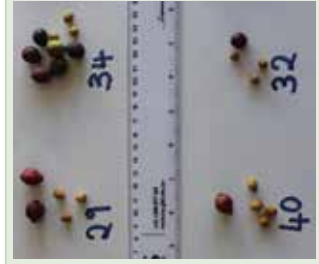




Taem yu planem sidling blong sandelwud, yu mas planem wetem wan host plant (wan pot host). Yu mas planem ol host plant ia wetem ol sandelwud tri long fil blong mekem se sandelwud i save kro strong.

Sandelwud hemi soem ol difren fasin blong kro akros long jeografik renj blong hem (Tebol 2.1):

- **Habit** – Envaeromen blong sandelwud hemi afektem kro blong hem.
- Ol tri we oli stanap long ol open speis oli gat wan sot stampa mo ol branj oli spread, oli krukret mo oli gat fok; ol tri we i stanap long wan bus we i fasfas oli kro stret mo longwan i ko antap mo oli gat smol branj nomo.
- **Skin** – skin blong wud hemi save smut o i raf mo i gat ol laen long hem, mo kala blong skin hemi krei kasem red-braon o i save blak long sam *S. album*, mo ol nalumlum i kro long ol olfala tri.
- **Ol lif** – klosap oli stret nomo (linia) long sam *S. yasi*, mo sam oli ko moa raon long ol *S. album* sep blong ol lif hemi ovol mo samtaem i ko sap olsem wan spia. Fulap sidling oli gat ol bunbun lif, we oli ko moa fatfat taem oli kam bigwan. Ol lif blong ol Pasifik sandelwud spisis oli nogat tumas kala. Ol lif oli saen mo oli dak krin antap mo oli laet krin mo no saen tumas andanit. Ol lif blong *S. lanceolatum* oli sem kala long tugeta saed o oli krei-blu o krin wetem wan saen krei kala. Posisen blong plant, kaen kraon we hemi stap long hem, mo amaon blong shed i save afektem bigwan kala blong lif. Sandelwud (speseli *S. yasi*) we i kro long open ples wetem san mo ol host we i no stret, bae hemi gat ol lif we oli moa yelo.
- **Flawa** – Sandelwud i gat ol smol krin mo waet pat blong flawa (tepals) we oli save laet pink ko kasem dak red taem oli redi fulwan (be long *S. austrocaledonicum* mo *S. lanceolatum* ol flawa blong olgeta i krin/waet ko kasem we oli redi fulwan). Ol flawa ia oli kamaot tu taem long wan yia. Wanwan flawa i open long moning mo i klos long aftanun blong nekis dei blong hem. Long *S. austrocaledonicum*, *S. lanceolatum* mo *S. macgregorii*, ol wanwan flawa oli stap open long moning mo oli klos long aftanun blong nekis dei. Long *S. album* mo *S. yasi*, ol flawa oli save stap open blong fulap dei mo oli no klos kasem we oli mekem ol frut kasem oli foldaon.
- **Frut** – frut i strong mo krin taem i yang, hemi red taem i raep, mo i ko dak pepol taem i redi gud. Wanwan frut i kontenem wan sid nomo mo skin i kavremap mo tu i gat wan mak long top blong sid we ol tepal i mekem.
- **Sid** – wan strong kot (testa) i kavremap sid mo hemi gat wan waet mit insaed long hem we hemi stiki lelebet. Ol daemita blong sid hemi abaot 9–15 mm. Aotsaed sefes blong sid i smut o i raf smol mo i laet braon. Seip blong sid blong ol difren spisis i no semak. *S. album* hemi gat wan sid we klosap i raon. *S. yasi* hemi gat wan ovol sid wetem sap poen long wan en. Ol sids blong *S. austrocaledonicum* long ol saoten aelan oli raon; ol sids long ol noten aelan oli longwan smol.
- **Wud** – natora insaed hemi yelo kasem red o red/braon, mo aotsaed blong sapwud hemi laet yelo kasem waet. Natora hemi rij long oel we i smel naes mo hemi gat komesiol valiu.

Bislama: Tebol 2.1 Komparisen blong ol difren kro habit mo ol mak blong ol *Santalum* spisis

<i>Santalum yasi</i>			
<i>Santalum macgregorii</i>			
<i>Santalum lanceolatum</i>			
<i>Santalum austro-caledonicum</i>			
<i>Santalum album</i>			
Habit			
Skin			
Ol lif			

<i>Santalum yasi</i>			
<i>Santalum macgregorii</i>			
<i>Santalum lanceolatum</i>			
<i>Santalum austro-caledonicum</i>			
<i>Santalum album</i>			
Ol flawa	Fruit		Ol sids



3 Neseri

3.1 Prodaksen blong sidling

I gat ol difren wei we ol fama oli save prodium ol plant blong setemap plantesen:

1. kroem ol sidling long neseri
2. transplantem ol sidling long wan ples i ko long narafala (ol waelding)
3. Planem sids i ko long kraon (daerek siding)
4. tekem ol kating.

Long olgeta ia, kroem ol sidling long neseri hemi moa komon, mo hemi fokas blong yumi long kaed ia. Long fiuja, fasin ia i save kam antap moa from i gat ol prokram naoia blong prodium ol niu sandelwud we oli impruvum wetem jenetik saens aot long ol mein spisis we yumi stap lukluk long hem. Ol waelding oli no pefom gud olsem ol sidling we oli kroem long ol impruv sid. Askem lokol sandelwud ekstensen ofisa o kavman Akrikalja/forestri staf sapos i gat ol impruv sid o sidling. Hemi wan jalenj blong kroem ol kating, speseli blong ol fama we oli nogat eksperiens mo oli gat wan besik neseri setap nomo. Daerek siding i save wok gud be i gat isiu blong ajvivim gud jemineisen, problem blong ol pest (olsem rat), nid blong wid oltaem, mo kasem gud speising.

Wan komon fasin blong establishem ol niu sandelwud plant hemi blong soem ol sid long wan jemineisen mediom mo afta transplantem mo kroem ol sidling long ol polibak we i fulap long kraon. Oli kroem ol sidling wetem wan pot host long wan plant neseri (Figa 3.1), mo afta oli transplantem i ko long fil long wet sisen (long stat blong wet sisen i gud).

Figa 3.1 (foto long narasaed pej) Prodaksen neseri, Timor-Leste
Foto blong Luis Almeida

3.2 Koleksen blong ol sids mo storej

Kolektem mo priperem ol sids

1. Pikimap



Pikimap raep frut long tri mo kolektem frut we hemi jes foldaon i ko long kraon. Ol raep frut oli sopsop mo oli saen. Ol sids we i no redi oli pepol/blak mo oli strong. No karem sids long ol krin frut from bae oli no save kro o stap long taem. Eni frut we i soemaot saen blong red kala i gud blong kolektem, be oli moa had blong prosesem sapos oli no redi gud.



2. Draonem long wota



Draonem ol raep frut long wan baket blong wota fulnaet (abaot 12 haoa) blong mekem se mit blong hem i sopsop.

3. Klinim



Rabem ol frut we oli draonem long wota wetem han blong yu blong mekem se mit blong hem bae i kamaot long sid. Rinsim ol sids ia long klin wota blong karemaot eni doti we i stap long hem.

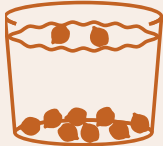
Mit



Sid



4. Sids we i flot



Putum ol sids i ko insaed long wan baket blong wota. Sakemaot ol sids we oli flot, from fulap long olgeta bae oli no save kro. Ol rabis sids bae i save brok isi nomo taem oli prestem wetem finka mo oli gat smol kakae nomo we i drae mekem i no fulumap insaed blong sel blong hem. Kakae blong ol gudfala sids oli fulumap gud mo i fas long sel mekem se hemi save draon long wota.

Kolektem ol sids we i draon from hemia nao ol gudfala sids.

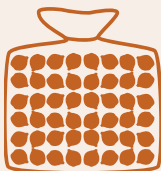


5. Draemap



Draemap ol klin sids long wan flat sefes long wan ples we i wom mo drae, be i no long ples we i kasem ful sanlaet from se ol sids i save ded sapos oli kam hot tumas.

6. Storem



Storem ol drae sids long wan klin kaliko o pepa bak, mo putum long wan kol mo drae ples; long wan ples we i sef mo rat i no save kakae. Ol sids we oli storem olsem bae i save stap gud kasem sikis manis be hemia nomo oli mas salem o yusum hariap. Ol drae sids we oli silim long kontena mo storem insaed long wan aes bokis (2–4 °C) i save stap gud bitim wan yia. Ol sids we oli storem long plastik bak oli save swet mo roten sapos oli no draem gud bifo oli storem. Long Timor-Leste ol fama oli salem mo storem ol drae sids long plastik botel we i gat fulap hol long hem blong mekem win i pas. Oli holem kasem 3 manis.



7. Transpotem



Transpotem Kipim ol sids i kolkol mo drae taem yu transpotem. Sapos yu stap sendem ol sids long pasel, putum kaliko bak long wan katon mo fulumap wetem ol pepa we oli skranjem long han blong mekem se ol sids oli no kam hot tumas taem oli transpotem.

Figia 3.2 Fasin blong kolektem mo priperem ol sids blong storej mo transpot

Hemi impoten blong yusum ol gud kwaliti sids from oli prodiusum ol strong, helti sidling. Yusum simpol fasin blong sid preperesen we oli aotlaenem long Figa 3.2.

Fasin blong klinim ol sids hemi wan impoten eksesaes, speseli sapos bae yu storem ol sids long taem lelebet (Figa 3.3). Storej laef blong sids hemi ko sotwan sapos hemi olem sam mit, from mit i gat suka long hem we i pulum ol smol samting olsem mold mo ol nara kaen fankes. Mek sua blong draem gud ol sids, hemia i impoten blong storej. Taem i gat wota long storej, i save mekem sids i jemineit kwik taem tumas mo mold mo fankes tu i save kro. Hemia i save afektem kro blong sids bigwan (Figa 3.4). Long Timor-Leste oli salem mo storem ol drae sids long plastik botel we i gat fulap hol long hem blong mekem win i pas. Oli holem kasem 3 manis.



Figa 3.3 Ol sids long lef saed i klin lelebet, long medel i moa klin, long raet saed i klin fulwan



Figa 3.4 (antap) Taem oli no storem gud ol sids hemi krietem ol kondisen blong fankes i kro – hemia i save spoelem ol sids kwik taem nomo

Figa 3.5 (raet saed) Ol drae sids we oli storem insaed long wan plastik botel blong mekem win i pas

Foto blong Luis Almeida



3.3 Jemineisen

Ol sids oli jemineit gud taem oli soem long wan kraon we i givim gudfala drenej olsem 2:1 resio mikis blong sanbij blong riva mo kraon (Figa 3.6). Sodas we i roten gud hemi gud blong yusum tu.



Figa 3.6 Sid we i jemineit finis (antap) mo ol sidling we i redi blong transplantem i ko long poli bak (daon) Gudfala sidling i save tekem sam manis blong kompli jemineisen blong evri sids long wan baj blong sids. Hemia from we wanwan sid i silip long difren taem bifo oli wekap. Hemia i gud taem we wan man nomo i manejem operesen from olsem i gat smol namba blong sidling blong handelem long wan taem blong ol difren wok (poting, sotemaot, hadening). Be i gat ol nogud saed tu olsem tumas difren saes long neseri, nid blong sotemaot ol sidling folem ol difren saes, mo tu manejimen blong shed mo hadening blong ol difren krup blong sidling.

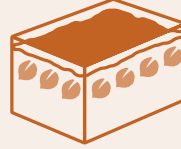
Ol jemeiteing sids

1. Nick (katem)



Katem smol sel blong sid kasem mit blong hem we i stap insaed. Ol sids we oli katem, oli save stat blong kro afta long tu wik nomo, be hemia we oli no katem oli save stap kasem sikis wik bifo oli kro.

2. Soem (planem sids)



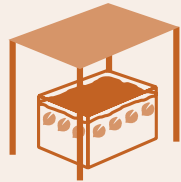
Soem ol sids long wan trei blong sidling o pot, (5–10 mm) andanit long sefes blong kraon mo luk se ol sids oli no fasfas long olgeta.

3. Wota



Kipim kraon i wetwet smol long ples blong soem ol sids be i no mas wetwet tumas. Blokem gud ol trei sapos i gat tumas ren.

4. Protektem



Protektem gud ol sidling we oli jemeitei blong strong san i no kasem. Lukaot long ol rat mo pijin oli no stilim ol sids.

Figa 3. Fasin blong jemeiteim ol sids

I gat tu mein fasin metod we oli yusum blong promotem semtaem jemeisein:

1. Katem smol sel (olsem long Figa 3.7) blong smol namba blong sids.
2. Tritmen wetem gibberellic acid blong bigfala namba blong ol sids. Draonem ol sandelwud sids fulnaet long wan solusen blong gibberellic acid long wan reit blong 0.1 go kasem 0.25 g/L blong aktiv ingredien (100 kasem 250 ppm). Long sam test, oli draonem long taem moa, kasem 48 haoa, long wan solusen we i strong moa (500 ppm) mo hemia i givim ol beta risal. Be taem yu draonem longtaem moa yu mas tantanem oltaem blong oksijen i kasem solusen mo blong ol sids i no damej. Sapos yu gat wan fish tank aerator yu save yusum insted blong yu tantanem solusen long han.

I gat ol difren kapasiti blong sids storej blong sandelwud (eksampol:

S. austrocaledonicum blong Loyalty Islands hemi no save stap long storej long taem, be ol nara *S. austrocaledonicum* oli save stap long taem long storej olsem long Figa 3.2). Hemi gud blong soem *Santalum* sids taem hemi fres, from we mediom-term storej hemi save mekem sam sids i ko gud.

3.4 Priperem wan mediom

Kwaliti blong kroing mediom i save afektem bigwan kwaliti blong sandelwud sidling mo fasin blong muvum ol sidling long jemineisen trei i ko long wan polibak (poting). No tingting daon long impotens blong ol step ia. Gud kea mo gud praktis long neseri bae hemi prodium ol strong sandelwud plant long fil blong fulap yia.

3.4.1 Ol komponen blong wan kroing mediom

Wan gudfala poting mediom i mas gat evri gudfala propeti blong gudfala kru long wan smol amaon. Mekem se poting mediom bae hemi lelebet difren long kraon blong karen (Figa 3.8). Ol 3 men komponen blong sidling i kro:

1. gud kwaliti loamy topsoel
 - i saplaem ol impoten nutrien blong sidling i kro
 - i help blong holem taet wota
2. Ol drenej patikol
 - i kam long ol bigfala samting long miks blong kraon olsem sanbij
 - i alaoem mediom blong drenemaot wota afta long ren o afta man i wotarem plant
 - i letem moa ea i kam insaed long mediom, mekem ol rus oli pulum win mo oli no fulap long wota tumas
3. Okanik mata
 - i kam long **ol gudfala kompos**– skin blong kokonas, skin blong raes, ol doti blong karen, kakao mo kofi, sodas, ol hafhaf wud, mo ol samting olsem...
 - i help blong holem taet wota
 - i gat ol helti smolsmol bebet (blong stopem ol sik long kraon)
 - i help blong holem taet ol nutrien

Ol kraon blong poting mediom



No yusum ol hevi klei kraon blong poting mediom



Yu save yusum laet klei kraon blong mediom sapos yu ademap sanbij mo okanik mata



Yu save yusum loamy kraon wetaot sanbij, be ademap okanik mata

Figa 3.8 Yus blong ol difren kraon long poting mediom

Ol sandelwud sidling oli kro gud long wan miks blong kraon we i givim gudfala drenej we i gat:

- 2 pat gudfala topsoel (ol nutrien)
- 1 pat sanbij (ol drenej patikol)
- 1 pat skin blong kokonas (okanik mata).

3.4.2 Sanbij

Yu save karem sanbij long klin freswota riva o spring. Sanbij i wan impoten komponen blong promotem drenej long poting mediom.

I gat ol difren krein saes blong sanbij:

- faen (smol krein)
- mediom (krein i bigwan lelebet moa)
- rafwan (bigfala krein).

I no rili gud blong yusum sanbij blong solwota. Sapos hemi onli ples we yu save karem sanbij, meksua blong wasem gud long freswota bifo yu yusum.

3.4.3 Sterelaesem kraon mo sanbij

Topsoel (kraon antap) hemi gat ol pest mo ol disis (sik), speseli taem mediom hemi nogat gudfala drenej. Sapos i posibol, karem topsoel long ol ples we yu save se i nogat disis. Sapos yu no sua, i nid blong hotemap topsoel mo sanbij blong sterelaesem mo kilim ol pest mo disis wetem ol sids blong ol wid. Sterelaesesen i save tekem ples insaed long wan aean dram we oli katem long haf wetem wan smol faea (Fika 3.9). Tanem kraon mo sanbij blong gat gudfala distribusen long hot blong faea ova long 1 haoa. Yu save putum kraon long blak plastik tu mo leko long san blong sterelaesem (luk seksen 3.8.1)



Figa 3.9 Sterelaesesen blong kraon insaed long ol aean dram

Foto blong David Spencer

3.4.4 Okanik mata

Putum evri okanik matai a long wan kompost bifo yu yusum. Long proses blong compost bai i brekem daon ol fres okanik mata mo rilisim ol nutrien we i impruvum strakja blong okanik mata. Proses blong kompost ia i min se oli hipimap ol okanik materiel, tanem mo wet sam taem (wik ko kasem manis) blong hemi brekem daon. Ol gudfala okanik mata i gat ol sodas, sel blong kakao, skin blong kokonas, skin blong raes, doti blong kofi, skin pinat, kras we oli katem, ol lif, doti blong vejtabol, sisit blong animol, olsem. Yu save yusum ol skin blong kokonas we yu rasrasem mo yusum raet awei, i no nid blong mekem kompost fastaem (Figa 3.10).



Figa 3.10 Yu save yusum ol skin blong kokonas we yu rasrasem mo yusum raet awei

3.4.5 Resio blong miksim ol okanik mata

Ol difren komponen blong wan kraon mediom i mas miks gud bifo yu yusum. Ol resio blong kraon, sanbij mo okanik mata hemi difren blong meksua se i gat gud-kwaliti miks we wota i save ronaot long hem, folem ol propeti blong kraon mo sanbij (Figa 3.11).

Resio ajasmen blong miks

Kraon, sanbij mo okanik mata i mas miks gud bifo yu yusum. Yu save ajastem ol resio blong miks folem ol propeti blong kraon mo sanbij

- Sapos yu yusum hevi kraon, adap moa sanbij
- Sapos sanbij i raf, putum inaf nomo (i no tumas)
- Sapos kraon i gat sanbij long hem i no nid blong adap moa sanbij, be adap moa okanik mata



Figa 3.11 Ol resio blong miksim kraon, sanbij mo okanik mata

Long Timor-Leste, taem i gat ol gud-kwaliti topsoel, oli yusum hemia nomo, oli nomo folem resio blong miks. Be hemi impoten se hemi 'gud-kwaliti', mo i gat ol propeti we oli diskraebem antap, mo hemi sterelaes.

3.5 Kroem sidling

Ol sidling oli redi nomo blong transplantem i ko long polibak taem we oli gat tu lif i kamaot finis (Figa 3.12).

Kroem sidling

Ol sandelwud sidling oli redi blong transplantem aot long ol jemineisen trei i ko long ol pot taem we oli kasem stej we I kat 2-5 set blong ol lif. Insaed long ol jemineisen trei (50 mm), sidling oli mas transplantem i ko long ol polibak long stej blong namba tri lif o bifo long hem, from afta long hem bae ol rus oli fasfas long andanit long trei. Long ol jemineisen trei we oli moa dip (>50 mm), yu save transplantem ol sidling we i ko kasem stej blong faev lif wetaot damej long ol rus.

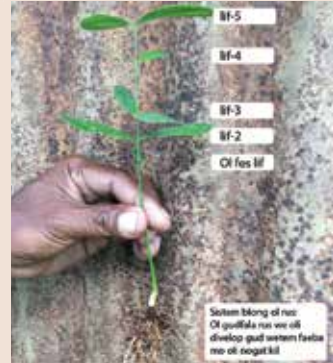
Long samfala neseri, oli potem evri sidling insaed long jemineisen trei folem ol toktok ia antap. I minim se samtaem ol sidling oli gat 1-2 lif nomo. Hemi impoten se ol sidling oli sotemaot folem ol saes blong olgeta. Afta long poting blong ol smol sidling bae oli nidim moa taem andanit long 50% shed (olsem we oli diskraebem andanit).

