

Fertilization Investment Analysis (inc-IRR) using TIPSY-FAN\$IER



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Incremental IRR (Internal Rate of Return)

- Inc-IRR is the Ministry's preferred method for assessing investments against its 2% return threshold.
- It is the incremental return on fertilization over and above the base case (without fertilization), ignoring sunk costs.
- TIPSY and FAN\$IER work together to calculate inc-IRR.

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In General

- More stands will show a net positive return with fertilization using single-regime (treated case only) analyses for NPV and SV, e.g., textbook full-rotation crop planning.
- Inc-IRR helps focus on prescriptions that will provide high incremental return in existing stands, ignoring sunk costs, e.g., late-rotation fertilization, etc.

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Resources & Support

<http://lbis.forestpracticesbranch.com/LBIS/node/874>

FFT ROI Website contains:

- TIPSY download link (includes FAN\$IER)
- *Two tutorial videos*
- **PDF:** Using TIPSY 4.3 and FAN\$IER in FFT ROI Calculations (2013)
Site rehab focus, but same basic principles.
Fert is an “Existing Stand Treatment”.
- **PDFs:** Worked examples for coast and interior (2017).

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TIPSY Fertilization Defaults

Application rates associated with default TIPSY responses:

- Fdc 225kg N/ha
- Ss 250kg N + 100kg P/ha (uses Fdc response model)
- Cwc No response (Fdc model may be applied manually)

- Pli 200 kg N (+ 50kg S/ha where deficient);
for 150 kg N reduce efficiency by 25%, i.e., to 60%
- Sw (Sx) 200kg N/ha
- Fdi 200kg N/ha (response only in ICH)
- All others No response

TIPSY fertilization response lasts 10yrs.

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4 Basic Steps

From PDF:
Using TIPSY 4.3 and FAN\$IER in FFT ROI Calculations (2013)

- Step 1:** Produce TIPSY runs for two regimes:
unfertilized (base case) and
fertilized (treated case)
- Step 2:** Send both TIPSY runs to FAN\$IER
- Step 3:** Configure both regimes in FAN\$IER
- Step 4:** Check inc-IRR results in the Compare Tab

Briefly, here's what it looks like

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Step 1a: TIPSy Base Case

Stand Geography Settings:

Project Title and Stand Geography

Project Title
Experimental

Forest Region: Southern Interior

Forest District: Central Cariboo

Biogeoclimatic Zone: SBS
 All Zones Regional

Average Slope: 10 %

Buttons: Help, Use Defaults, OK, Cancel

- Do not affect on yield.
- Only control default costs in FAN\$IER (silv, harvest, etc)

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Step 1a: TIPSy Base Case

Species Specifications:

Species	Percent Composer (%)	Site Index (m)	Site Index Reference Status	Stock Height (cm)	Genetic Worth (%)	Fertilization Response	OAFs
Western Douglas-fir	10	22.03	reference species	N/A	N/A	None	No
White Spruce	10	22.41	conversion	N/A	N/A	None	No
Lodgepole Pine	10	22.78	conversion	N/A	N/A	None	No

Multiple Species option aggregates pure stands for forest-level planning. It is NOT VALID for mixed-species SILVICULTURAL applications.

Buttons: Help, OK, Cancel

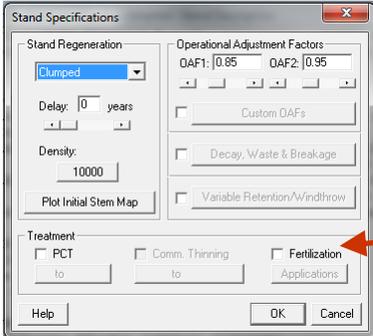
- Species Composition (fixed)
- Site Index
 - From reference spp, or
 - User defined
- Genetic Worth (if planted)
 - None (old or unknown)
 - Std Class B = 5%
 - Class A, planting records
- Species Fertilization Response
 - Definitions, not the trigger
 - View default responses
 - Interactive (custom one-off)
 - Input file (custom reusable)