Ol sidling we oli leko long jemineisen trei longtaem tumas bae oli gat kil long sistem blong rus blong olgeta (ol red sekel) mo smol nutrien tumas o i no aktif. Ol sidling ia bae oli no save kro i kam ol strong plant, mo i moa gud blong karemaot olgeta i go long pot. Long saed blong sandelwud, ol kaen sidling ia fulap taem oli neva prodiusum wan gudfala komesiol tri mo fama bae i no save mekem mane long hem.

Sam sidling long jemineisen trei bae oli no fit tumas, mo i nid blong karemaot bifo i ko long pot. Ol red sekel long pikja oli soem se ol sidling oli no fit oli sud karemaot long taem blong poting. Long saed blong sandelwud, ol kaen sidling ia fulap taem oli neva prodiusum wan gudfala komesiol tri mo fama bae i no save mekem mane long hem.

Yusum wan smol stik blong leftemap ol rus mo karemaot sidling long mediom. Lukaot blong no brekem o damejem sistem blong rus.

Fulumap polibak wetem kroing mediom kasem bitim hafwe 'two thirds' (2/3) o tri-kota ful. Speis long top blong polibak bae i mekem i posibol blong planem sidling. Mekem wan smol hol long poting mediom wetem finga blong mekem spes blong ol rus blong sidling I save kro long wan.



Putum sandelwud sidling long top pat blong polibak. Meksua se sistem blong rus i no lusum sep blong hem long eni wei. Hemi wan problem we i stap hapen fulap taem, taem ol rus i ben i ko antap o raon long stampa blong sidling, i mekem se i olsem wan leta J o i ko raonraon long plant. Ol sidling wetem ol sep olsem oli no kro gud long neseri o long fil afta we oli planem (mo i no mekem mane).



Fulumap speis we i stap long polibak wetem poting mediom kasem we yu kavremap ol sandelwud sidling mo sefes blong mediom hemi laenap wetem botom blong stampa blong sidling.



Sentarem sandelwud sidling long polibak mo prestem slo nomo poting mediom i ko daon wetem finga blong yu. Sapos no yu save pikimap polibak mo tapem slo nomo, holem beis blong hem wetem nara han blong yu blong mekem poting mediom i setel. Hemia bae i mekem se i nogat tumas speis blong ea insaed long poting mediom.



Fulumap eni spes we i stap long poting mediom. Notem se sidling ia i gat tu set blong tu lif nomo, mekem se bae i nid blong krupem wetem ol nara smol sidling mo i mas kro andanit long 50% shed blong 3-5 wik (luk Seksen 3 5 2 long saed blong hadenem ol sidling).



Prestem poting mediom bakegen slo nomo wetem ol finga blong yu raon long sandelwud sidling blong stopem eni bigfala speis blong ea.



Wotarem gud sandelwud sidling mo putumaot long neseri bed andanit long shed (andanit long wan haos neseri sapos ples hemi humid). Sapotem ol polibak blong oli no foldaon. I gud sapos neseri bed i gat drenej (olsem ol korel o smolston) blong letem wota i ronaot long polibak mo i dreneaot, olsem bae i no fulumap polibak.



Fig 3.12 Kroem mo potem sidling

3.5.1 Planem pot host

Alternanthera (luk Seksen 6.4) hemi wan pot hos we oli mas planem wetem sandelwud afta we sandelwud i gat 4–6 lif. Figa 3.13 hemi soem gudfala ifek blong hem taem yumi planem pot host long stret taem. Sapos oli planem pot host ia hariap tumas bae hemi kro hariap mo i save kavremap smol sidling mo mekem se sidling i kro slo mo i save ded. Mo sapos oli planem pot host leit tumas, sandelwud bae i save kro slo tu.



Figa 3.13 Oli sandelwud sidling i stap soem ifekt blong planem pot host wetem. Long lef saed sidling we i nogat pot host i kro slo, be long raet saed sidling i gat pot host mo hemi kro kwik.

3.5.2 Hadening blong ol sidling

Taem ol sidling i gat 10–12 lif, oli mas muvum olgeta i ko long ples we i gat sanlaet blong mekem oli strong gud mo fit blong oli save ko long fil. Oli sud gat 50% shed long fes manis, 25% shed long namba tu manis mo ol narafala manis long ful sanlaet, bifo oli planem ol i ko long fil. Oli sidling we oli karemaot olgeta long shed mo transplantem olgeta i ko stret long ful sanlaet long fil, bae plante i no save kro.

Wan sidling i redi blong oli planem long fil sapos hemi soem tu (2) long ol saen ia (Figa 3.14): Sidling I stap kro gud, wetem ol niu shuds, mo I kat dak krin lif.

- Sidling hemi kro gud wetem ol niufala kru, mo i gat dak krin lif.
- Stampa blong sidling i strong lelebet finis (i jenj i ko braon).
- Sidling hemi tolfala i kasem 20–30 cm.
- Sidling i gat ol smol smol branj we i kro long ol joen blong lif mo mein stampa.
- Yu save luk sam smol rus tru long ol hol long andanit blong plastik.



Figa 3.14 Sidling i redi blong planem long fil

3.6 Reiseumap ol sidling we oli kro wael

Yu save kolektem ol sidling we i kro andanit long wan mama sandelwud tri mo planem long neseri o long narafala ples (ol sidling olsem oli kolektem ol waelding) (Figa 3.15). Hemia hemi wan simpol fasin blong setemap ol niufala plot blong sandelwud:

- Selekttem ol sandelwud tri we oli stap mekem frut o hemia we i stap karem plante frut oltaem.
- Klinim gud ples andanit long ol sandelwud tri we oli selektem.
- Jes bifo ol frut i redi blong foldaon, dikim kraon (abaot 5 cm) mo mekem i sopsop gud andanit long ples we oli klinim. Ol waelding oli save stat jemineit long kaen kraon olsem abaot 1–2 manis afta we ol frut i foldaon.
- Wotarem ples (andanit stampa blong sandelwud tri) long drae taem sapos i posibol o afta, taem we ol fes sidling oli kro.
- Lukaotem ples ia blong mekem se ol wid o rabis kras i no kro bakegen.
- Karemaot ol sidling taem longfala blong olgeta i kasem 10cm mo dikim andanit long sidling blong mekem se i nogat tumas rus i brokbrok.
- Transplanem ol sidling i ko stret long polibak o narafala ples olsem wan sandelwud plantesen.
- Wotarem gud ol sidling afta we oli transplanem.



Figa 3.15 Waelding we oli leftemap long kraon wetem kea (lef saed) mo waelding sidling we i redi blong transplantem (raet saed)

3.7 Neseri konstraksen

Wan forestri neseri hemi wan ples we oli reisem ol sidling long hem. I gat plante kaen neseri be hemia we i save prodiusum ol gud kwaliti sandelwud sidling hemi ol neseri we i gat gudfala sed, inaf sanlaet, fres wota kolosap, mo ol plant oli kro long miks blong kraon we wota i save ronaot long hem mo hemi fulap long nutrien (Fika 3.16).



Figa 3.16 Prodaksen blong sandelwud neseri long Timor-Leste (lef saed) mo smolholda sandelwud neseri long Papua Niugini (raet saed)

Ol pikja long Figa 3.17 i soem ol eksampol blong ol difren sandelwud neseri:

1. wan 'krin haos' we oli bildim long timba mo plastik we hemi gud long ol kolkol ples blong kipim ol sidling oli wom
2. wan bed blong sidling wetem lif kokonas olsem sed antap long wan timba freim
3. wan bed blong ol sidling wetem ol *Glyricidia* tri olsem shed
4. wan benj we oli mekem long timba blong ol sidling i staon antap long hem, mo hemi gat 50% krin net
5. wan bed blong sidling we i nogat shed; oli yusum hemia blong hadenem ol sidling bifo oli planem aot
6. wan bed blong ol sidling wetem 20% blong krin net long freim blong timba
7. oli reisem sidling long wan plastik (plastik) blong 1 kilo bak raes antap long wan bed we oli leftemap mo hemi stap andanit long wan najurol shed



Figa 3.17 Eksampol blong ol difren sandelwud neseri

3.8 Neseri Manejmen

Haejin o klinlines, priperesen blong kroing mediom, drenej, stret yus blong wota mo fetelaesa hemi ol narafala samting we i ko tugeta wetem gudfala manejmen blong 'pot host' mo hadening blong ol sidling blong givim ol gudfala risal.

3.8.1 Haejin

Gudfala haejin long wan neseri hemi save mekem sua se neseri i save prodiusum ol helti sidling. Blong mekem se ol sidling i no kasem sik mo stap helti oltaem, mek sua se i nogat ol branj we oli katem, ol ded lif mo ol ded sidling long neseri from olgeta nao oli save pasem sik i ko long ol sidling. Fankes mo bakteria we plante taem man i no save luk i stap kosem plante sik insaed long wan neseri. Oli save 'sterelaesem' kraon blong stopem janis blong sik i pas tru long kraon (luk Seksen 3.4.3). Oli save sterelaesem mediom long wan wei we oli mekem olsem sanwij insaed long ol blak plastik mo livim i stap long san blong hotem wan ful dei, o oli save putum insaed long aean dram mo kukum long faea.



Fig 3.18 Sterelaesesen blong mediom wetem blak plastik long hot blong san (lef saed) mo long faea long aean dram (raet saed)

Foto (lef saed) blong Ken Robson

3.8.2 Drenej

Kraon we i gat pua drenej i save mekem se wota i no save ronaot gud speseli long sisen blong ren. Tumas wota long kraon hemi wan mein samting we i kosem ded blong plante sidling long neseri. I mekem se hemi impoten blong ademap sanbij mo miksim wetem kraon blong impruvum drenej blong mekem mediom hemi letem wota i ronaot, mo putum ol polibak long wan ples we i drenemaot gud wota.

3.8.3 Wotarem

Mos impoten samting we i save afektem helt mo laef blong neseri sidling hemi kwaliti blong wota we i avelabol long ol polibak (poting mediom).

Sidling hemi nidim wota plante taem.

Hamas taem yu wotarem sidling bae i dipen long:

- kondisen blong weta (hot mo ren)
- level blong sanlaet (blong givim shed)
- saes blong sidling.

I moa gud blong wotarem ol sidling long ful san long drae sisen wan o tu taem long wan dei, be long wet sisen, haedem long ren sapos i nid blong mekem.

3.8.4 Fetelaesa

Krot blong wan sidling hemi save impruv wetem fetael soel. Wan topsoel we i save brokbrok gud mo i rij long okanik mata bae hemi gat moa nutrien bitim wan kraon we i gat sanbij o hevi klei wetem smol okanik mata nomo. Blong ademap ol nara nutrien long kraon yu save yusum ol daelut solusen blong wom fetelaesa, ol kompos okanik mata, o ol komesiol likwid mo slorilis fetelaesa.



4 Setemap wan plantesen

4.1 Seleksen blong saet (ples)

Hemia ol gudfala saet blong setemap ol niu sandelwud plantesen we i stret blong kwik developmen blong natora blong sandelwud:

- wan ples long saed blong hil
- gat kraon blong volkenu we i stap antap long korel laemston
- i risivim gudfala sanlaet (i no dak bus)
- stap long kraon we i gat gudfala drenej (i.e. kaen kraon we i no holem wota blong long taem)
- i fri long ol kaen sik olsem fankes *Phellinus noxius* (luk Seksen 8.1)
- i gat wan drae sisen long taem blong ol manis blong kolkol.

Bes kro blong sandelwud hemi tek ples long ol sed saed blong dak bus (Figa 4.1) wetem ol kaen ples olsem long poen ia antap, from ol rus blong ol difren host spisis oli sebet i ko olbaot insaed long kraon. Sandelwud hemi wan hae-valiu spisis, yu save planem raon long vilij o iven long yad long taon, be hemi impoten blong planem inaf nomo we ol host bae i save sapotem olgeta.



Figa 4.1 *S. yasi* planting long 'Eua, Tonga (lef saed) mo *S. yasi* plantesen long Tutu, Taveuni, Fiji (raet saed)
Ol foto blong Lex Thomson



Figa 4.2 Sandelwud long wan kroping eria long Papua Niugini (lef saed) mo wan miks kava karen long Vanuatu (raet saed)

4.2 Saet priperesen

Sandelwud i kro gud taem oli planem long semtaem we oli mekem niufala karen. Oli save selektem wan ples blong kliarem mo livim sam tri i stap olsem ol gud host tri (luk Japta 6). Hemi impoten blong bonem gud ol stampa blong ol tri we oli katem blong mekem se oli no kam sos blong sik Phellinus (luk Seksen 8.1).

Ol sandelwud sidling oli save kro gud taem oli planem olgeta long taem blong mekem karen. Ol taem blong mekem karen i difren long ol difren aelan truaot long Pasifik be plante taem hemi stap long stat blong sisen blong ren. Taem ia i alaoem sandelwud blong putum rus sistem blong hem long kraon bifo drae sisen i stat. Bae sandelwud i kro slo long fes drae sisen, mo sapos i gat sam drae yia bae hemi nidim ekstra wota. Stat long seken ren sisen bae hemi kro hariap.

Mein kos blong ol wud o tri blong plantesen oli ded, hemi from oli no kontrolem gud ol wid long ol fesfala yia taem plantesen i stat. Bambae i no save gat tumas wok blong kontrolem ol wid sapos man i selektem wan ples we hemi nogat tumas wid long hem blong statem plantesen. Ol ples we i gat plante wid long hem bambae i nid blong mas widim evri wik.

Wok blong kontrolem ol wid bambae hemi no had tumas sapos man i planem sandelwud long wan ples blong niufala karen. Hemia from taem oli widim karen semtaem tu oli klinim sandelwud long ol eli stej blong hem, sandelwud hemi kro gud moa long ol niufala karen bitim long ol olfala karen, from long ol olfala karen plante gudfala kakae blong kraon i lus finis. Sandelwud i save benefit tu long fetelaesa taem oli putum long ol fes yia blong setemap plantesen. Olsem wan kaed, oli save yusum Nitrophoska® Spesial (o wan kaen semak okanik fetelaesa) long 25–50g taem sandelwud i kasem 6 manis, long 50–100g taem hemi kasem 12 manis, mo long 200g taem tri i kasem 2 yia, 3 yia mo 4 yia. Taem oli yusum fetelaesa ia, putum nomo raonem stampa blong wud be no mekem i tajem stampa blong hem.

4.3 Leiaot blong planting mo tri speising

Speis bitwin wan sandelwud mo host tri hemi impoten blong mekem se ol tri oli kro gud kasem taem we oli redi (Figa 4.3). Disaen blong plantesen bae hemi dipen long ol host spisis mo habit blong olgeta. Jois blong host spisis (luk Japta 6) hemi dipen long avelabiliti blong host mo hao i save adapt long ples we yu wantem setemap plantesen. Yu save yusum ol difren kaen setap long stael blong skwea (grid), bae i dipen long ol lokol kondisen (kraon, klaemet, speis etc.), mo avelabiliti blong ol spisis mo objektiv blong fama.

Speising blong ol sandelwud tri hemi 3 m x 6 m o 4 m x 5 m - i sud inaf spes blong evri plant (Figa 4.4). Kru blong sandelwud i save slodaon taem we i gat tumas long wan smol spes (olsem sapos speising hemi smol bitim 3m x 4m). Bae sandelwud i save kro gud long ol fes yia, be afta 3-4 yia bae hemi nomo kro gud from ol tri oli kompit from wota long kraon, ol nutrien mo laet.



Figa 4.3 *S. album* plantesen long saot kos blong Timor-Leste (lef saed) mo *S. lanceolatum* Quintis plantesen long Kwinslan, Ostrelia (raet saed).

Foto long lef saed hemi blong Luis Almeida; foto long raet saed hemi blong David Lee



Figa 4.4 Bigfala speising long wan bigfala komesiol plantesen

Long wan speising blong 4 m × 5 m, putum ol sandelwud tri long wan spes blong 4m long ij laen wetem wan long-term host evri 16m, mo wan speising blong 5m bitwin ij laen (oli kolem inter-row). Wan 5-m inter-row speising bae i givim inaf speis blong trak i save pas blong manejem mo havestem ol sandelwud tri mo komesiol host tri. 5-m speising hemi letem krop i kro bitwin ol laen blong samples long 3-4 yia (Figa 4.5). Sapos ol krop i nid blong stap long taem moa, i moa gud blong mekem wan inter-row speising blong 6-8m.



Figa 4.5 Ol karen planting blong sandelwud wetem ol difren kaen host

4-m speising bitwin ij sandelwud tri i provaedem speis blong planting blong ol intamidiet host spisis bitwin ol sandelwud. Kaed ia i diskraebem 2 difren leiaot: (1) **Miks spisis laen**, mo (2) **altenet spisis laen**. Ol resio blong sandelwud mo host bae i dipen long ol kondisen blong ol saet mo ol host spisis we oli yusum. Wan resio blong sandelwud mo intamidiet host (*Sesbania*) hemi 1:1. Blong sandelwud mo long-term host, resio hemi stap bitwin 1:1 mo 2:1. Oli rekomendem 1:1 resio blong sandelwud mo long-term host blong ol tri we oli kro long wan saet we i gat wan o moa long olgeta ia: (1) Kraon we i no fetael mo i no dip, (2) stip hil, mo/o (3) drae sisen. Long ol saet we oli moa fetael wetem gudfala ren evri yia mo sot drae sisen, wan resio blong 2:1 blong sandelwud mo long-term host bae i save wok.

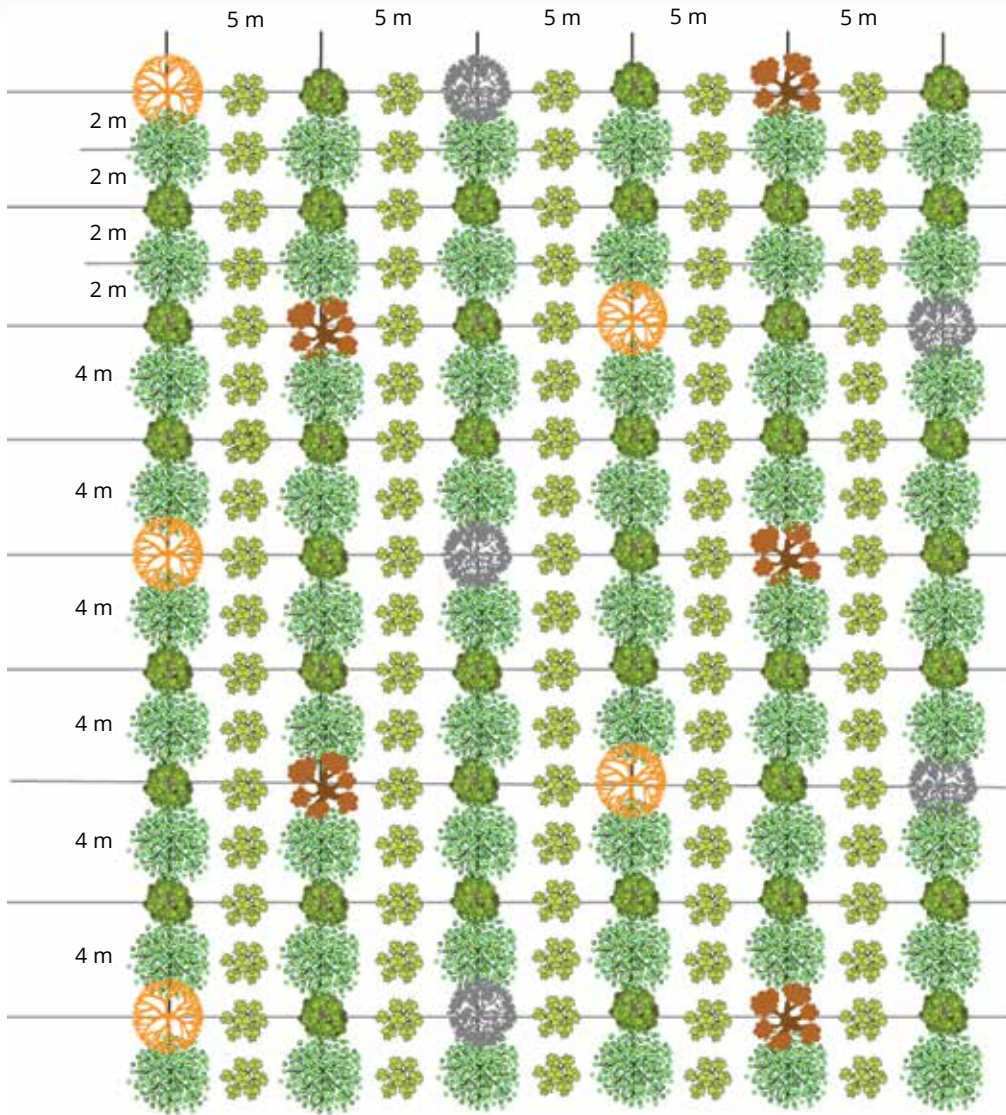
4.3.1 Miks spisis laen planting







Yu save yusum wan miks spisis laen leiaot blong inkrisim namba blong ol sandelwud tri, mo long semtaem mentenem gud akses long ol host tri we yu planem long saet. Leiaot ia i givim 13% moa sandelwud (375 tri) kompea wetem altenet spisis laen leiaot (333 tri) blong wan 4 m × 5 m skwea. Planem ol long-term host evri namba fo spes o 16 m, mo wokem ol laen blong mekem se ij sandelwud tri hemi 5 o 6 m nomo aot long wan long-term host (Figa 4.6).