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Step 1a: TIPSY Base Case

Stand Specifications:



- Regen Method
 - Planted (~ rows)
 - Natural (purely random)
 - Clumped (slightly)
- (regen) Delay
- Density (initial establishment)
 - Known, or
 - Estimated by trial & error from surveyed age & total tree count
- OAFs std 0.85 & 0.95 (TSR etc)

● **Fertilization (the trigger)**

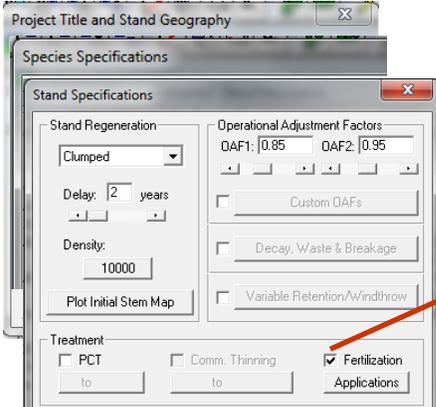
- But not yet, unless there was a previous application(s)

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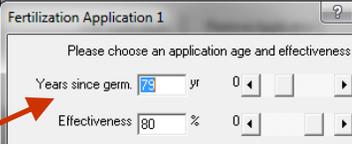
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Step 1b: TIPSY Treated Case

Just duplicate Base Case Settings (File - Save As) and Add Fertilization:



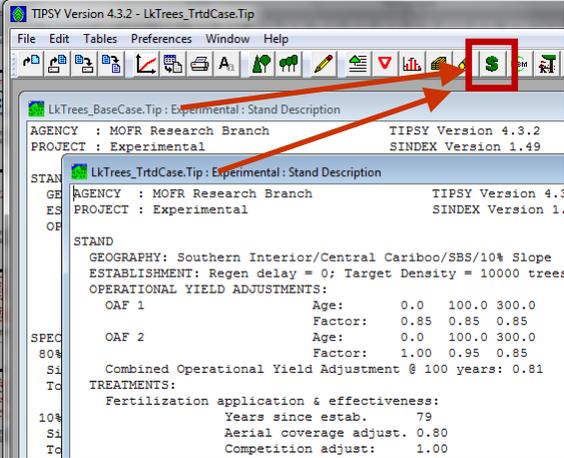
- Check the Fertilization box
- Enter timing (years since germination)
- Std operational effectiveness (80%)



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Step 2: Send both to FAN\$IER



The screenshot shows the TIPS Version 4.3.2 interface. The menu bar includes File, Edit, Tables, Preferences, Window, and Help. A toolbar contains various icons, with a 'Send' icon (a green square with a white dollar sign) highlighted by a red box. A red arrow points from this icon to the 'Send' button in the FAN\$IER interface shown in the next slide.

LkTrees_BaseCase.Tip : Experimental : Stand Description
AGENCY : MOFR Research Branch TIPS Version 4.3.2
PROJECT : Experimental SINDE Version 1.49

LkTrees_TrtCase.Tip : Experimental : Stand Description
AGENCY : MOFR Research Branch TIPS Version 4.3.2
PROJECT : Experimental SINDE Version 1.49

STAND
GEOGRAPHY: Southern Interior/Central Cariboo/SBS/10% Slope
ESTABLISHMENT: Regen delay = 0; Target Density = 10000 trees
OPERATIONAL YIELD ADJUSTMENTS:
OAF 1 Age: 0.0 100.0 300.0
Factor: 0.85 0.85 0.85
OAF 2 Age: 0.0 100.0 300.0
Factor: 1.00 0.95 0.85
Combined Operational Yield Adjustment @ 100 years: 0.81