4.3.2 Altenet spisis laen planting

Altenet spisis laen leiaot hemi wan moa simpol arenjmen, we i mekem manejen blong sandelwud mo ol host tu i moa gud. Long leiaot ia planem ol sandelwud tri mo ol long term host long ol individuol laen, we oli altenet long wan resio blong 2:1 sandelwud mo host (Figa 4.7). Planem ol intamidiet host spisis long evri laen bitwin sandelwud mo ol longterm host tri, bae i dipen long objektif blong fama. Yu save daonem stok blong intamidiet host sapos yu wantem inkrisim prodaksen blong ol plant. Yu mekem hemia taem yu katem daon namba blong ol intamidiet host insaed long ol laen o mekem ol intamidiet host oli stap wetem ol sandelwud laen nomo.

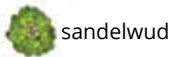
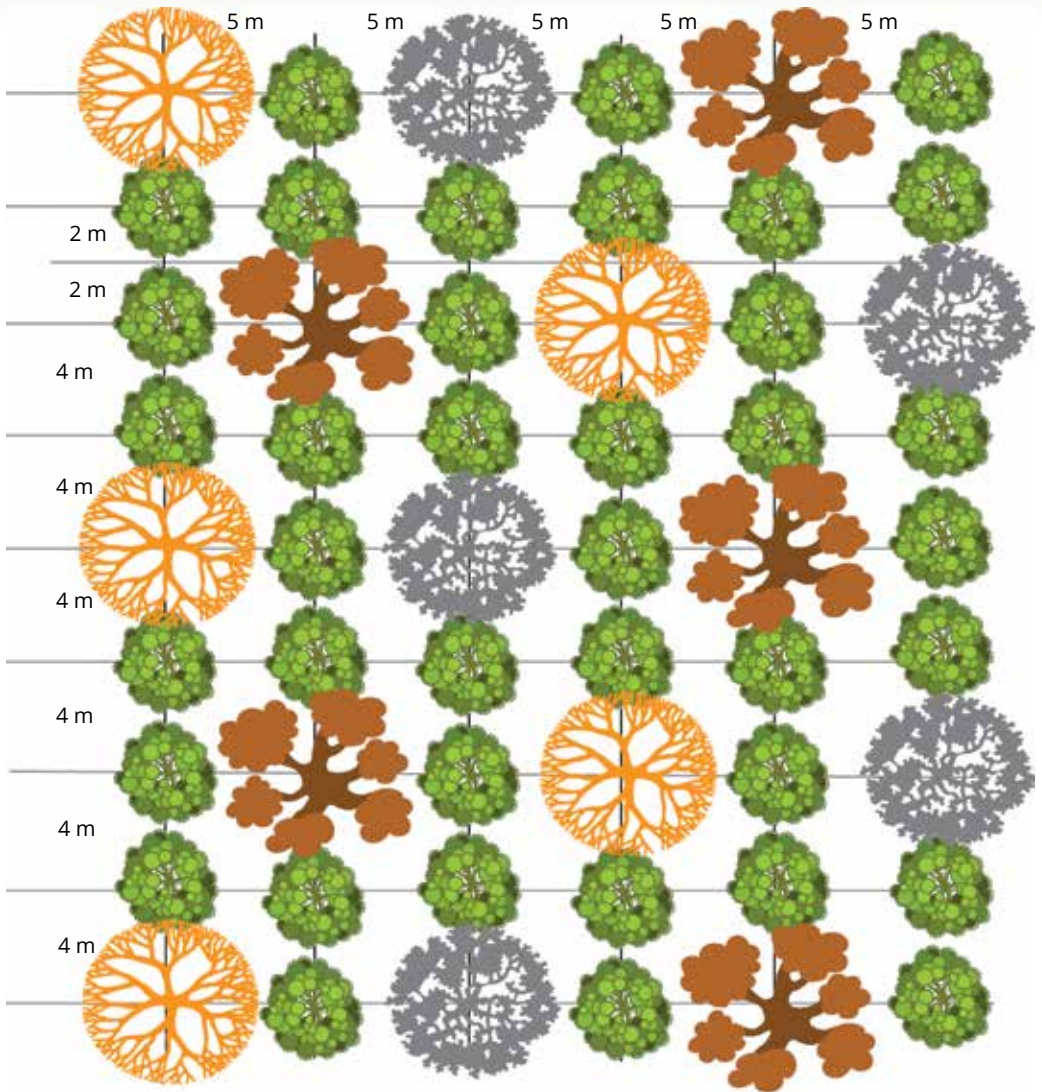
Namba blong ol intamediet host tri bae i dipen tu long saes blong host tri. Pijin pi (*Cajanus cajan*) i stap long evri spes bitwin ol sandelwud tri. Ol bigfala intamidiet host tri olsem korel tri (*Erythrina poeppigiana*), sesbania (*Sesbania grandiflora*) mo kasis (*Leucaena leucocephala*) yu save speisem bigwan moa – olsem evri namba tu o tri sandelwud tri. Be pinto pinat (*Arachis pintoii*) yu save planem long ful saet, mo taem yu manejen gud, hemi save kavremap fulwan ol kraon blong sapotem ol sandelwud tri mo semtaem daonem ol wid.



- Ki**
-  sandelwud
 -  Krop plant
(Pijin Pi, Lupins)
 -  Intamidiet host
(olsem Sesbania)
 -  Long-term host 1
 -  Long-term host 2
 -  Long-term host 3

- Stok**
- Total stok 2000/ha (2×2.5 m)
 - Sandelwud stok 375/ha
 - Intamidiet host stock 500/ha (4×5 m)
 - Long-term host stock 125/ha (16×5 m)
 - Krop stok 1000/ha (2×5 m)

Fig 4.6 Wan eksampol blong wan skwea leiaot blong wan sandelwud plantesen we i folem fasin blong miks spisis laen. Ol fes 5–10 yia (lef saed) mo 10+ yia (raet saed). Ol krop plant i save stap 3–4 yia mo ol intamidiet host 5–10 yia



Ki



Long-term host 1



Long-term host 2



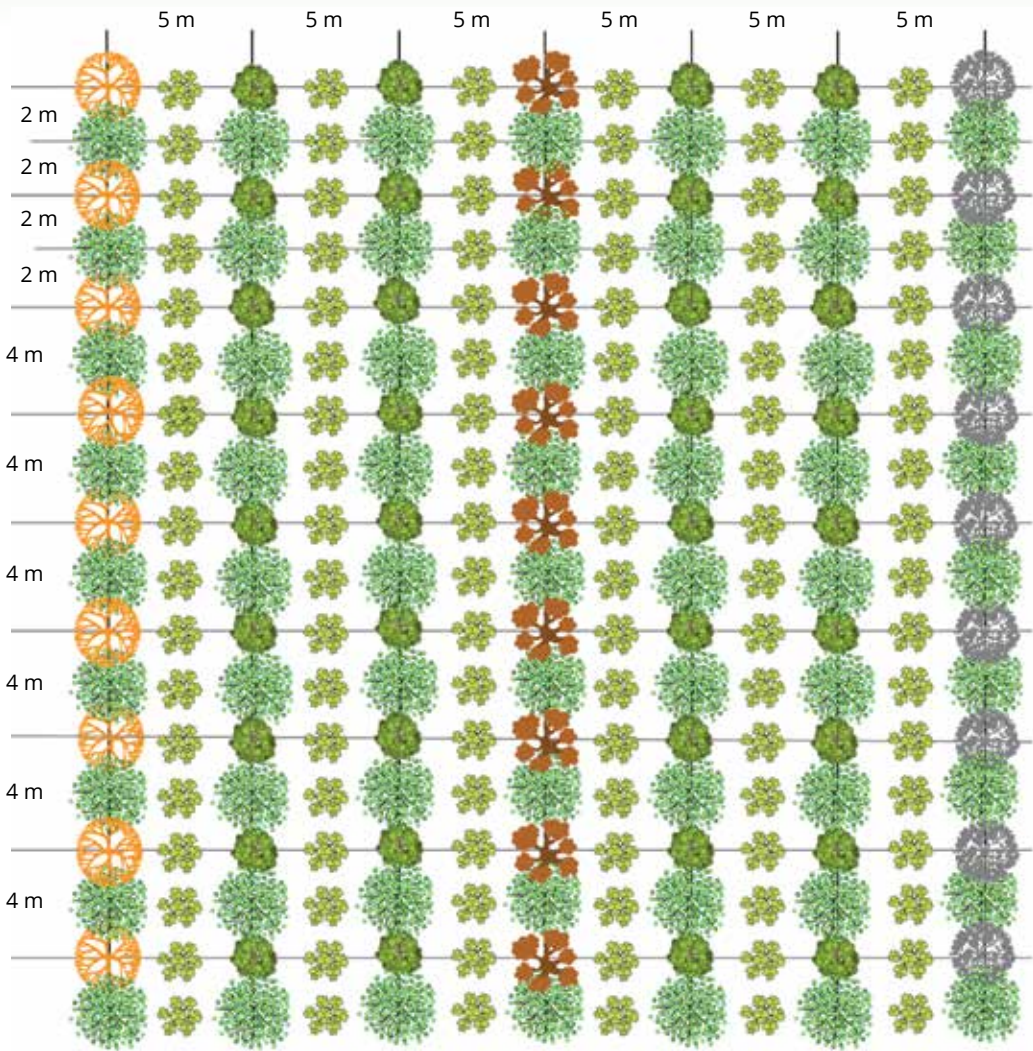
Long-term host 3

Stok

Total stocking 2000/ha (2 × 2.5 m)

Sandelwud stok 375/ha

Long-term host stok 125/ha (16 × 5 m)









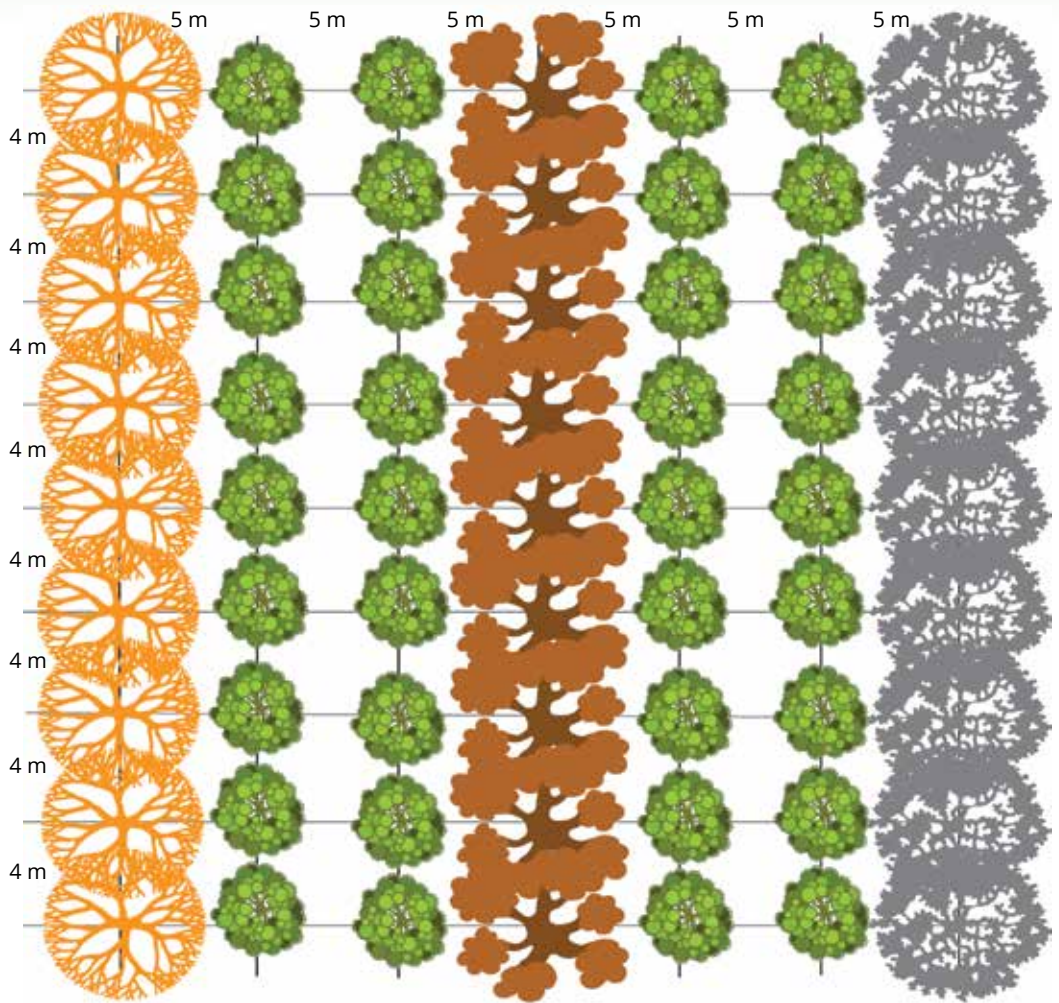




Ki		Stok
 sandelwud	 Long-term host 1	Total stok 2000/ha ($2 \times 2 \times 5$ m)
 Krop plant (Pijin pi, Lupins)	 Long-term host 2	sandelwud stok 333/ha
 Intamidiet host (olsem Sesbania)	 Long-term host 3	Intamidiet host stok 500/ha (4×5 m)
		Long-term host stok 167/ha (15×5 m)
		Krop stok 1000/ha (2×5 m)

Fig 4.7 Wan eksampol blong wan skwea leiaot blong wan sandelwud plantesen we i folem fasin blong altenet spisis laen. Ol fes 5–10 yia (lef saed) mo 10+ yia (raet saed). Ol krop plant i save stap 3–4 yia mo ol intamidiet host 5–10 yia.



 sandelwud

Ki

-  Long-term host 1
-  Long-term host 2
-  Long-term host 3

Stok

Total stok 500/ha ($2 \times 2 \times 5$ m)
 Sandelwud stok 333/ha
 Long-term host stok 167/ha (15×5 m)

4.4 Daerek siding

Man i save kasem gudfala risal sapos hemi planem sid blong sandelwud daerek long kraon o stret long plantesen. Nomata we hemi nidim plante wok long saed blong meintenens, ol sidling we oli planem stret long kraon oli save kro gud mo strong bitim hemia we i kamaot long neseri sapos oli manejem gud.

Man i mas manejem gud eria blong daerek siding semak olsem wan neseri sapos hemi wantem se plante sandelwud i laef:

- Kipim eria we oli planem wud long hem i klin oltaem.
- Wotarem ol sidling evri dei long taem we ples i hot, mo long drae taem.
- Provaedem shed long ol sidling. (eksampol: wan tri kolosap o wan frem wetem lif kokonas).
- Maet hemi wan gudfala tingting blong soem plante sid long ij ples blong meksua se i gat wan i jemineit. Sapos i gat plante i jeminet, i nogud blong kohed blong planem fulap samting long ples ia. Dikimaot ol sidling ia mo yusum long wan nara ples o putum long polibak wetem ol kroing mediom, olsem oli talem finis, blong yu save salem.

4.5 Planem ol sidling

Teknik blong planem sandelwud hemi save mekem se sandelwud i kro gud long eli stej o i ded. Hemi moa gud blong tekem taem blong planem gud wan sandelwud tri bitim hemia we oli planem hariap nomo. Nomoli ol smol sidling bae oli slak lelebet taem man i jas planem nomo, be blong mekem se oli no slak tumas mo kroem rus mo laef hariap, man i mas tekem kea blong planem folem stret fasin blong hem.

Planem ol sidling long wan fasin we i givim bes janis blong i laef

Planem nomo long kraon we i gat wota (moisja) long hem mo taem weta i no hot tumas

1. Digim hol



Digim hol i waed mo i dip smol moa nomo long polibag.



2. Katem polibag



Katem polibag wetem kea blong no distebem mo no brekem ol rus. *



3. Karemaot bag



Pikimap sidling mo karemaot polibag we yu katem sloslo.



4. Planem



Putum sidling long hol, no distebem ol rus.



5. Fulumap hol



Fulumap hol mo prestem graon i go insaed sloslo wetem han blong yu. Neva stanap long sidling wetem leg from bae yu brekem ol rus blong sidling.



6. Wotarem



Sapos graon long bag i brokbrok o ol rus oli disteb, i impoten blong wotarem sidling kwik taem blong mekem se hemi no stress tumas from transplant.



* Blong yusum sem polibak bakegen, folem ol step long Figa 4.9.

Figa 4.8 Fasin we oli rekomendem blong planem sidling

Planem ol sidling mo sevem polibak blong yusum bakegen

1. Mekem i wetwet



Mekem graon long polibak i wetwet.



2. Holem



Holem sidling apsaed daon mo holem top blong kraon long palm blong han blong yu.



3. Karemaot bag



Karemaot bak sloslo, no distebem kraon o rus.



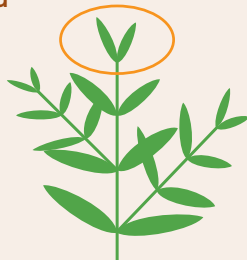
Kontiniu long steps 4 kasem 6 long Figa 4.8

Figa 4.9 Fasin blong planem sidling mo sevem polibak blong yusum bak

Fomatif pruning

1. Aedentifaem sentrol kru

Sentrol lida hemi mein medel kroing poen blong tri.



2. Aedentifaem kru we i kompit

Wan saed shut we i save kompit wetem sentrol lida i kro andanit long sentrol lida.



3. Rimuvum ol saed shut

Pinsim ol tip blong ol saed shut bitwin finka mo tamb blong brekem.



4. Smosmol tri we oli prunum

Tip blong sentrol (medel) lida we i kro hem wan nomo i stap.



5 Prunem ol smol tri

Kaving lok we hemi gat moa valiu bitim ol narafala prodak blong sandelwud hemi stap fom insaed long natora long stampa blong wan tri we i nogat branj. Tru long fasin blong katemaot ol branj long fes 3–4 yia long laef blong tri, wan fama i save promotem wan stampa nomo (we i nogat fok) blong sandelwud blong i kro stret mo impruvum ol janis blong tri ia blong fomem wan kaving lok. Natora blong sandelwud i develop stat long rus mo i kro i go antap folem stampa. Stampa we i gat fok bae i sloem daon developmen blong natora we i kro i ko antap long stampa. Amaon blong natora long tufala branj we i fok bae hemi smol bitim hemia we i gat sem saes be i stap long wan mein stampa nomo.

Be, i impoten blong andanstandem se pruning hemi nomo produktif blong tri we i nogat gudfala seip mo oli gat 3-4 yia. Long stej ia, eni pruning bae i save mekem moa damej. Long ol tri ia pruning i save spoelem kru blong tri.

Sapos i nogat eli pruning, fama i no save ekstendem laef blong ol tri blong mitim kwaliti blong kaving lok.

5.1 Fasin blong pinsimaot top

Fasin blong pinsimaot ol top long ol smolmol tri hemi wan gudfala wei from hemi karemaot smol lif nomo we tri i nidim blong mekem kakae blong hem. Hemia i stap hapen taem oli pinsim ol top we i kro long saedsaed mo leko hemia long medel nomo i stap.

Sapos man i pinsimaot top blong ol yangfala kru blong sandelwud evri taem i min se bae i gat smol (o i nogat) nid blong katemaot ol branj wetem sekata o bus naef.

5.2 Fom pruning

Plante taem wan tri we oli no bin katemaot sam branj blong wan yia o moa hemi gat nid blong mas katemaot sam branj blong mekem se tri i gat wan stampa nomo (Figa 5.2). Fom pruning hemi difren long fasin blong pinsimaot top pruning from se hemi nid blong yusum wan sekata o naef. Hemi impoten blong mekem wan klin kat stret antap long solda blong saed branj blong no mekem bigfala kil mo alaoem kil ia blong hil hariap. No leko ol longfala branj long ples we yu katem from bae i save letem sik blong hat-rot (hatwud i roten) i kam insaed long mein stampa. Fasin ia hemi wok gud long ol yangfala tri we i kasem 4 yia be i no wok gud tumas long ol olfala tri. Oli no sud katemaot ol branj blong ol olfala tri from fasin blong pruning o katemaot ol branj long wan ej olsem i save introdusum sik blong hatwud I roten.

Fig 5.1 (lef saed) Ol kaedlaen blong fom pruning

Fom pruning

1. Aedentifaem smolsmol tri we i gat fok

Selektem ol smolsmol tri wetem fok long mein stampa



2. Karemaot fok

Katemaot branj we yu no wantem wetem wan sap naef o sekata blong karemaot fok



Figa 5.2 Ol gaedlaen blong fom pruning

**3. Aedenitfaem ol nara gru
we oli faet wetem men gru**

Wan saed gru we bae i kompito o faet wetem mein gru hemi
stap gro andanit long men gru.



4. Rimuvum nara gru

Karemaot wan saed gru wetem sekata



5. Tri we oli prunum



5.3 Kanopi ridaksen pruning

Long ol eria we i stap gat ol strong saeklon, i gat benefit long pruning blong ol bigfala kanopi blong letem strong win i pas tru mo daonem risk blong win i spoelem tri. Eim blong pruning ia hemi blong daonem haet mo spred blong hed blong tri, mo karemaot ol branj we oli krosem olbaot mo tu ol ded wud. Bes wei blong mekem pruning ia hemi wetem wan longfala handel pol pruna mo lada. Lukaot gud long sefti taem we yu wok long ol haet antap.

Oli stap mekem kanopi ridaksen pruning long stat blong saeklon sisen (long leit Novemba), mo sapos i gat inaf woning mo i luk se i gat hae janis blong strong saeklon i pas, i gud blong mekem sam moa kanopi ridaksen (hemia hemi posibol nomo blong wan smolholda wetem smol namba blong sandelwud we i no bitim 50-100 tri)

5.4 Rimidiol pruning

I gat nid blong pruning o katemaot ol branj blong ol tri blong gat wan mein kru nomo, speseli sapos top blong sandelwud i bin brok long wan win, wan pijin i brekem, o wan branj i foldaon long hem. Pruning i save tekem ples stret afta we top blong kru we i brok i kro bakegen.

Fig 5.3 i soem plante kru we oli stap faet o kompit (ol yelo sekel) mo we oli kro aot long wan branj nomo afta we wan branj i bin foldaon mo brekem mein kru (orenj sekel). Oli katemaot ol kru ia we oli stap kompit wetem sekata mo livim wan mein kru nomo (blu sekel). Bae i nid blong prunem sam narafala branj tu taem we oli stat blong faet wetem mein kru.

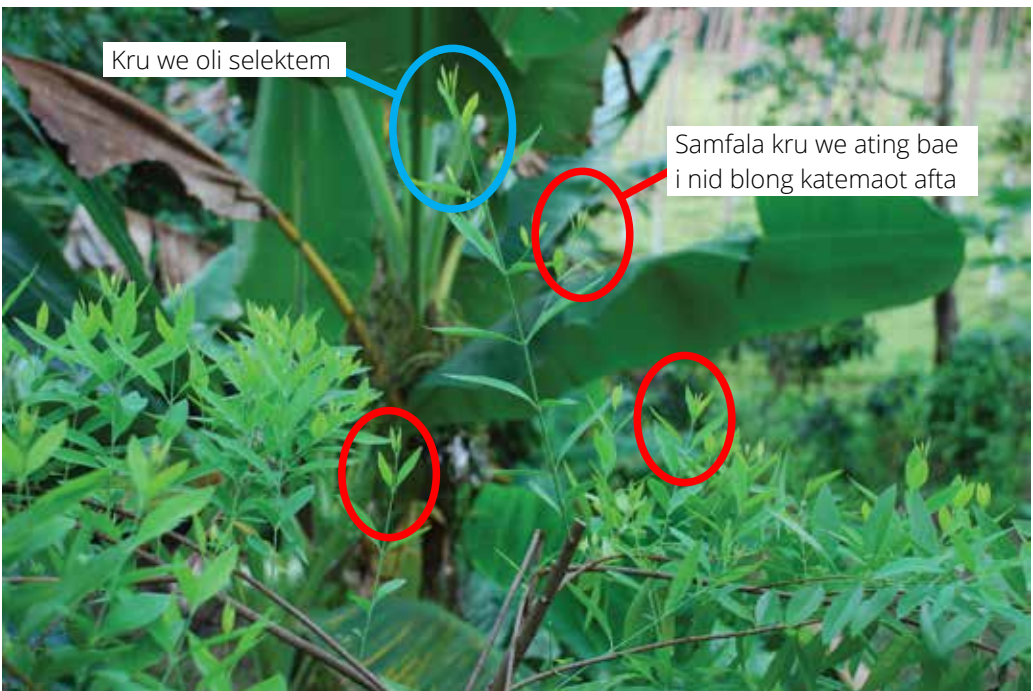


Fig 5.3 Ol kaedlaen blong rimidiol pruning

5.5 Pruning long stret fasin

Wan sandelwud tri we oli prunem folem stret fasin hemi gat:

- wan stampa mo wan kru nomo antap
- ol lif we oli spredaot mo kavremap samples 2/3 blong haet blong ol tri, i provaedem wan gudfala eria blong ol tri oli mekem kakaie blong olgeta blong mekem se oli kro strong
- wan sep blong tri we i bigwan long stampa mo i smol i ko antap long top blong hem blong provaedem gudfala balens.



5.6 Pruning we i no stret

Eksampol blong wan sandelwud tri we c no bin katemaot ol branj blong hem lon wan stret fasin hemi gat:

- wan sep we i nogud—long ples ia hemi olsem wan 'lolilop' from se oli bi katemaot tumas branj we oli stap dac
- smol branj nomo—tri i no save meke inaf kakaie mekem se bae hemi no sa kro strong
- tumas branj long top blong tri bae i mekem se top blong tri i hevi mo bae no save stanap strong long taem blong strong win.



Fig 5.4 Eksampol blong stret pruning (top) mo pruning we i no stret (daon)





6 Ol host

6.1 Host silvikalja

Host spisis silvikalja hemi wan impoten samting blong sandelwud plantesen. Kru mo saes blong ol host spisis bae i afektem ol stret speising (distens bitwin sandelwud tri mo host spisis), arenjmen mo manejmen.

Resio, speising mo arenjmen blong ol host wetem sandelwud hemi eim blong:

- promotem haustorial koneksen bitwin ol hosts mo evri sandelwud
- inkrisim namba blong ol difren host spisis we i avelabel long sandelwud
- givim proteksen long hot mo san
- alaoem speis long sandelwud blong save tekemaot ol risos long kraon (wota mo ol nutrien)
- Leko sandelwud i kasem daerek sanlaet long sam pat blong dei.

Nomata se ol host oli impoten blong sandelwud i kro gud, sam spisis oli save kompit mo bitim sandelwud tri sapos oli fulap bitim wanem we oli diskraebem (long Seksen 4.3) o sapos yumi no jekem kru blong olgeta. Hemi impoten blong monitarem mo mekem adaptif manejmen (silvikalja) blong meksua se ol host spisis oli helpem mo oli no kompit mo kosem stres long ol sandelwud tri.

Meksua se yu gat wan gud seleksen blong ol host wetem ol sot-term, mediom-term mo long-term host we oli impoten blong gudfala developmen blong sandelwud (Fika 6.1). Hemi impoten se developmen blong ol host i i stret wetem developmen blong ol sandelwud. Sapos host i slo tumas long developem blong hem, bae sandelwud tu i develop slo, mo hemi save tumas long host mo kosem stres, o iven kilim ded tugeta host mo sandelwud. Ol host we oli develop kwik taem tumas oli save tekova long sandelwud mo mekem se i no develop gud.

Host sivikalja hemi impoten be fulap taem yumi no lukluk long hem long saed blong sandelwud prodaksen. Prunem gud ol host sapos yu luk olsem se oli stat blong kro bitim sandelwud. Taem yu katemaot top blong hem i save help. Sapos yu luk se ol host oli strakel, yu save introdium ol niu host, be hemi no wok gud olsem we sapos yu mekem stret long stat (o 12 manis bifo yu plantem sandelwud long fil), wetem stret namba blong ol host long sandelwud plantesen blong yu. Ol bes host blong yusum sapos yu nid blong ademap sam moa hemi pijin pi tru long daerek siding, *Alternanthera dentata* mo pinto pinat wetem ol kating, peipa malberi (*Broussonetia papyrifera*) mo sam bigfala pemanen host, speseli olgeta we oli save kroem ol niu shut olsem *Acacia leptocarpa* mo sam *Casuarina* spp.

Figa 6.1 (ol foto long narasaed pej) Ol altenet laen wetem gudfala speising (5m × 5m) blong host (*Cassia fistula*) mo sandelwud (*S. macgregorii*) long Papua Niugini (antap). Sandelwud (*S. austrocaledonicum*) we oli planem wetem Calliandra we hemi altenet insaed long ij laen long Vanuatu (daon).

6.2 Ol kaen host

Ol plant we oli fomem haustoria wetem sandelwud (luk Seksen 2.2) oli kolem ol host. Sandelwud hemi fomem haustoria wetem fulap difren spisis, be sam spisis (speseli ol lekium) oli sapotem ol gudfala kru moa wetem gudfala laef long sandelwud. I gat 3 mein kaen host we oli yusum blong kroem sandelwud:

1. **Pot hos** – wan kaen kras we i kro daon nomo mo i spred isi we oli planem long polibak afta we sidling i gat 4–6 lif. Meintenem saes blong pot host wetem pruning blong meksua se i no tekova long sandelwud. Hemi save stap long fil fiu manis afta we oli planem.
2. **Intamidiet host** – Wan smol lekium tri we laef blong hem i sot nomo (sam ples long 5 yia). Hemi putum kas naetrojen i kobak long kraon mo oli planem klosap (1-2 m) long sandelwud. Intamidiet host i sapotem eli kru blong sandelwud. Distens we oli planem long sandelwud bae i dipen long saes blong hem. Samtaem bae i nidim pruning blong meksua se i no tekova long sandelwud.
3. **Long-term host** – wan bigfala tri we i stap olsem host blong ful laef blong sandelwud. Oli no planem bigfala namba long plantesen mo distens blong hem long sandelwud hemi 3 m i ko antap (i save ko kasem 8 m). Olsem intamidiet host, i nidim moa bigfala speising sapos host tri hemi moa bigwan.

6.3 Ol stret host blong wanwan spisis

Oli yusum ol difren sandelwud host long ol difren jeokrafik eria wetem ol difren spisis blong sandelwud, blong promotem bes kru mo laef blong ol sandelwud planting (Tebol 6.1).

Tebol 6.1 Ol sandelwud spisis mo ol stret host long ol difren kaontri

	<i>Santalum album</i>	<i>Santalum austro-caledonicum</i>	<i>Santalum lanceolatum</i>	<i>Santalum macgregorii</i>	<i>Santalum yasi</i>	Risk blong wid
<i>Alternanthera nana</i>	Timor-Leste	Vanuatu	Aust	PNG	Fiji & Tonga	
<i>Alternanthera dentata</i>					Fiji	
Sims' wattle <i>Acacia simsii</i>			Aust	PNG		
Pinto peanut <i>Arachis pintoi</i>		Vanuatu	Aust		Fiji & Tonga	
Paper mulberry/hiapo <i>Broussonetia papyrifera</i>					Tonga	
Pijin pi <i>Cajanus cajan</i>	Timor-Leste	Vanuatu		PNG	Fiji & Tonga	
<i>Calliandra calothyrsus</i> & <i>C. suranamensis</i>	Timor-Leste		Aust	PNG	Fiji & Tonga	
Korel tri <i>Erythrina poeppigiana</i>		Vanuatu (intermediate to long-term host)				
<i>Sesbania grandiflora</i>	Timor-Leste	Vanuatu		PNG		
Ijipsen pi <i>Sesbania sesban</i>			Aust	PNG		
<i>Acacia auriculiformis</i>			Aust	PNG		
<i>Acacia crassicaarpa</i>			Aust	PNG		
<i>Acacia leptocarpa</i>				PNG	Fiji	
<i>Acacia leucophloea</i>	Timor-Leste					
Qumu <i>Acacia richii</i>					Fiji	
Namariu <i>Acacia spirorbis</i>		Vanuatu				
<i>Waet siris</i> <i>Albizia procera</i>	Timor-Leste			PNG	Fiji	wid risk
<i>Pink shawa</i> <i>Cassia javanica</i>	Timor-Leste			PNG		
Golden ren tri <i>Cassia fistula</i>	Timor-Leste			PNG		wid risk
Bij she-ok/nokonoko <i>Casuarina equisetifolia</i>	Timor-Leste	Vanuatu		PNG	Fiji & Tonga	
<i>Citrus</i> species, esp. <i>C. maxima</i> , <i>C. reticulata</i> , <i>C. x taitensis</i>		Vanuatu		PNG	Fiji & Tonga	
Poumuli/namamau <i>Flueggea flexuosa</i>	Samoa	Vanuatu			Fiji	
<i>Leucaena leucocephala</i>	Timor-Leste					Hae wid risk. Oli yusum blong fidim buluk.
<i>Pterocarpus indicus</i>	Timor-Leste	Vanuatu				
<i>Tamarin</i> <i>Tamarindus indica</i>	Timor-Leste					

6.4 Pot host

6.4.1 *Alternanthera* (*Alternanthera nana* mo *Alternanthera dentata*)



Fika 6.2 Eksampol blong ol kaen blong alternanthera (laen antap) mo alternanthera olsem wan pot (laen daon)

Oli yusum alternanthera olsem wan fes host blong sandelwud long neseri. Hemi wan plant blong flasem ples mo i gat fulap kaen (Figa 6.2). Taem we oli planem alternanthera long polibak, kru blong sandelwud i moa strong bitim we sapos yumi planem sidling we i nogat alternanthera. Be, yumi mas meksua se yumi prunem host oltaem; sapos no bae alternanthera i save tekova long sandelwud mo i kilim. Taem ples i wetwet, stampa blong alternanthera i save fas long sandelwud mo mekem i rotem mo ded.

6.5 Ol intamidiet host

6.5.1 Sims' wattle (*Acacia simsii*)



Fig 6.3 Habit blong *A. simsii* (lef saed), ol flawa (antap long raet saed) mo frut (daon long raet saed)

Hemi wan akasia we i kro long Ostrelia mo Papua Niugini. Saes blong hem i smol (2-4 m), mo hemi wan host lekium we i laef sot taem nomo (Fig 6.3). Hemi spred tru long sid blong hem. Sid blong hem i gat wan had kot we i nid blong katem o porem hot wota (70–80 °C) ova long hem blong mekem i sopsop, mo draonem blong 24 haoa. Minimam speising blong hem i 1.5 m long ij sandelwud tri. Yu save mekem fom pruning o tining olsem sapos l gat i nid.

6.5.2 Pinto peanut (*Arachis pintoi*)



Fig 6.4 Ol flawa blong Italicise mo lif blong olgeta (lef saed) mo olsem wan host blong Italicise (raet saed)

Pinto pinat hemi wan smol plant we i kam long Brazil (Fig 6.4). Hemi save kasem 20-50 cm long haet mo hemi save kro gud blong kavremap kraon. Hemi wan gudfala intamidiet lekium hos from hemi save putum kas naetrojen i ko bak long kraon, hemi no stap kompit wetem sandelwud from sanlaet mo hemi save kilim daon ol wid. Hemi save kro long ol han blong hem we oli krol long kraon, mo hemi isi nomo blong pulumaot blong putum ol niu plant. Hemi tekem taem blong mekem i kro, be hemi gud long fulap kaen kraon, sanbij ko kasem klei sapos drenej blong olgeta i gud

6.5.3 *Peipa malberi* (*Broussonetia papyrifera*)



Figa 6.5 *B. papyrifera*: Oli woman flawa (lef saed), oli man flawa oli hang (medel) mo frut (raet saed)

Oli foto: long lef saed hemi blong Daderot, CC0 1.0; long senta hemi blong Didier Descouens, Fronton, France. 19 Epril 2014, CC BY-SA 4.0; long raet saed hemi blong Didier Descouens, Clermont-le-Fort, France. 7 Okis 2019, CC BY-SA 4.0.



Figa 6.6 *Peipa malberi* (long foret) we oli planem olsem host blong *S. yasi* (tofalala tri bihaen) long 'Eua, Tonga
Foto blong Lex Thomson

Peipa malberi hemi wan smol tri we i kamaot long Asia. Ol Lapita/Polynesian pipol oli karem i kam long ol Pasifik aelan. Hemi kro hariap mo i save kasem 6-10 m. Long Polynesia hemi no prodium ol sids from evri tri oli orijineli ol woman klon, mekem se hemi spred tru long ol niu rus o ol kating. Hemia i mekem se hemi no mekem problem tumas olsem wan wid. Be long sam nara Pasifik aelan olsem Hawai'i, Solomon Aelan mo Fiji, tugeta woman mo man plant i kro (Figa 6.5). Sapos we yu planem peipa malberi blong yusum skin blong hem, yu save planem long wan smol speising (eksampol: 1.5–2 m × 1.5–2 m), be sapos yu planem nomo olsem wan host mo yu wantem hemi kam wan bigfala pemanen host, planem long wan moa bigfala speising (eksampol: 6–8 m apat mo 2 m distens long sandelwud, i no ko klosap moa) (Fika 6.6).

6.5.4 Pijin pi (*Cajanus cajan*)



Figa 6.7 Ol flawa blong *C. cajan* (lef saed), fruit (medel) mo ol lif (raet saed)



Figa 6.8 Ol Pijin pi host plant (long foret mo raet saed blong foto)

Pijin pi hemi wan lekium tri we i laef blong smol taem nomo (3–5 yia) mo oli save planem ol sid blong hem daerek i ko long kraon (Figa 6.7). From we saes blong hem i smol nomo, oli save planem pijin pi kolosap (1–2 m) nomo long ol yang sandelwud sidling, from hemi no kro bigwan blong i save kompit wetem sandelwud. Hemi posibol blong planem pijin pi wetem evri sandelwud tri (nomata sapos speising blong sandelwud i smol) (Figa 6.8). Ol pod we i holem sid, ol lif mo ol flawa blong pijin pi oli nambawan kakae blong animol, mo ol sids oli gudfala kakae blong ol man.

6.5.5 Sesbania (*Sesbania grandiflora* mo *Sesbania ormosa*)



Figia 6.9 Ol flawa blong *S. grandiflora* (lef saed) mo habit (raet saed)



Figia 6.10 Sesbania hemi wan gudfala intamidiet host blong eni sandelwud spisis

Sesbania i kamaot long Ostrelia, Saot-Is Asia mo India. Hemi narafala lekium tri we i laef blong sot taem nomo mo hemi gat hae valiu olsem wan intamidiet hos. Hemi save kro bigwan lelebet moa long pijin pi. Hemi wan open tri we i kro hariap kasem 8-15 m tol wetem wan stampa blong 25-30 cm daeamita (Figia 6.9 mo 6.10). Hemi spred isi nomo tru long ol sids blong hem, mo hemi jemineit gud, i no nid blong katem. Hemi save spred tru long ol shut mo kating tu. Oli rekomendem blong planem tri ia olsem host blong lukaotem 2-3 sandelwud tri, mo bae i stap 2 m distens o moa long eni sandelwud tri, i no ko klosap moa. Yu save yusum fom pruning sapos yu wantem wan klin stampa blong timba prodaksen.

6.5.6 Ijipsien pi (*Sesbania sesban*)

Hemi kamaot long Not-Is Africa be i kam pat blong fulap kaontri we oli planem. Hemi wan smol tri we i kro hariap wetem wan sot laef, mo stampa blong hem i save kasem 1 kasem 8 m tol wetem wan top we i save spredaot taem i gat speis. Hemi spred tru long ol sids blong hem we i nidim tritmen olsem 'scarification' (sikrasem o yusum asid) o draonem long wota blong 80°C blong 8 minit (hot wota i save kilim ol sids sapos yu no monitarem gud). Oli rekomendem blong speisem mediom-saes host ia long minimam blong 3m distens long eni sandelwud tri. Yu save prunem ol branj blong hem, o yu save katem stampa blong hem daon o antap blong mekem kakae blong ol buluk. Hemi mekem fulap sids mo bae i kro isi nomo long ol kraon we oli wetwet mo nogat samting long hem, mekem se i gud blong kontrolem blong mekem se hemi no spred tumas.