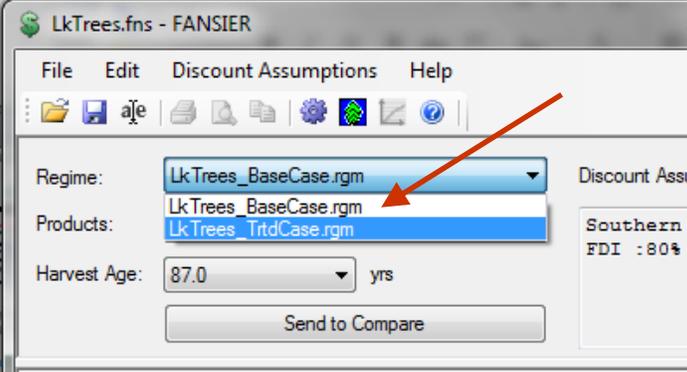
SPEC
80%
Si
To
TREATMENTS:
10%
Si
To
Fertilization application & effectiveness:
Years since estab. 79
Aerial coverage adjust. 0.80
Competition adjust: 1.00

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Step 3: Configure both in FAN\$IER

Select and configure both regimes, one at a time:



The screenshot shows the FAN\$IER interface. The 'Regime' dropdown menu is open, showing 'LkTrees_BaseCase.rgm' as the selected option and 'LkTrees_TrtCase.rgm' as the highlighted option. A red arrow points to the 'LkTrees_TrtCase.rgm' option. The 'Products' dropdown menu is also open, showing 'LkTrees_BaseCase.rgm' and 'LkTrees_TrtCase.rgm'. The 'Harvest Age' is set to 87.0 yrs. A 'Send to Compare' button is visible at the bottom.

LkTrees.fns - FAN\$IER

File Edit Discount Assumptions Help

Regime: LkTrees_BaseCase.rgm
Products: LkTrees_BaseCase.rgm
LkTrees_TrtCase.rgm
Harvest Age: 87.0 yrs

Discount Assu
Southern
FDI : 80%

Send to Compare

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Step 3: Configure both in FAN\$IER

Same 3 settings for both Base & Treated Cases:

- Products = Logs (coast)
Lumber (interior)
- Harvest Age
- Age at Base Year = Fert age + regen delay
- Ignores sunk costs

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Step 3: Configure both in FAN\$IER

For the Treated Case, edit Fertilization cost in the CostsTab:

- Select User Specified
- Enter (Fert + App) Cost
- Enter dollar Year (e.g., cost in 2016 dollars)

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Step 4: Send both to Compare and check inc-IRR

Select and send each regime to the Compare Tab:

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Step 4: Send both to Compare and check inc-IRR

Regime	Base Case	Treated Case	Comparison
Regime	LkTrees_BaseCase.rgm	LkTrees_TrtdCase.rgm	
Products	Lumber & Mill Residues (Pre Adjustments)	Lumber & Mill Residues (Pre Adjustments)	Lumber & Mill Residues (Pre Adjustments)
Discount Assumptions	Fansier Defaults	Fansier Defaults	Fansier Defaults
Harvest Criteria	Manual	Manual	Manual
Harvest Age (yr)	87 (2025)	87 (2025)	87 (2025)
Early Stand Replacement	no (click here)	no (click here)	no (click here)
Age at Base Year (yr)	79	79	0
Discount Period (yr)	8	8	0
Discount Rate (%)	4.000	4.000	0.000
Discounted Benefits (\$/ha)	75,275	77,197	1,922
Discounted Costs (\$/ha)	24,228	25,235	1,007
NPV (\$/ha)	51,047	51,963	915
Site Value (full rotation) (\$/ha)	1,931	1,973	42
Volume (m ³ /ha)	393	402	9
IRR (%)	No Treatment Costs	86.624	
FTT Incremental IRR (%)	----	----	18.808

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Repeat Fertilization

- Given annual funding constraints, repeat applications are funded and analyzed separately, with previous applications included in base cases.
- TIPSY models repeat applications independently (same response magnitudes), and applications <10yrs apart truncates the previous response.
- Lower expectations for subsequent applications can be adjusted with the Effectiveness setting. E.g., if the second application's response is expected to be half of the first, adjust its Effectiveness value by multiplying the first's by 0.50.

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That's it. Questions?



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