6.6 Ol intamidiet kasem long-term host

6.6.1 Korel tri (*Erythrina poeppigiana*)

Oli save yusum korel tri olsem wan intamidiet host mo planem 1–2 m longwe long sandelwud tri be oli mas prunem oltaem. Oli save yusum olsem wan long-tem host mo planem 3–4 m longwe long stampa blong sandelwud. Korel tri hemi wan lekium we i kamaot long Saot Amerika mo i kro hariap mekem se i save putum plante kas naetrojen i ko bak long graon. Be i nid blong oli mas prunem blong meintenem saes blong hem mo blong i no kompit wetem mo no kro bitim sandelwud taem oli jas planem tufala. Ol branj mo lif we oli katemaot long taem blong pruning oli gudwan blong yusum blong kompost. Oli sud planem wan korel tri olsem host blong lukaotem 2–3 stampa blong sandelwud.



Figia 6.11 *E. poeppigiana* oli planem olsem host blong *S. austrocaledonicum*

6.6.2 Calliandra (*Calliandra calothyrsus* and *Calliandra surinamensis*)

Hemi kamaot long Meksiko, Sentrol Amerika mo Kolombia. Calliandra hemi wan smol tri we i kro hariap kasem 5-6 m wetem wan stampa daeamita kasem 20 cm (Figa 6.12 mo 6.13). Hemi spred tru long ol sids we i nidim blong draonem long hot o kol wota blong 24-48 haoa. Oli rekomendem blong mediom-saes host ia oli speisem 3 m o moa aot long sandelwud tri. Prunem ol branj oltaem mo yu save katem stampa mo yusum olsem kakae blong ol buluk mo prodaksen blong faeawud. Hemi kro isi nomo long kraon we i wetwet mo nogat samting long hem, mekem se i gud blong kontrolem blong mekem se hemi no spred tumas. I luk olsem sandelwud hemi kakae bigwan aot long *C. calothyrsus*, be i gat risk blong sandelwud i kilim calliandra (mo i semak wetem sitrus/aranis), mo afta hemi save kasem infesken long 'braon butt rot' (*Phellinus noxius*), we i save tanem raon mo kilim sandelwud. Blong fiksिम hemia i gud blong planem ol difren kaen host, i no calliandra nomo, mo meksua blong gat wan hae host-sandelwud resio. Sandelwud i no benefit semak long *C. surinamensis*, be hemi wan host we i moa strong, mo habit blong hem blong ol branj i kamaot long fasin blong 'semi-horizontal' i gud from hemi no tekova long sandelwud antap.



Figa 6.12 *C. calothyrsus*: habit (lef saed), ol flawa (medel) mo frut (raet saed)

Oi foto: (lef saed) Forest & Kim Starr, CC BY 4.0; (medel) Forest & Kim Starr, CC BY 3.0; (raet saed) Roger Culos CC BY-SA 4.0.



Figa 6.13 *C. surinamensis*: habit (lef saed), ol flawa (medel) mo frut (raet saed)

Oi foto: (lef saed) Katherine Wagner-Reiss, CC BY-SA 4.0; (medel) Scott Zona, CC BY 2.0; (raet saed) Philipp Weigell, CC BY 3.0.

6.7 Ol long-term host

6.7.1 Papuan wattle (*Acacia auriculiformis*)



Fig 6.14 *A. auriculiformis* habit long najurol envaeromen (lef saed), wan sid pod we i open (antap long raet saed), mo ol sid pod we oli kolektem wetem ol lif (daon long raet saed)

Noten o Papuan wattle (*A. auriculiformis*) hemi wan mediom-saes tri we i kro kasem 30m mo i laef gud long ol difren kaen kraon (Fig 6.14). Hemi gat wan bigfala kanopi we i spredaot, mo rus sistem blong hem tu i spredaot. Tri ia hemi wan gudfala host blong sandelwud, be from bigfala saes blong hem mo stong kru blong hem, bae yu mas lukluk gud long bigfala speising mo manejem kanopi blong hem. Hemi gud blong faeawud mo shed from hemi gat kanopi long ol drae taem. Planem long wan minimam blong 4–5 m aot long eni sandelwud tri mo planem hafwe bitwin ol namba tri mo namba fo sandelwud tri (olsem 16–20 m apat).

6.7.2 Salwud (*Acacia crassicarpa*)



Figa 6.15 *A. crassicarpa* long wael, long Keru, Papua Niugini (lef saed), ol flawa (antap long raet saed) mo ol sid pod (daon long raet saed)

Salwud (*A. crassicarpa*) hemi wan mediom-saes tri we i kro long wan maksimam haet blong 30 m (Figa 6.15). Stampa hemi stret mo nogat branj kasem sam ples long 13–18 m, mo hemi kro kasem 50–60 cm daeamita. Skin blong salwud i dak o krei-braon, mo i strong wetem ol dip vetikol laen; insaed skin i red mo i gat faeba long hem. Hemi save kro long ol difren kaen kraon – ol gudfala kraon kasem hemia we i no dren gud mo i asid. Top blong hem i gat fulap branj mo i spred long ol open envaeromen. I nid blong manejem kanopi blong hemi no tekova long sandelwud. Planem long wan minimam blong 4-5m aot long eni sandelwud tri, hafwe bitwin ol namba tri mo namba fo sandelwud tri (olsem 16–20 m apat)

6.7.3 Coast wattle (*Acacia leptocarpa*)



Fig 6.16 *A. leptocarpa* habit (lef) mo taem hemi flawa (raet)

Hemi kamaot long Ostrelia mo Papua Niugini, *A. leptocarpa* hemi wan smol bush (3–5 m) o smol tri we i save kasem 15 m, wetem wan daemita kasem 25 cm (Fig 6.16). Top blong hem i save kro bigwan o smol nomo mo i gat wan stampa nomo. Hemi kro long ol kraon we i fulap long ston o sanbij. Sids blong hem i gat strong kot we i nidim tritmen olsem kapsaedem hot wota (70–80 °C) long ol sids mo draonem blong 24 haoa. Sakem ol sids we oli flot (oli no fetael), planem ol sids we i swelap mo tritim bakegen eni sids we i stap yet. Bae i save gat nid blong fom pruning blong daonem spred blong top blong tri, mo yu save yusum ol pruning blong faeawud. Timba blong hem i gud long ol smol joineri wok blong flasem ples be hemi smol nomo from tri i smol. Planem wan minimam blong 2m aot long eni sandelwud tri, hafwe bitwin ij seken sandelwud tri (i.e. 12 m apat).

6.7.4 Ai-marō (Kemak name), waet-skin acacia (*Acacia leucophloea*)



Figa 6.17 *A. leucophloea* habit (antap long lef saed), oli katem top blong hem (antap long raet saed), skin (daon long lef saed) mo ol lif (daon long raet saed)

Wan bigfala tri we i spredaot, hemi kamaot long Is Asia mo Indian sabkontinen, *A. leucophloea* i save kro kasem 35 m hae mo daemeta long haet blong jes (DBH) i save kasem 100 cm (Figa 6.17). Samtaem ol sids oli no save kro gud. Hot wota tritmen i save impruvum jemineisen, be i stil save tekem 1–3 manis blong jemineit. Spisis ia hemi slo blong kro taem yu komperem wetem *Leucaena* (kasis) be hemi laef long taem moa. Yu save katem top blong hem blong fidim buluk mo blong mekem i no spred tumas. Be meksua se yu miksim lif blong hem wetem nara kakae bifo yu givim long buluk from hemi asid tumas. Wud blong hem i mekem naes timba we i save stap longtaem.

6.7.5 Qumu (*Acacia richii*)



Figa 6.18 *A. richii* pods

A. richii hemi kro long Fiji nomo (endemik). Hemi wan smol kasem mediom-saes tri (6–25 m) wetem wan laet kanopi. Olsem fulap akasias, ol sids i gat had kot (Figa 6.18) mo i nidim kaen tritmen olsem kapsaedem hot wota (70–80 °C) long sids mo draonem blong 24 haoa. Sakem ol sids we oli flot (oli no fetael), planem ol sids we i swelap mo tritim bakegen eni sids we i stap yet. Bae i save gat nid blong fom pruning blong daonem spred blong top blong tri. Wud blong hem i mekem hae-valiu timba. Planem long wan minimam speising blong 2m aot long eni sandelwud tri, hafwe bitwin evri seken sandelwud tri (ie. 12m apat).

6.7.6 Namariu (*Acacia spirorbis*)



Figa 6.19 *A. spirorbis* habit, Tanna, Vanuatu (lef) mo ol lif mo flawa (raet)

Namariu hemi wan nambawan hos spisis blong sandelwud, speseli long Vanuatu, mo hemi kro wael long evri aelan long Vanuatu wetem ol najorol populesen blong sandelwud. Long neja, ol ples we namariu i kro long hem i indiketem se sandelwud tu i save kro long ol ples ia. Namariu hemi wan bigfala tri (15–20m tol, 40–60cm daeamita) mo oli save planem mo havestem sandelwud tu taem bifo yu katem aot namariu blong yu (Figa 6.19). Man i save yusum wud blong namariu olsem pos blong haos o fanis sapos oli prunem mo meintenem gud stampa blong hem blong hemi kro stret. Sabspisis *spirorbis* i endemik long Vanuatu mo Niukaledoni, mo sabspisis *solandri* i endemik long Papua Niugini mo Ostrelia.

6.7.7 Waet siris (*Albizia procera*)



Fig 6.20 *A. procera* habit (mein foto) mo ol lif blong hem (insaed foto)

Hemi kamaot long Ostrelia, Saot-Is Asia mo India, *A. procera* i wan bigfala, drae-sisen 'deciduous' tri we i kro hariap wetem wan open kanopi. Hemi save kasem wan haet blong 30m wetem wan stret stampa kasem 9m bifo oli lif i branj aot, mo wan daemita blong 30–60cm (Fig 6.20). Hemi agresif mo save tekova long ol nara spisis. Ol fres sids i no nidim tritment. Ol sids we yu storem i rispon gud long tritment blong hot wota (70–80 °C) blong 5 seken, afta karemaot mo draonem long paep wota fulnaet. Daerek siding long kraon we yu priperem gud i moa saksesful bitim we yu transplantem aot long neseri, sapos we i gat wota long kraon ia mo yu widim oltaem. Planem long wan minimam distens blong 3m aot long eni sandelwud tri mo planem hafwe bitwin ol seken mo namba tri sandelwud tri (i.e. 12–18m apat). Mekem Fom pruning blong gat wan klin stampa blong timba prodaksen.

6.7.8 Golden shawa (*Cassia fistula*) mo pink shawa o Java cassia (*Cassia javanica*)



Figa 6.21 *C. fistula* habit (lef) mo ol flawa (raet)



Figa 6.22 *C. javanica* habit (left) mo ol flawa (raet)

C. fistula and *C. javanica* oli kamaot long Asia. Oli planem long fulap tropikol kaontri mo oli kam najurol long ol kaontri ia. Oli kro spid, long drae sisen, oli ol mediom-saes, 'deciduous/ semi-deciduous' tri we oli save kasem wan haet blong 25m (samtaem kasem 40m), mo oli gat wan top we i spredaot (Figa 6.21 mo 6.22). Ol sids oli jemineit long 7 kasem 30 dei. Oli rekomendem blong yusum ol bigfala, long-term hosts ia long wan speising blong 3 m minimam aot long eni sandelwud tri mo planem hafwe bitwin namba tum o nambatri sandelwud tri (i.e. 12–18m apat) blong mekem se oli no tekova long sandelwud tri leta on. Yusum fom pruning sapos yu wantem wan klin stampa blong timba prodaksen. Sapos yu katem long stampa bae hemi mekem fulap shut, mo sapos yu no kontrolem bae hemi kam olsem wan wid.

6.7.9 Bij shi-ok or nokonoko (*Casuarina equisetifolia*)



Figa 6.23 *C. equisetifolia* we oli planem (lef saed), ol woman flawa (antap long raet saed) mo ol kon blong wan woman tri (daon long raet saed)

Hemi kamaot long Pasifik, Saot-Is Asia mo Ostrelia. Oli yusum ok tri plante olsem wan host tri blong sandelwud. Hemi provaedem gudfala proteksen long sandelwud long taem blong strong win mo i no tekova long sandelwud. Ok tri i save kro hariap be i isi blong kontrolem wetem pruning blong smol branj nomo. Speising i mas at lis 15 m × 6m blong alawem inaf spes blong kru mo developmen blong sandelwud. Yu save yusum olsem faeawud ol stampa o ol branj we oli katem.

6.7.10 *Citrus* spp. (aranis, pamplemousse, laem o laman)



Figa 6.24 Mandarin host blong *S. yasi*, Vavau, Tonga (lef saed) mo mandarin host long *S. yasi*, Taveuni, Fiji (raet saed)

Ol difren kaen aranis o citrus spisis oli mein tri spisis we i no putum bak nitrogen long kraon be oli rekomendem olsem wan gudfala host tri blong sandelwud. Sapos i nogat inaf aranis tri wetem namba blong sandelwud tri, bambae ol sandelwud i save kilim ol aranis ia. Yus blong aranis olsem wan long-tem host tri hemi gud from se hemi save provaedem ekstra mane long saed blong ol frut blong hem taem we man i wet blong sandelwud i redi, be ol bes (moa strong) citrus host hemi ol wael citrus we i nogat tumas komesiol valiu, olsem ol raf lemon, pomelo mo wael mandarin.

6.7.11 Poumuli o namamau (*Flueggea flexuosa*)



Figa 6.25 *F. flexuosa* plantesen (lef), ol flawa (antap long raet saed) mo frut (daon long raet saed)



Figa 6.26 *F. flexuosa* we oli no mekem pruning (lef saed), wan klosap foto blong flawa (antap long raet saed) mo frut (daon long raet saed)

Flueggea hemi kamaot long Malesia blong Filipin ko kasem Solomon Aelan mo Vanuatu, mo oli introdium i ko long fulap nara Pasifik aelan. Sipsis ia hemi adapt blong kro long ol kraon we i daon nomo (i no long ol maonten), long humid tropikol klaemet, mo i kro gud long ol difren kaen kraon. Hemi wan smol kasem mediom-saes tri, we i ko kasem 10–15m tol, wetem wan DBH sam ples long 20–30cm (Figa 6.25 mo 6.26). Poumuli i spred wetem ol fres sids afta we oli karemaot skin long ol raep frut. Ol sids i no nidim eni tritmen bifo oli soem. Oli rekomendem se speising blong host ia i wan minimam blong 3m aot long sandelwud mo planem hafwe bitwin ol nambatu mo nambatri sandelwud tri (i.e. 12–18m apat) blong mekem se i no tekova long ol sandelwud tri leta on. Tri ia hemi gat gudfala stampa mo i prodium wan strong timba we oli laekem yusum blong konstraksen (olsem wan pos).

6.7.12 Kasis (*Leucaena leucocephala*)



Figa 6.27 *L. leucocephala* oli stanap (lef saed), Flawa (antap long raet saed) mo ol sid pod (daon long raet saed)

Kasis hemi wan smol tri 3-15m tol mo 10-35cm daeamita (Figa 6.27). Hemi wan gudfala host blong sandelwud speseli sapos yu yusum blong fidim buluk (katem mo karem). Ivendo Kasis i no wan plant blong Pasifik, hemi kro wael mo i gat plante bus blong hem olbaot long Vanuatu. Kasis hemi wan spisis we i save kompit—hemi kro plante mo hariap mekem se sandelwud i no save kro gud sapos oli no prunem mo widim aot ol smolsmol kru blong kasis. Long ol ples we kasis i kro, sandelwud tu i save kro long ol ples ia. Mas tekem kea blong hemi no kam wan wid.

6.7.13 Roswud o bluwota (*Pterocarpus indicus*)



Figia 6.28 *P. indicus* habit (lef saed), ol flawa (antap long raet saed) mo frut (daon long raet saed)

Sandelwud hemi kro najureli wetem bluwota mo ol fes risej i soem se bluwota tu hemi wan gudfala hos tri blong sandelwud. Bluwota hemi wan bigfala tri so speising blong 15 m x 6 m olsem hemi gud blong mekem se i no tekemap evri speis taem we tufala i stap kro i kam bigwan. Bluwota hemi wan gudfala wud blong timba mo sapos oli prunem gud bambae oli save katem timba long 2 laef-taem blong sandelwud.

6.7.14 Tamarind (*Tamarindus indica*)



Fig 6.29 *T. indica* habit (lef saed), ol flawa (antap long raet saed) mo frut (daon long raet saed)

Tamarind hemi wan evakrin (lif i krin ova long fulap sisen) lekium tri we i kro kasem 30 m long ol gudfala kondisen (Fig 6.29). From hemi kro slo, yu save planem tamarind wan yia bifo yu planem sandelwud. Spisis ia i adapt gud, i save kro long ol drae tropikol savana klaemet mo ol eria wetem hae renfol. Top blong hem i ol difren seip mo stampa blong hem i sot, hemi save stanap long ol strong win mo saeklon. Skin blong hem i dak krei mo i gat ol laen long hem. Ol lif oli smosmol mo fulap wetem 10-20 pea blong ol liflet we oli gat seip blong oblong. Ol longfala bin pod we oli tanem smol oli wan mak blong spisis ia, mo oli holem 1-12 sids. Wan swit-konkon stiki orenj mit i raonem ol sids. Oli stap yusum mit ia olsem wan flewa long ol jatni, kari mo ol nara kaen kakae



7 Ol wid

7.1 Impotens blong kontrolem wid

Evri niu sidling we oli jes planem i nidim wan eria we i nogat wid blong 1 m2 blong 3 yia o i bitim. Mos komon kos blong plantesen i brokdaon hemi taem i nogat inaf widening long taem blong setemap plantesen. I min se yu mas tingbaot leba blong kontrolem wid long eni niu planting blong sandelwud taem oli jes planem nomo kasem we oli gat 3 yia.

I gat 3 kaen wei blong kontrolem gud ol wid:

1. Pulum wetem han—hemi gud blong mekem long taem blong ren from i kipim kraon i wetwet mo i kolkol.
2. Long taem blong drae sisen, i gud blong brasem wetem busnaef blong mekem se stampa blong ol kras i stap nomo from i impoten blong kipim kraon i kolkol mo i wetwet lelebet oltaem. (Figa 7.1).
3. Man i save yusum ol kemikol blong kontrolem ol wid be hemia nomo se ol meresin ia oli sas lelebet blong ol lokol fama blong pem. Lukaot gud hao yu yusum ol kaen kemikol olsem glyphosate from i save kilim eni kaen plant, i pas i ko tru long ol rus blong sandelwud tru long haustoria blong hem mo sloem daon kro blong hem o kilim hem. Yu save yusum ol kemikol bifo yu planem sandelwud blong karemaot ol wid, be i gud blong mekem hemia sam wik bifo yu planem sandelwud.



Figia 7.1 Brasem Guinea kras (*Megathyrsus maximus*) wetem busnaef

Long Vanuatu, taem man i statem wan plantesen, i gat samfala kaen rop o wid we oli kosem plante problem wetem ol yangfala sidling. Samfala long ol kaen rop ia i gat *Neonotonia wightii* (glycine), *Merremia peltata* (rop biglif) mo *Mikania micrantha* (rop-Merika). Yu save kontrolem ol rop ia wetem busnaef, be oli kro bak kwik taem (Figa 7.2).



Brasem ol wid wetem busnaef



Soybean



Sandelwud i save gro gud wetem wikli wid kontrol



Rop biglif



Ol wid we oli no kontrolem gud oli kavremap gud ol smolsmol sandelwud tri



Rop-Merika

Figa 7.2 Ol rop wid oli wan ril problem sapos yu no kontrolem gud wetem bus naef. Ol wid olsem glycine, big lif, mo rop-blong Amerika oli kro spid mo oli wan ril problem

Singapore daisy (*Sphagneticola trilobata*) long Vanuatu (Fig 7.3). Onli wei blong dil wetem wid ia hemi blong stopem blong i no ko insaed long plantesen – karemaot kwik taem taem yu faenem hem. Wid ia hemi wan problem from ol risen ia:

- Hemi daonem bigwan kru blong sandelwud wetem fulap tri, from sistem blong rus blong hem i faet strong, mo i gat smol poesen long hem.
- Hemi save mekem wota i hip raon long beis blong sandelwud mo promotem ol fankes olsem *Phellinus* spp. mo *Phytophthora* spp.
- I nogat gudfala stret fasin blong kontrolem wid ia insaed long ol yangfala sandelwud tri. Pulum wetem han i no naf from hemi krobak long eni pis rus o stampa. Yu save kontrolem Singapore daisy wetem metsulfuron-methyl, be kemikol ia i save kilim o spoilem kru blong ol sandelwud tri.



Fig 7.3 Singapore daisy (*S. trilobata*) hemi wan wid we i kro daon nomo. Hemi daonem kru blong sandelwud mo mekem stampa i roten.

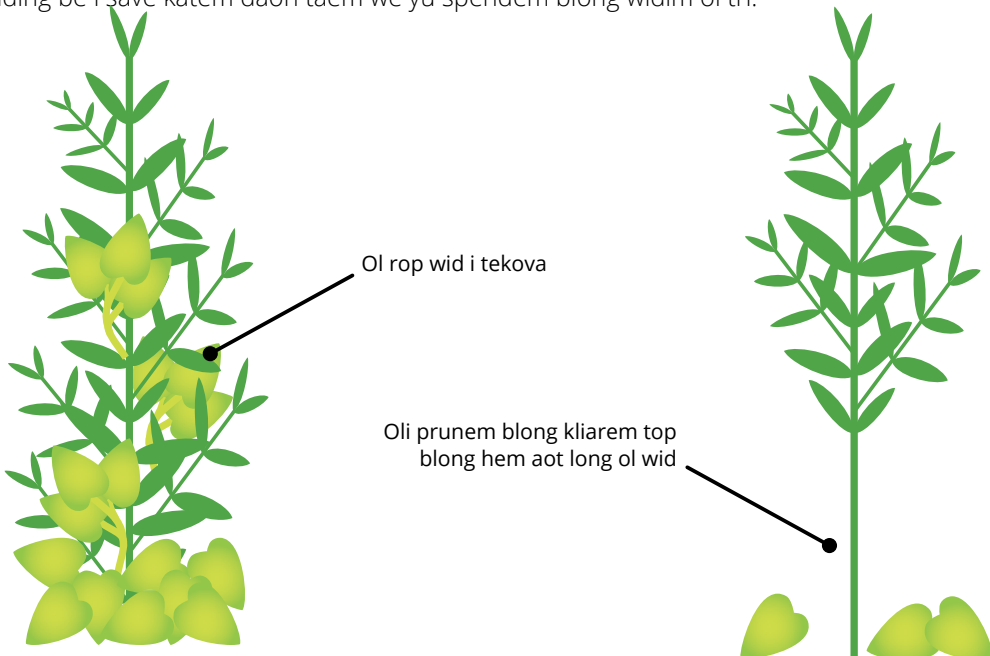
Long Fiji mo Tonga, *Spathodea campanulata* (African tulip tri) mo *Tecoma stans* (yelo trumpetbush) oli ol bigfala wid long ol sandelwud plantesen. Tufala ovasi wid ia blong famili Bignoniaceae, oli givim strong kompetisen mo shed long sandelwud mo tu oli tekova long ful envaeromen mo jenjem ekosistem mo ol spisis blong ples. Long Timor-Leste, Siam wid (*Chromolaena odorata*) hemi wan plant we i tekova mo kwik taem nomo kro ova long ol smolmol sandelwud tri. Long Papua Niugini, kunai gras (*Imperata cylindrica*) hemi faet strong wetem ol sandelwud tri from strong sistem blong rus mo fromwe hemi save bon long faea long drae taem.

7.2 Wid kontrol – pulum mo katem

Sapos oli wid wetem han nomo, hemi gud blong klinim gud raon long stampa blong wanwan tri long evri 2–4 wik blong fes 6-12 manis.

I nid blong katem o pulum (dipen long ol sisen) ol rop wid wan taem long evri tu wik afta we oli jas planem ol sidling nomo. Hemia i sud gohed blong sam yia kasem taem ol yangfala tri ia oli gat inaf lif blong mekem shed mo blokem ol wid blong no kro tumas. Yusum naef blong katem ol rop wid sapos oli bigwan tumas. Ol smol rop wid nomo yu save pulumaot isi long ren taem.

Taem ol rop wid oli kosem problem, oli save prunem ol branj blong sandelwud we i stap daon blong leftemap top blong tri longwe long kraon (Figa 7.4). Hemi mekem se ol rop wid i save ataj long stampa nomo. Maet hemi no katem daon hamas taem yu nid blong mekem widing be i save katem daon taem we yu spendem blong widim ol tri.



Figa 7.4 Metod blong trimim ol rop wid mo prunem ol branj blong sandelwud we oli stap daon blong leftemap top blong tri longwe long kraon

7.3 Host kompetisen

Sandelwud i no stap kro gud nating long ol ples we ol tri oli faet from kakae long kraon, wota mo laet.

Ol host tri oli gud blong helpem sandelwud i kro gud be semtaem oli save kompit wetem sandelwud mo sloem daon kro blong hem taem ol host i plante tumas mo oli no manejem olgeta.

Taem oli planem ol sandelwud long ol eria we kasis i fاسfas long hem, bae sandelwud i no save kro hariap mo bae ol lif blong hem i save ko yelo (Figa 7.5).



Sandelwud i go yelo long leucaena bush



Casuarina i raonem sandelwud



Ol sandelwud tri we oli planem i fاسfas mo i nogat inaf host tri

Figa 7.5 Ol eksampol blong ol sandelwud we oli fاسfas tumas mo hao hemi afektem kro mo helt blong olgeta

7.4 Sandelwud kompetisen

Sandelwud i no save kro gud taem oli planem olgeta klosklosap tumas (i no bitim 3 m x 4 m). Bae ol tri oli kro gud long wan eli stej taem oli fاسfas be afta long 3–4 yia bambae kru blong olgeta hemi slodaon taem oli kam bigwan lelebet mo stat blong kompit from laet, wota mo ol kakae long kraon. Figa 7.5 hemi soem ol eksampol blong ifekt blong planem sandelwud i fاسfas tumas. Ol tri long rael pikja oli ol tri we i no kro gud folem wan fاسfas speising (1.5 m x 1.5 m) mo bigfala namba blong ol host tri (*Casuarina* ok tri) we oli planem raon long ol sandelwud. Ol tri andanit long pikja ia oli gat 10 yia be oli no kro kud from oli fاسfas tumas mo oli nogat ol host tri we oli save stap longfala taem.



8 Ol Pest, sik, mo ol nara problem long prodaksen

8.1 *Phellinus noxius*

Phellinus noxius hemi wan sik we i stap afektem ol rus (oli kolem braon rut rot, nawwun o ringworm blong wud), we hemi save kilim ol sidling blong sandelwud mo ol tri (Figa 8.1). Sik ia i afektem ol lif hariap nomo mo jenjem krin kala blong lif i ko braon bifo i foldaon afta we i soem ol saen ia. Sapos sik ia i stap, oli save luksave nomo from i mekem stampa blong sandelwud i kam braon. Sik ia i spred tru long ol rus blong ol tri, mo i save spred hariap nomo i ko long ol narafala tri long plantesen.

Sik i spred tru long sistem blong rus blong ol tri, mo infeksen i save spred kwik taem nomo i ko long ol nara tri long plantesen.



Figa 8.1 Ol eksampol blong *P. noxius* infeksen long ol sandelwud tri: (lef saed pej) stampa blong sandelwud i stap roten long beis blong hem, mo (antap) *Phellinus*-infeksen i kasem sandelwud mekem se i lusum lif

8.1.1 Hao blong blokem *Phellinus*

Bes wei blong blokem sik *Phellinus* hemi blong:

- no planem wud long ol eria we sik ia i stap long hem
- selektem wan ples we wota i ronaot gud olsem long saed blong hil mo ples we i no holem wota, from ol ples we i gat tumas wota hemi ol ples we sik ia i stat long hem isi nomo
- karemaot ol stampa we i laef taem yu kliarem wan niu ples from ol kaen stampa mo rus olsem nao sik *Phellinus* i stat blong gro long hem; yu mas bonem daon gud ol kaen stampa olsem
- livim ples i stap fastaem afta we yu kliarem blong mekem se ol rus blong ol tri we sik ia i stap kro long hem i roten gud
- planem ol smosmol tri long saed blong wan wan sandelwud tri (eksampol: *Euphorbia tithymaloides* (vinil), mo *Cordyline fruticosa* (cordyline o nangaria) oli talem se i help blong stopem spred blong sik be oli no save hao)
- no mas katem ol stampa blong sandelwud tri olbaot wetem wan bus naef
- prunem sandelwud tri long ol drae kondisen blong katem daon janis blong sik i afektem stampa blong tri mo i save helpem tri blong i kam gud hariap (from sandelwud i kro gud long drae sisen)
- no muvum ol tri we oli gat sik i ko insaed long sandelwud plantesen.

8.1.2 Kontrol blong *Phellinus*

Kontrol blong *Phellinus* hemi had lelebet. Taem sik ia i afektem wan tri, hemi impoten blong no spredem i ko long ol narafala tri long plantesen:

- katem daon namba blong ol man we oli stap wokabaot olbaot mo tajem ol tri we oli gat sik mo oli no wasem ol han mo lek blong olgeta wetem sop mo wota afta tajem ol narafala (helti) tri
- karemaot mo bonem ol branj we oli foldaon long plantesen
- dikimaot wan bigfala sekel (5–10 m daeamita) raon long sik tri wetem wan sped blong katem ol rus
- wasem ol tul we oli yusum long ol sik tri ia wetem sop mo wota mo putum olgeta antap long faea o wota we i boel bifo oli save yusum long ol tri we i helti.

Afta long ol fes saen blong sik ia i kamaot, olsem ol lif we i drae, sam sandelwud fama oli bilif se bae man i save folem ol kaen kontrol fasin olsem blong stopem spred blong sik ia:

- Planem sam smolsmol wud long saed blong wanwan sandelwud tri (eksampol: devil's backbone, nangaria).
- Dikim wan hol raon blong stampa blong sandelwud we i gat sik mo putum plante lemon stret long ol rus olsem we oli stap mekem long ol kofi plantesen long Tanna.

Sapos sik *Phellinus*, i kilim wan tri, hemi kam olsem wan men sos blong sik long ol narafala tri tu. Tri we i ded, oli mas bonem gud blong mekem se sik i nomo stap long wud o kraon. Hemi impoten tu blong dikim mo brekem ol rus blong mekem se sik i no save pas tru long ol rus i ko long ol narafala tri long plantesen. Yu save yusum natora blong ol sandelwud we i bigwan finis, be fulap taem sik ia hemi daonem kwaliti blong olgeta (luk Seksen 11.3).

8.2 Lif blakspot

Blakspot hemi wan sik we i afektem ol lif blong sandelwud, speseli ol smolsmol tri (Figa 8.2). Blakspot i no save kilim wan tri, be hemi wan saen se ples we sandelwud i kro long hem hemi wetwet tumas. Blakspot i save hapen wanwan taem nomo mo hemi dipen nomo long ol difren taem blong yia mo taem weta hemi jenis. Be sapos blakspot i stap olwei kasem wan yia, hemia i soem se klaemet long ples ia i no stret blong planem sandelwud. Oli no save yet sapos blakspot i sloem daon kro blong sandelwud mo sapos hemi afektem fomeisen blong natora.



Figa 8.2 Lif blakspot long sandelwud

8.3 Sidling i slak, 'damping off' mo 'dieback'

Ded blong ol sidling insaed long neseri from sik hemi spred bigwan long Timor-Leste mo ating hemi stap hapen tu long ol nara ples long Pasifik. Ol simptom inkludum sidling i slak, ol lif oli brokbok, rus i tanem raonem stampa, mo 'dieback' (ol yang shut oli ded). Ol sik ia i save mekem bigfala namba, 80–90% long ol sidling i ded (Figa 8.3), speseli long ol wet mo humid kondisen.

Kanopi (sed) blong ol sidling i soem tri klia simptom:

1. ol kil blong rus i tanem raon long stampa (Figa 8.4)
2. lif i slak o i gat ol kil mo 'damping off' (Figa 8.5)
3. rus i tanem raon long stampa mo 'dieback'.



Figa 8.3 Fulap sidling i lus from ol slak sidling disis long Timor-Leste



Fig 8.4 Ol kil long stampa i kosem 'girdling' mo ol lif antap long eria blong kil oli foldaon



Fig 8.5 Slak lif mo ol kil long yang sandelwud sidling

Ol kondisen ia oli save promotem stat mo developmen blong ol fankes disis:

- Ren blong longtaem mo ol lif i stap wetwet olwe - namba blong dei blong nonstop ren hemi moa impoten bitim hevi ren.
- Ol hevi sed tri klosap long neseri eria, mo ol hevi klaod wetem krin net.
- Speising blong ol sandelwud sidling i klosap tumas mekem se win i no pas gud, humiditi i ko antap mekem se sik i pas isi nomo.
- Ol pot host oli fulap mo kro kwik taem tumas mekem se oli tekova long sandelwud. I gat tri ifekt blong hemia:
 - humiditi i inkris mo flo blong ea sidling i ko daon
 - i gat wan nara host blong sik i kasem
 - laef mo pawa blong sandelwud i ko daon. Hemi impoten blong notem se nating se sandelwud i wan rus parasadet, ol host oli save tekova long ol smolsmol tri blong hem.

8.3.1 Ol kaljoral fasin blong kontrol

Yu save sloem stat blong fankol disis taem yu:

- Yusum klin mo disis-fri poting mediom/topsoel
- Yusum poting mediom we i givim gud drenej blong mekem se wota i no hipap long sidling
- kroem ol sidling antap long ol wuden tebol o antap long ol materiel we i givim gudfala drenej (olsem ol ston)
- Sterelaesem sefes blong ol sids bifo yu soem.

Yu save limitim ol disis wetem ol kaljoral praktis ia:

- Prunem ol pot host blong daonem humiditi flo blong ea.
- Karemaot ol ded plant long neseri.
- Aesoletem ol sik plant long wan seperet spes we hemi speseli blong wok ia long neseri.
- Karemaot eni ded lif o sik lif.
- Mekem speising bitwin long ol sidling i moa bigwan.
- Sotemaot ol sidling folem saes mo helt blong olgeta.
- Mekem moa laet ikam insaed long neseri blong helpem kro blong ol sandelwud mo daonem humiditi.
- Leftemap flo blong ea long neseri blong daonem humiditi.
- Wotarem ol sidling enitaem we i gat nid, insted blong folem wan rekula taem.
- Sapos i posibol, mekem se ol lif oli no stap wetwet tumas. Yu save mekem nomo sapos oli kro andanit long waet plastik.

8.4 Ol insekt we oli drink wota blong wud mo karemaot ol lif

I gat difren kaen bebet we oli stap drink wota blong wud long ol sandelwud tri—i gat milibak mo afid (*oda Hemiptera*), mo bitel bora (*oda Coleoptera*) (Figa 8.6). Ol bebet ia oli plante long ol lokol eria mo long wanwan taem long wan yia, be oli no ol rabis bebet tumas blong sandelwud. Ol bebet ia oli faenem plante long ol tri we oli slak mo oli smolsmol be i had blong faenem bebet ia long ol tri we oli kro strong finis.

Bes wei blong kontrolem ol bebet ia hemi blong mekem sua nomo se oli planem sandelwud long wan stret ples, mo i gat gudfala kontrol long ol wid. Ol praktis olsem i blong help blong promotem tri i kro strong mo mekem ol bebet ia oli no kam wan problem.

Yu save kontrolem ol milibak mo afid wetem waet oel pestisaed; spre i stret nomo long bebet (no mas spre i olbaot) blong no kilim ol narafala gudfala bebet.

Samfala bebet olsem ledibed (*oda Coleoptera*, famli Coccinellidae), oli save kakae ol milibak mo afid mo man i sud help blong mekem se oli stap long plantesen

Wan kaen stiki haniju i kavremap ol tri we milibak mo afid oli afektem. Haniju ia hemi swit mo hemi save mekem se i gat blakspot mo anis tu i save kam plante from swit suga ia.

Ol insekt we oli kakae ol lif olsem ol lokas mo katapila oli save spoelem ol smol sandelwud. Hemi no wan bigfala problem tumas, be samtaem i save gat aotbrek we i save spoelem ol smolsmol tri anda long 2 yia. Yu save kontrolem ol pest taem yu karemaot olgeta long han nomo, speseli long eli stej blong spred. Sapos pest populesen i kam antap, maet bae i nid blong yusum ol kemikol insektisaed blong kontrolem.



Figa 8.6 Milibak (lef saed) mo bora bitel (raet saed) oli save damejem ol smolsmol sandelwud tri

8.5 Ol isiu wetem pot host long fil

Sandelwud hemi pefom beswan taem we pot host (*Alternanthera*) i laef long fil kasem 1-2 yia. Hemi impoten blong katem/prunem bak host andanit long stampa blong ol smolsmol sandelwud tri taem ples i wetwet (sisen blong ren). Tufala men risen hemi from: (1) pot host i save fasem/tanem raon long stampa blong sandelwud mo mekem i roten mo mekem olsem ringworm long hem; mo (2) long sam eria blong Timor-Leste pot host i save haedem ol snel we oli kakae aotsaed skin blong sandelwud (Figa 8.7). Tufala problem ia i save mekem sidling i ded mo oli stap hapen long ren sisen mo taem pot host i kro bigwan raon long stampa blong wud. I isi blong stretem problem ia – katem mo pulumaot *Alternanthera* long stampa blong sandelwud.



Figa 8.7 Skin damej from pot host i ko raon long stampa mo i roten (lef saed) mo snel (smol pikja insaed long raet) i damejem skin blong yangfala sidling (raet saed). Tugeta problem ia i save mekem ol sidling oli ded long fil.

8.6 Goling long ol lif

Lif goling ("galling") i wan saries pest blong sandelwud tri mo i save mekem bigfala lus blong helt mo laef (Figa 8.8). Hemi wan problem long Timor-Leste, mo yu save faenem truaot long kantri blong olgeta. Ol larvae (smol bebet) blong wan flae o honet i stap mekem ol goling – oli no aedentifaem yet se wijwan. Ol smol bebet ia oli kakae ol lif mo spoilem bigwan. Ol yang shut nao oli stap afekted moa, mekem se oli save lusum kru fulwan long sisen we oli kasem problem ia. Oli no save tumas samting abaot pest ia mo ol fasin blong kontrolem, be i stap luk olsem ol tri we oli stap anda long stres nao oli gat hae janis blong kasem lif goling. Fulap taem lif goling hemi lid i ko long sekenri infeksien blong waet skel (Figa 8.9). I nidim moa risej blong aedentifaem ol insekt pest mo stret fasin blong manejem mo kontrolem.



Figa 8.8 Ol insekt blong lif goling oli afektem ol lif (lef saed) wetem ol niu shut (raet saed) blong sandelwud long Timor. Fulap taem afta goling, infeksien blong waet lif skel i tekem ples (raet saed)



Figa 8.9 Lif skel insekt i save fulap long sam eria

8.7 Ol katapila we oli mekem web mo kakae lif

Ol bigfala kampani blong katapila we oli stap fom insaed long wan web oli stap kakae ol lif blong sandelwud tri long Timor-Leste (Figa 8.10). Yu save faenem ol bigfala kampani (ol koloni) long ol bigfala tri, be i luk olsem se oli no kosem tumas damej. Be long ol yangfala sandelwud tri (1-3 yia) insaed long wan plantesen, oli save kakae aot evri lif. I save mekem se tri hemi nomo strong mo helti, mo sapos oli kohed blong kakae oli lif blong hem, bambae hemi save ded. Oli rekomendem blong kontrolem pest ia wetem pestisaed tritmen, o blong bonem, o karemaot mo muvum i ko long difren ples.



Figa 8.10 Ol katapila we oli mekem web mo kakae lif oli fodem ol koloni long skin blong ol bigfala tri. Oli kakae ol sandelwud lif (lef saed) mo samtaem oli kakae aot evri lif long ol yangfala tri (raet saed).

Oli foto blong Luis Almeida

8.8 Ol animol we oli kakae kras mo wokabaot

Ol wael buluk, ol buluk blong fanis, mo ol nara animol we oli kakae kras (kresing animol), oli save kakae ol smolsmol sandelwud tri mo daonem janis blong olgeta blong laef (Figa 8.11). Ol sandelwud tri oli mas gat 5 yia olsem bifo buluk kakae lif blong olgeta. Hemi wan problem long sam eria blong Timor-Leste we i gat fulap ol kresing animol long komuniti olsem ol nanigot, buluk mo hos. Long Papua Niugini wetem Vanuatu, ol pig (waelwan mo temwan) oli save mekem problem long sandelwud we oli planem wetem ol rut vejtebol. Taem ol pig oli dikimaot ol rut krop, bae oli distebem ol yang sandelwud sidling mo mekem fulap i lu.

Stret fasin blong kontrolem buluk hemi blong fasem buluk long rop, yusum ol tri gad o pulum fanis raon long plantesen. Sapos i nogat kaen kontrol olsem, ol buluk mo animol oli save spoelem gud ol sandelwud long plantesen. Long eria we ol pig oli stap mekem problem, i gud blong no planem ol rut krop klosap long sandelwud.



Fig 8.11 Ol gresing animol i save kosem bigfala damej long ol smol sandelwud tri

8.9 Ol pijin oli kakae ol sid

Sandelwud i gat wan swit mit long frut blong hem we plante kaen pijin i laekem. From se ol pijin i stap kakae ol frut blong hem i mekem se sandelwud i no stap gat inaf sid blong kolektem blong planem o blong salem. Proplem ia i bigwan long ol ples we i stap longwe long ol vilij from se i nogat man i distebem ol pijin ia long longfala taem mekem i had blong fama i kolektem gud ol sid.

Taem oli planem ol sandelwud klosap long vilij o karen, bae i helpem ol fama blong jekem ol tri oltaem mo ol pijin oli no save kakae plante frut blong sandelwud.

Yu save protektem wan sandelwud tri we hemi givim plante sid we i gat bigfala valiu wetem wan bigfala net we i kavremap evri branj blong tri. Narafala wei hemi blong hangem ol samting long ol branj blong tri blong mekem se pijin i fraet blong kam klosap. Ol kiaman skeleton man (scarecrow) i gud tu blong yusum. Be plante pijin i luk save ol kaen trik olsem, so hemi impoten blong putum ol samting ia insaed long plantesen nomo taem ol tri oli gat ol sid we i redi mo ol fama oli mas karemaot kwik taem afta we oli finis blong kolektem sid.

8.10 Wota i fulap/o wota tebol i hae

Evri sandelwud spisis oli nogud long tumas wota mo bae oli save kam yelo mo kru blong olgeta i nogud long kaen kondisen ia. Ol sandelwud we oli kro long ples we wota tebol i hae bae oli kro gud long fes yia, be afta bae kru blong olgeta i slodaon, ol lif bae oli kam yelo mo sik wetem ol pest bae oli save spoilem. Sandelwud i kro beswan taem i gat wan klia drae sisen samtaem long yia.

8.11 Faea

Sandelwud i no save laef taem faea i kasem mo i save ded sapos i stap kolosap long wan smol faea nomo. Ol spisis we oli stap safa moa long faea i gat *S. album*, *S. yasi* mo *S. austrocaledonicum*. *S. macgregorii* mo *S. lanceolatum* oli gat skin we i moa tik mekem se oli save stap klosap long wan faea we i no strong. No hipimap tumas faeawud long plantesen. Long ol drae taem, mekem sua se ol man oli no mekem faea kolosap long plantesen blong sandelwud. Long Papua Niugini oli stap planem sandelwud long ol kunai kraslan, we i gat bigfala janis blong faea. I nid blong aotem kunai kras wetem plao o kemikol long saet bifo oli planem sandelwud. Yu save planem ol tri we faea i no save bonem daon olsem noni (*Morinda citrifolia*) o mango (*Mangifera indica*) long ol saed blong plantesen blong mekem se faea i no save spred long plantesen, mo kipim kraon i klin long ol doti.



Fig 8.12 Sandelwud i kro long ol eria we i save gat faea long drae taem (lef saed). Ol tri oli nogud long faea, mo oli save ded from (raet saed).

8.12 Ol saeklon

Sapos yu save mekem, planem sandelwud long ol ples we i gat gudfala proteksen agensem strong win, blong blokem saeklon blong i no spolem ol tri. Yusum ol tri olsem ok tri *Casuarina equisetifolia*, from we oli save stanap agensem ol strong win mo oli save katem daon spid mo paoa blong win long ol plantesen blong sandelwud. Ol sandelwud tri we oli brokbrok long taem blong saeklon, oli save kro bageken. Yusum so blong prunem ol tri wetem ol stampa we i brok blong givim wan klin kat blong stopem wota blong i ko insaed mo mekem stampa i roten. Oli faenem se ol Pasifik spisis (*S. yasi*, *S. austrocaledonicum* and *S. lanceolatum*) oli stanap moa strong long saeklon bitim ol spisis olsem *S. album* mo *S. macgregorii*. Ol sandelwud tri we oli kro long ol dip fetael soel wetem hae renfol mo hae wota tebol oli save foldaon long strong win. Long ol kaen ples olsem ol sistem blong rus blong ol tri i no dip inaf mekem se ol sandelwud tri i no anka gud long kraon. Yu save mekem sandelwud i rikava sapos yu leftemap sloslo mo putum kalé long hem ova long sam manis. Saeklon i save mekem 'wotawud' i fom (luk Seksen 11.3) we i spolem hae valiu blong natora. I nidim moa risej blong faenemaot sapos wotawud i save kam natora afta sam taem.



Fig 8.13 Saeklon i damejem ol sandelwud tri *S. yasi* (lef saed) mo *S. austrocaledonicum* (medel mo raet saed)

8.13 Strong san

Strong san hemi wan problem long ol ples we i nogat inaf sed mo ol tri wetem stampa i stap long ful san (Fig 8.14). Bae i save moa wes sapos kraon i dak mo empti nomo (nogat samting i kro), from san bae i riflektem i ko bak antap. Strong san i mekem natora blong wud i save stap long open, mekem se i save kasem ol sik (luk Seksen 8.16).



Fig 8.14 Mak blong strong san i stap long saed blong ol tri we oli ekspos tumas long hot san.

8.14 Ol skin kat

Ol skin kat (Figa 8.15) i stap tekples fulap taem wetem bus naef, from man i spolem tri o from wan risen (ona i putum mak blong hem). I gat moa skin kat long ol rod we man i wokabaot long hem o long ples we ol man oli putum mak blong olgeta blong stopem stil. Ifekt blong skin kat long helt mo laef blong tri i dipen long kat (sapos i dip o no). Long sam vilij oli putum tabu long fasin ia.



Figa 8.15 Skin kat blong makem onasip o blong spolem ol tri. Ifekt blong skin kat long helt mo laef blong tri i dipen long kat (sapos i dip o no).

8.15 Damej blong natora jek

Natora jek hemi damej we ol man i mekem taem oli katem stampa blong jekem divelopmen blong natora (Figa 8.16). Teknik ia i mekem bigfala damej long ol tri. Hemi:

- daonem kru from hemi katem ol string we oli konektem ol rus wetem lif
- openem wan soa we ol sik mo fankes i save folem blong ko insaed long tri mo spolem
- introdusum wan wiknes long stampa, mekem se tri i save foldaon long strong win.

Sapos i nid blong jekem tri blong divelopmen blong natora, bae yu mekem ol smol kat long ol branj mo/o long ol rus. Fasin ia hemi save kosem ol kaen problem olsem taem yu jekem natora long men stampa, be hemi no strong tumas olsem ia. Wan narafala fasin hemi blong yusum wan smol drillbit (6mm) blong dril i ko insaed long tri, afta yu save kolektem ol makas blong wud we i kamaot mo jekem blong luk sapos natora i stap mo sapos i dip. Ol man we oli save gud long saed blong natora divelopmen oli save smelem pefium blong natora blong jekem ej blong hem. Driling i save kosem isiu wetem ol insekt mo fankes we oli save ko tru long hol, be long wan gudfala strong tri skin i save krobak kwik taem blong kavremap soa.



Figa 8.16 Ol eksampol blong strong damej blong natora jek

8.16 Natora i roten

Fankes, bakteria mo ol nara sik i save mekem natora blong sandelwud tri i roten. Oli stap ko insaed tru long ol soa o damej long natora (olsem taem ol branj i brok long strong win). Ol tri i save kasem ol isiu ia taem oli stap anda long stres. Soa blong fankes long stampa hemi wan saen se tri i kasem infeksien (Figa 8.17 lef saed) mo afta sam taem i save mekem tri i ded (Figa 8.17 raet saed).



Figa 8.17 Sapos i stap longtaem, bae natora blong sandelwud tri we i roten (long lef saed) i kilimded tri (long raet saed)



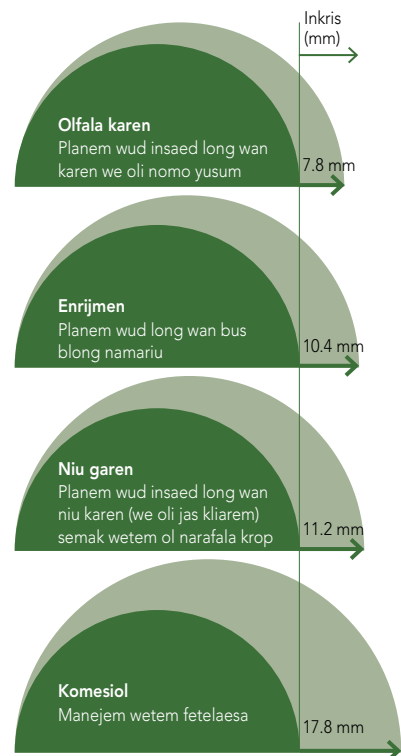
9 Kru blong tri wetem natora, mo ol propeti blong natora

9.1 Reit blong kru blong tri

Mos long ol data we oli kolektem long reit blong kru blong sandelwud i soem se wan averej krut reit hemi araon 1 cm long wan yia (long 20-30 cm antap long kraon level) hemi nomol long ol stret saet. Sapos yu no stap kasem averej ia ova long plante yia, i posibol se i gat isiu wetem saet o manejen, eksampol: i nogat inaf gudfala host. Folem ol kaedlaen long kaed ia blong gat bes janis blong ajivim ol hae kru reit mo gudfala natora developmen.

Hemi interesting blong notem se data we oli kolektem long ol difren kaen blong sandelwud spisis mo ol difren saet i soem se kru reit blong araon 1 cm long wan yia hemi nomol, nomata we i save gat bigfala difrens, mo hemia i nomol tu. Wan stoktek mo mesamen blong *S. yasi* mo *S. album* blong ol difren ej mo kondisen we oli stap kro long hem long Fiji mo Tonga i soem wan kru blong araon 1 cm long wan yia. Folem hemia *S. yasi* bae i save kasem saes blong haves (20–25 cm daeamita, 20–30 cm antap long kraon level wetem gudfala developmen blong natora) bifo long 25 yia.

Long wan komparisen blong ol sandelwud kru (mm) reit anda long 4 difren fasin blong manejen long Vanuatu (Fig 9.1) oli mesarem daeamita blong stampa long 10 cm antap long kraon level long 1,685 *S. austrocaledonicum* sandelwud tri we oli planem long 5 difren aelan (Santo, Malekula, Efate, Erromango mo Tanna). Ol sandelwud we oli planem long ol komesiol kondisen oli kro gud bitim ol sandelwud we oli kro anda long ol narafala fasin blong manejen from bigfala atensen we oli putum i ko long ol host tri mo fetelaesa. Be oli no faenem eni difrens long ol tri we oli planem long ol niufala karen wetem olgeta we oli planem long ol ples we oli mekem ol teknik blong mekem kraon i kam rij (krot reit blong 10.8 mm long wan yia long daeamita blong stampa). Oli faenem se ol tri we oli planem long ol olfala karen oli kro slo bitim hemia we i kro anda long narafala manejen teknik. 93% blong ol data we oli kolektem long ol tri we i gat 10 yia i kam daon, i luk olsem ol difrens ia bae i semak yet taem ol tri oli kro long ol yia we i stap kam yet.



Averej annual inkris blong daeamita long stampa blong tri (long 10 cm antap long level blong kraon) anda long ol difren fasin blong manejen.

Fig 9.1 Ol reit blong sandelwud kru anda long 4 difren fasin blong manejen we oli yusum long Vanuatu

Long Papua Niugini ol krot reit blong ol lokol spisis *S. macgregorii* oli jenj bigwan bitwin ol planting, folem saet seleksen mo mentenens, wetem ol krot reit blong araon 1cm long wan yia long daeamita (20-30 cm antap long kraon level) blong ol planting we oli lukaotem gud. Be yus blong ol mekanikol plao, gudfala wid control, stret speising (4 m × 5 m) mo yus blong ol host blong promotem nambawan eli kru i save givim ol gudfala krot reit go kasem 2cm long wan yia.

Folem ol mesamen blong ol *S. album* we oli planem long Timor-Leste, daeamita blong stampa (20 cm antap long kraon level) krot reit blong wan planting we oli lukaotem gud i bitwin 0.9 mo 1.1cm long wan yia. Ol planting we oli nogat inaf host o fasfas tumas, oli gat ol krot reit blong 0.45-0.75cm long wan yia.

Krot reit blong ol 2-yia *S. lanceolatum* long ol plantesen long Cape York, Kwinslan oli gat wan averej blong 1.2cm long wan yia daeamita long haet blong jes long skin (DBHOB) blong olgeta we oli wotarem mo 0.45cm long wan yia blong olgeta we oli no wotarem.

9.2 Developmen blong natora

Valiu blong sandelwud i stap long natora we i smel gud, i minim se developmen blong natora hemi impoten. Krot reit blong natora i jenj bigwan bitwin ol difren spisis, be tu long wanwan tri long wan spisis. Reit blong developmen blong natora hemi dipen long ej we tri hemi statem proses blong mekem natora. Moa eli natora i stap blong develop (olsem long wan yangfala tri), mo amaon blong natora bae i avelabol long taem blong haves (Figa 9.2 mo 9.3).



Figa 9.2 Ol lukluk wan mesamen we oli tekem long wan *S. yasi* tri long Tonga blong jekem natora developmen.

Plante sandelwud fama long Vanuatu we oli gat ekperiens, oli bilif se reit blong natora developmen hemi dipen long kraon, renfol mo level blong sanlaet we sandelwud tri i kasem. Fulap long ol ekperiens fama ia oli talem se sandelwud i developem natora blong hem hariap taem hemi kro long wan kaen kraon we i no dip o kaen kraon we i gat fulap ston, i gat longfala drae taem mo we i kasem ful sanlaet. Stret taem we oli ekspektem blong havestem ol sandelwud anda long ol kondisen ia hemi 15–20 yia, be i save kasem 30–40 yia long ol tri we kro long ol eria we kraon i rij mo i dip, i gat plante ren truaot long wan yia, mo we i stap andanit long shed. I nidim moa wok blong faenemaot ol stret samting we i mekem natora i develop mo olsem wanem hemi jenj bitwin ol spisis mo ol ples.

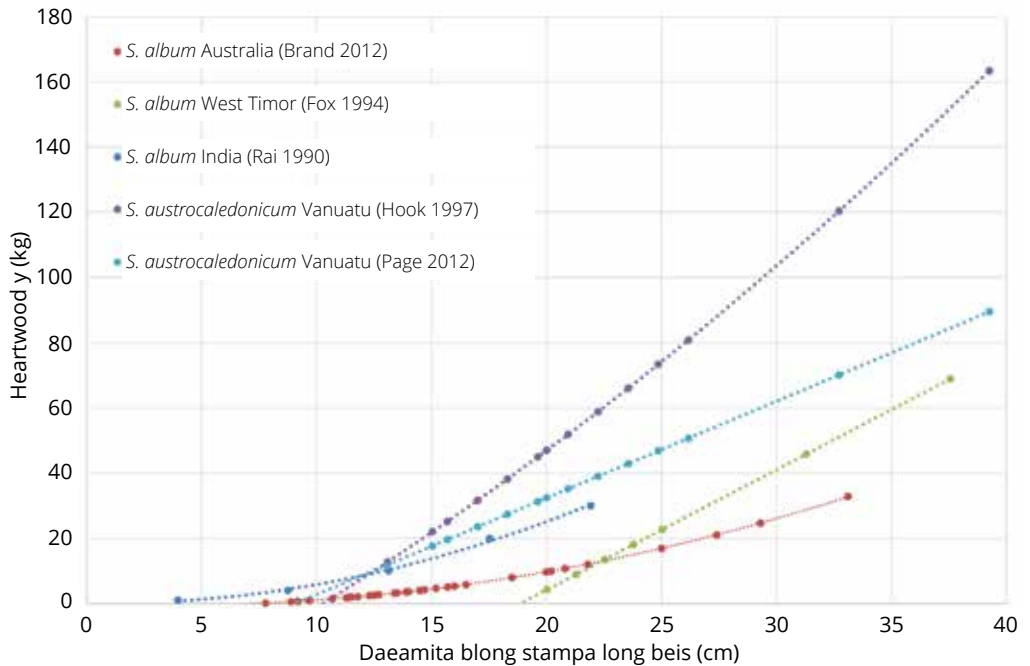


Fig 9.3 Natora developmen we faef raeta oli mekem blong *S. album* mo *S. austrocaledonicum* blong stampa daeamita long beis blong tri (0.2-0.3 m antap long kraon level). Data blong Rai (1990), Fox (1994) mo Hook (1990) oli bin bes long DBH mo wan konvesen fakta blong 1.25 (*S. austrocaledonicum*) kasem 1.3 (*S. album*) blong kalkuleitem bes daeamita.

9.3 Ol propeti blong natora

Valiu blong wan sandelwud tri i dipen bigwan long hevi blong natora mo konsentresen mo komposisen blong oel blong hem.

Hemi impoten blong faenemaot developmen reit blong natora from bae i afektem hamas taem i pas bifo tri i save mekem mane. Amaon blong natora i dipen long saes blong tri. Ol bigfala tri oli gat moa bigfala amaon blong natora.

Ej blong tri tu i gat influens long konsentresen blong natora oel mo kwaliti. Ol olfala tri (20+ yia) oli gat gudfala natora.

Valiu blong ol wud prodak blong sandelwud i dipen long konsentresen (amaon) mo kwaliti (smel) blong oel we i stap insaed.

- **Oel konsentresen** long natora hemi bitwin 1 mo 8%. Olgeta wetem hae konsentresen oli smel strong moa. Be pawa blong smel i dipen fulap long nus blong man so i nogud blong yusum smel olsem wan indiketa blong valiu blong wud.
- **Kwaliti blong oel** oli testem long kaen smel we sandelwud i prodium. Evri sandelwud oli gat sem kaen smel, be i gat ol smol difrens we ol konsuma oli smelem save. Kwaliti blong smel i rileit daerek i ko long miiks blong ol difren kemikol we i stap insaed long oel. Ol 'santalols' (α - mo β -santalol) olgeta nao i impoten mo oli diskraebem olsem se oli gat wan 'sopsop mo wudi' smel.

Kwantiti blong oel mo komposisen blong oel i jenj folem kaen wud mo wanem pat blong tri (rus, stampa daon, stampa mo ol branj) (Figa 9.4). Oli faenem ol haies oel mo santalol konsentresen long ol bigfala rus mo stampa blong tri. Moa yu ko antap long tri, moa level blong konsentresen i ko daon (Moretta 2001; Baldovini et al. 2011; Braun et al. 2014).

Ej blong tri i gat bigfala ifekt long kwaliti blong natora. Ol olfala mo bigfala tri oli prodium ol bigfala amaon blong natora wetem wan hae konsentresen blong oel mo santalol i bitim ol yangfala tri (Subasinghe et al. 2013). Taem wan tri i stap ko olfala, daeamita saes blong natora insaed long tri i stap ko antap, mekem se yu save faenem ol bigfala amaon blong natora insaed long ol olfala tri (Page et al. 2010).

Ol branj (smol log)

Natora i stap long top pat blong stampa blong ol yangfala tri, mo long ol branj blong ol tri we oli olfala bitim 20 yia. Ol branj oli gat smol konsentresen blong natora mo oel bitim evri nara pat blong tri.

Stampa (ol log)

Fulap natora i stap long beis blong stampa, moa yu go antap, moa natora i go smol.

Stampa (tik stampa we i stap daon)

Mos oel rij natora i stap long as blong natora.

Rus

Ol bigfala rus oli save holem natora, be olsem ol branj, natora long rus i stap long ol olfala tri nomo.

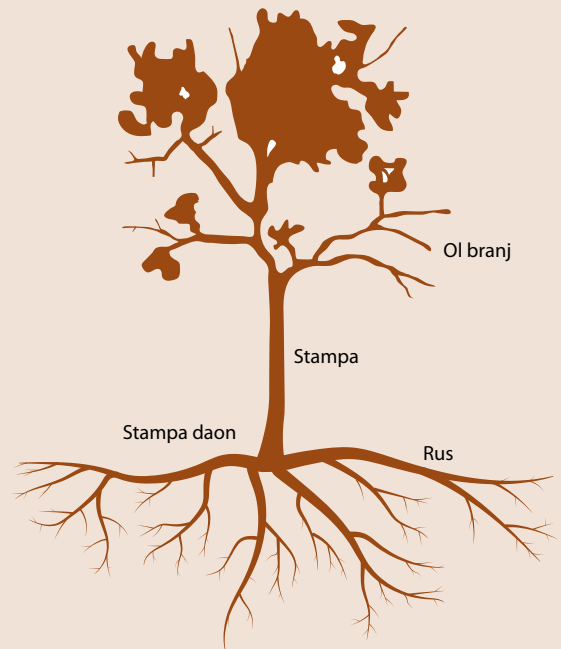


Fig 9.4 Natora oel i stap insaed long ol rus, stampa daon, stampa, mo ol mein branj blong sandelwud tri

9.4 Oil referens

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10 Haves blong sandelwud mo ol fes prosesing

10.1 Haves blong sandelwud

Taem we bae i tekem blong developem inaf natora blong havestem i difren bitwin ol tri mo envaeromen we oli kro long hem. Saes blong wan tri hemi wan gud saen blong soem weta tri i redi blong havestem o nogat. Minimam haves saes hemi 20cm daeamita long 0.2m AGL, we i ripresentem wan tri blong 20-25 yia.

Oel i plante long ol rus mo long stampa blong sandelwud tri, mekem se oli mas dikimaot tu ol stampa mo rus blong save winim bigfala valiu long wan tri. Natora i stap tu long ol branj blong ol olfala tri be i nogat tumas long ol tri we i gat 15–20 yia.

Ol fama ol nid blong tingabaot tu kost mo lojistik blong provaedem sekiuriti mo proteksen blong ol tri taem oli kasem saes blong haves. Ol man i save stilim ol tri taem oli stat blong kasem 12-15 yia, speseli olgeta we oli kro kwik.

Blong save sapos tri i redi blong havestem i nidim wan asesmen blong developmen blong natora. Yu save mekem asesmen long 3 difren wei:

1. mekem ol smol kat long ol branj
2. mekem ol smol kat long ol rus
3. dril i ko insaed long stampa (20 cm AGL) wetem wan smol drilbit (6mm) (Figa 10.1).

Blong kaedlaen (oli tekem long Thomson et al. 2020), yu save havestem sandelwud afta we oli rijim 17-20 yia, wetem wan daeamita blong 25cm klosap long beis (20-30cm antap long kraon) mo taem sapwud hemi andanit long 5cm. Driling i save kosem isiu wetem ol insekt mo fankes we oli save ko tru long hol, be long wan gudfala strong tri skin i save krobak kwiktaem blong kavremap soa.

Fig 10.1 (foto long narasaed pej) Oli tekem wan sampol blong jekem level blong developmen blong natora long wan *S. yasi* tri long Fiji



Figa 10.2 Fasin blong havestem sandelwud

Ol pikja long Figa 10.2 oli soem olsem wanem oli havestem sandelwud:

1. **Mesarem stampa blong tri** stret long jes 20cm AGL blong faenemaot ol tri blong katem.
2. **Jekem tri** blong luk sapos i gat inaf natora blong havestem.
3. **Katemaot kanopi** mo ol branj wetem bus naef blong kolektem ol branj mo blong mekem se i nogat tumas damej long ol tri taem hemi foldaon.
4. Tri i redi blong foldaon mo dikimaot.
5. **Katem daon** long jenso mo katem i ko long sotsot pis (ol lok) afta o bifo yu dikimaot ol rus blong hem.
6. **Dikimaot ol rus**, wetem savel.
7. Redi blong katem mo kolektem ol rus we oli kliarem gud i stap.
8. Redi blong skelem ol rus we oli katemaot finis.

10.2 Ol fes prosesing

Blong salem sandelwud oli mas skelem. Bifo oli salem, hemi wan rikwaeamen blong oli mas katemaot sapwud we i raonem natora. Hemia oli katemaot wetem wan bus naef. Proses ia i gat tufala wes prodak blong hem: ol piua sapwud jips mo nambatu kating jip (2CC), we tugeta ia oli save yusum blong mekem senta. 2CC hemi ol jip we i gat sam natora long hem mo oli laekem blong yusum olsem insens.



Figia 10.3 Kros-seksen blong sandelwud log (lef saed) i soem skin, sapwud mo natora; mo (raet saed) i soem natora afta we skin mo sapwud i kamaot.



Figia 10.4 Katemaot skin mo sapwud (lef saed), ol sapwud jips olsem wan bae-prodak (raet saed)



Figia 10.5 Sekenri manuol prosesing blong sandelwud – oli karemaot evri saen blong sapwud long natora.

10.3 Prodaktiviti

Long wan hekta blong sandelwud we oli planem long wan speising blong 4 m x 5 m, i save gat 330 tri we i redi blong havestem. Sapos yumi tekem se amaon blong sapwud mo natora (wanwan hemi 18 kg) mo 1.5 kg blong 2CC, amaon blong sapwud mo blong 2CC bae hemi 6 mo 0.5 tan long wan hekta.

Praes blong sapwud mo 2CC hemi lo mo i save kodaon moa taem we i gat tumas saplae. Hemia i no semak long praes blong natora blong sandelwud. Disisen blong salem tufala lo kred prodak ia i dipen long ol man we oli planem sandelwud mo oli no sud inkludum ol prodak ia long kalkuleisen blong olgeta.

10.4 Referens

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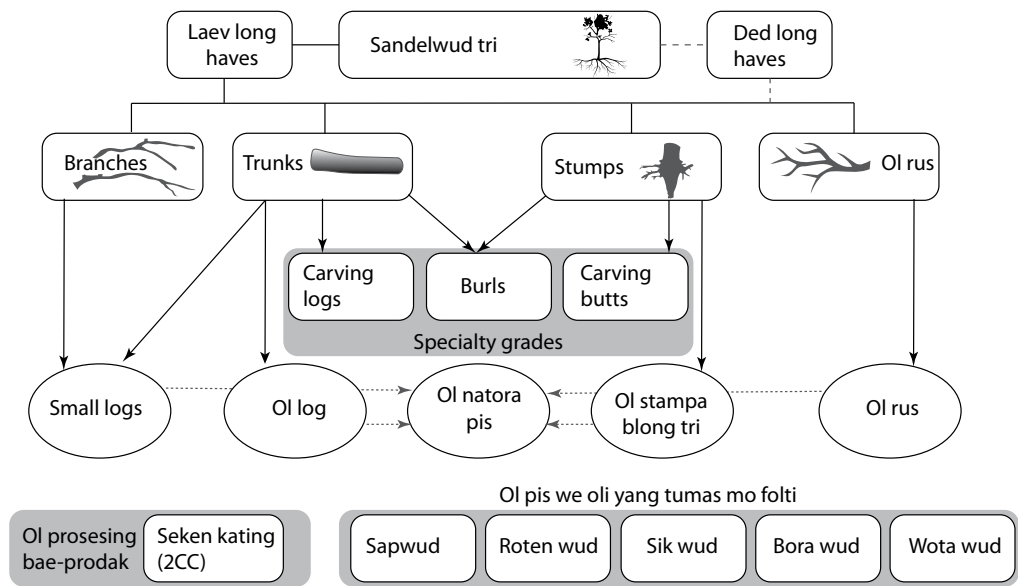


11 Kreding sistem blong ol prodak

Sandelwud kreding sistem i beis long tri strakja. I gat 4 praemeri katekori mo ij wan i gat on kred blong hem (Luk Figa 11.1). Konsentresen blong oel mo totol santalol kontent blong ol natora oel i hae long ol beis blong tri (ol bigfala rus mo stampa blong tri). Taem yumi muv i ko antap bae kontent blong olgeta i drop. Yu save luk hemia long sandelwud kreding sistem daon ia. Sistem ia oli yusum blong ol tri we oli laef yet long taem blong haves.

Ol 4 praemeri katekori i gat (Figa 11.1):

- **Speieli** – hemi produs meinli long ol olfala tri we oli bitim 20 yia mo hemi gat valiu blong ol samting blong flasem ples. Ol kaving lok blong hem oli bigwan mo li naf blong wan atis i save kavem i kam wan naes samting. Ol spesielti kred oli gat tu ol not o joen long timba we oli save haelaetem long ol difren najurool pis we oli yusum blong flasem ples. Nekosiesen bitwin man blong pem mo man blong salem bae i talemaot praes blong spesielti kred.
- **Tipikol** – Ol komon komesiol kred truaot long fulap tri mo ol difren kaen ej tri.
- **Folti** – Ol natora prodak we insekt i afektem, kred i kodaon, o natora i no kro gud. Ol folti pis ia oli gat lo valiu mo folti stetas blong olgeta i kanselem eni kreding blong tri we hemi kamaot long hem.
- **Ol bae-prodak** – Ol prodak we oli kamaot tru long proses blong aotem wota blong wud. Pua sapwud we i kamaot long taem ia i gat smol komesiol valiu nomo.



Figa 11.1 Ol sandelwud prodak oli beis long strakja blong tri long 4 prodak katekori: (1) spesielti; (2) tipikol (insaed ol ovol); (3) folti; mo (4) ol bae-prodak

Tekem not: ol das laen oli ol koneksen we i no komon long ol tropikol sandelwud spisis. Ol dot laen i soem se ol natora pis ia i save kam long eni tri.

11.1 Ol tipikol kred blong sandelwud

Wan simpol faef-kred sistem blong ol **tipikol sandelwud** katekori.

1. Ol pis stampa blong tri

Seperetem stampa long rus afta we evri sapwud i aot. Longwan blong stampa hemi stat long 15 cm antap long kraon level. Oli klasem olgeta olsem smol (andanit long 10 cm stampa seksen long kraon level – Figa 11.2) mo bigfala (bigwan bitim 10 cm stampa seksen long kraon level – Figa 11.3). Ol smol-saes stampa blong sandelwud i kamaot fulap taem long ol yangfala tri mekem se oel konsentresen mo komesiol valiu blong olgeta i smol tumas taem yu komperem wetem ol bigfala-saes stampa blong tri.



Figa 11.2 Ol smol stampa blong sandelwud/stampa seksen we i no bitim 10 cm long kraon level



Figa 11.3 Ol bigfala stampa blong sandelwud/stampa seksen we i bitim 10 cm long kraon level

2. Ol rus

Ol solid rus – oli karemaot evri sapwud (Figa 11.4)



Figa 11.4 Ol solid rus – oli karemaot evri sapwud

3. Ol lok

Ol bigfala daeamita seksen blong branj we i nogat wota blong wud mo ol natora stampa we oli longfala blong 30-100 cm mo andanit long 10 cm long daeamita long smol en (Figa 11.5).



Figa 11.5 Ol lok – ol bigfala daeamita seksen blong natora stampa we oli karemaot wota finis mo oli longfala blong 30-100 cm long mo 3.5-10 cm long daeamita long smol en (Figa 11.6).

4. Ol smol log

Ol smol-daeamita seksen blong branj mo stampa natora we oli karemaot wota finis mo oli longfala blong 30-100 cm long mo 3.5-10 cm daeamita long smol en (Figa 11.6).



Figa 11.6 Ol smol wud - ol smol daeamita seksen blong branj mo stampa natora we oli karemaot wota finis mo oli longfala blong 30-100 cm long mo 3.5-10 cm daeamita long smol en.

5. Ol natora pis

Wan sinkel kred blong ol pua natora pis, smolmol pis, smol branj mo doti. Ol smol pis natora we oli no fit insaed long katekori blong spesielti, tipikol o folti kred (Figa 11.7).



Figa 11.7 Ol natora pis - wan sinkel kred blong ol pua natora pis smolmol pis, smol branj mo doti we oli no fit insaed long katekori blong spesielti, tipikol o folti kred.

11.2 Prosesem ol bae-prodak

1. Seken kating jips (2CC)

Wan **bae-prodak** we i kamaot long seken stej blong proses blong karemaot wota long wud, we ol wokman nao oli stap wokem (Figa 11.8).



Figa 11.8 Ol seken kating jips – wan bae-prodak taem oli karemaot wota blong wud afta we skin i kamaot finis; fulap taem hemi gat 1:1 resio blong natora mo sapwood.

11.3 Ol kred blong sandelwud we i yang tumas mo folti

Faef kred bakegen we oli diskraebem olsem ol **imajiua (yang tumas) mo folti** natora prodak. Komesiol valiu blong ol prodak ia i lo.

1. Sapwud

Wud blong ol tri we i yang tumas mo i nogat gudfala natora (Figa 11.9). Sapwud hemi lo-valiu waet-kala aostsaed leia blong wud long ol bigfala tri we i nogat oel, mo hemi wan bae-prodak tu blong proses blong karemaot wota blong wud. Sapwud i fulap long ol yang tri mo yu save faenem long ol branj blong ol bigfala sandelwud tri.



Figa 11.9 Sapwud – ol aota leia blong wan bigfala tri o wud blong wan yangfala tri we i nogat gudfala natora.

2. Roten wud

Natora we i gat bigfala eria we i nogud, fulap taem from wota o disis i ko insaed long wud (Figa 11.10).



Figa 11.10 Roten wud - natora we i gat bigfala eria we i nogud, fulap taem from wota o disis i go insaed long wud.

3. Sik wud

Sik i afektem natora blong tri, speseli ol fankes disis we i kam long kraon olsem *Phytophthora* spp. mo *Phellinus* spp. (Figa 11.11). Fulap taem long medel blong tri i infekted mo i kro nogud.



Figa 11.11 Sikwud – sik i afektem natora blong tri, speseli ol fankes disis we i kam long kraon olsem *Phytophthora* spp. mo *Phellinus* spp.

4. Wotawud

Sandelwud natora developmen we i no komplit, i olbaot o i gat kil (transisen wud), o natora i kasem damej (Figa 11.12). Oli saspektem se prodak ia i olsem from saeklon damej. Oli save hem olsem wotawud, from ol ona oli stap luk se wota kontent blong hem i hae taem oli havestem.



Figa 11.12 Wotawud - sandelwud natora developmen we i no komplit, i olbaot o i gat kil (transisen wud), o natora i kasem damej.

Tekem not: Oli stap ting se prodak ia i olsem from saeklon damej.

5. Borawud

Natora wetem evidens blong insekt atak o bora damej.

11.4 Spesielti natora

Tri kred i diskraebem ol **spesielti natora** prodak.

1. Ol kaving lok

Ol ful-klin natora log we oli karemaot wota finis mo i gat wan smut sefes, wetem wan minimam daeamita long smol en blong 10 cm. Minimam blong longsaed blong hem i 20-30 cm mo maksimam i 120cm. I mas komplit, mo long seip blong sekel long kros-seksen mo i nogat hol, krak o not (Figa 11.13). Evri sapwud mo transisen wud i mas aot blong mekem se natora nating nomo i stap. I nid blong silim ol en wetem kliia 'end sealer' (Coakley 2007).



Figa 11.13 Ol kaving lok we oli karemaot wota finis (lef saed), mo ol ful-klin log (raet saed).

2. Stampa blong tri blong kaving

Ol pis wud we i kam long stampa blong tri, blong mekem ol artwok. Valiu blong ol kaving ia bae i dipen long agrimen blong produsa mo man we i stap pem.

3. Ol not

Ol natora pis we i had blong faenem wetem wan gren blong wud we i fاسfas. Ol kaen ia i mekem ol naes paten we oli save yusum blong art mo ol kaving pis. Ol kaen not ia oli save fom from sam kaen baeoljokol infeksien we oli no mekem wud i roten (Figa 11.14). Praes blong ol not ia bae i dipen long akrimen blong produsa mo man we i stap pem.



Figa 11.4 Ol not oli kro aot long stampa (lef saed) mo oli fomem ol pis wud blong flasem ples we i had blong faenem (raet saed).

11.5 Referens

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12 Prosesem sandelwud

Kaving lok i atraktem haeis praes long maketples, finis oel, afta natora paoda. Be hamas profit wan prodak i karem i dipen tu long kost blong prodaksen.

Evri prodak i nidim blong sapwud long aotsaed i mas kamaot. Wok ia havesta o fama i mekem bifo oli salem prodak. Fulap taem ol bisnis blong sandelwud ol karemaot moa wota blong wud afta we oli pem sandelwud blong karemaot eni saen blong sapwud klosap long natora. Faenel proses ia i prodiusum wan bae-prodak we oli kolek ol seken kating jips (2CC), we hemi wan miks blong wota blong wud (sap) wetem natora.

Kost blong karemaot wota long wud i dipen long seip blong natora. Fulap taem kost blong prosesing blong ol kaving lok i daon moa from oli gat fulap natora we i seip gud, mo kost i stap hae nao blong ol yangfala tri, ol branj mo ol rus. Blong ol kaving lok, oli stap silim ol en (oli stap yusum waks) blong mekem i no drae kwiktaem tumas mo save krak.

Paoda wud i nidim ekstra miling mo blending blong ol difren paoda blong ajivim wan faenol prodak we i gud blong yusum long agarbatti.

Sandelwud oel hemi mos ekspensiv prodak blong prodiusum from oli mas milim natora long wan konsisten kred bifo oli karemaot oel wetem wan proses we i kompliketed mo i yusum fulap eneji – proses ia oli kolek distilesen. Oel kontent blong natora we oli milim i jenj (oli skelem), be long top-kwaliti natora bae hemi sam ples long 3-4%.

Long distilesen, oli mekem stim long wan boela we i ron long mazut, kokonas oel, wud o elektrisiti. Stim ia i pas tru long paoda natora afta i miks wetem natora oel. Afta oli kulumdaon mo kondensem miksja ia, mo mekem oel i fomem wan leia antap long wota. Distilesen i save tekem fulap dei blong karemaot evri oel long natora.

Prodaksen blong hae-kwaliti oel i nidim wan hael level blong eksperiens mo save. Mekem se praes blong oel i inkludem kost blong natora mo ol nara input olsem bensin mo leba – risen ia nao i mekem se praes blong oel i bigwan bitim natora paoda. Hae input kost blong oel prodaksen i save mekem se profit i no bigwan tumas blong sam prosesing bisnis.

12.1 Oli proses prodak

1. Oli natora jips

Natora we oli katem long ol sem saes spesifikesen (kred) we oli yusum long distilesen blong ol oel (Figa 12.1).



Figa 12.1 Oli milim natora i ko long sem saes spesifikesen (gred) blong 3–5 mm jips, we oli yusum blong ekstraksen blong oel.

2. Natora paoda

Oli kranem natora i ko paoda blong yusum blong mekem ol jos stik mo ol nara insens prodak (Figa 12.2 mo 12.3).



Figa 12.2 Oli kranem natora i ko paoda blong yusum blong mekem ol jos stik mo ol nara insens prodak.



Figa 12.3 Oli prosesem agarbatti

3. Oli natora oel

Oli oel we oli smel gud we i kamaot long natora wetem solvent ekstraksen, wota o stim distillesen, o supakritikol ekstraksen (Figa 12.4 mo 12.5).



Figa 12.4 Oli karemaot oel blong sandelwud tru long ekstraksen long natora mo hemi kam long ol difren kala (laet drae kras kala ko kasem dak hani braon kala).

Tekem not: Blong atraktem wan gudfala praes, natora we oli karemaot oel long hem i sud gat hae oel kontent (>3%) mo wan hae kombaen α - mo β -santalol kontent we i bitim 50%.



Figa 12.5 Oli yunit blong sandelwud distillesen we oli stap tritim ol jips wud wetem presa stim blong rilisim oel we i stap insaed.



13 Moa riding

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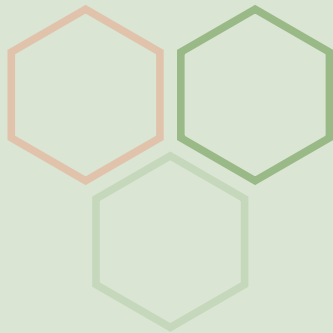
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