# Beer-bottle tops: a practical exercise on forest inventory and management

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## Beer-bottle tops: a simple forest management game

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SUMMARY

Forest planning and management concepts can sometimes be difficult to grasp. Games provide an effective way to demonstrate different concepts and facilitate deeper understanding of approaches and practices to sustainable forest management. In this paper we describe a game devised to demonstrate alternative ways to set allowable harvest levels in large (>10,000 ha) native forest planning units. The game requires minimal materials (photocopies of relevant maps and a few hundred beer bottle tops), and can be played and debriefed in 2-3 hours. The game focuses on the principles underlying area control and volume control of timber harvesting, and provides a basis for discussion of inventory and monitoring needs. The game has been popular and effective in courses for forestry professionals in developing countries, and for students in an undergraduate forestry course.

# Exercise objectives

Aims to demonstrate some forest inventory concepts and practices in a simple engaging way

1. Control the **AREA** harvested each year
   - 1662 in Evelyn's *Silva*: "*… divide the Woods, and forests, into eighty partitions; every year felling one of the divisions*"
   - This is simple to do – just harvest an equal area each year
2. Control the **VOLUME** harvested each year
   - Need to do a simple inventory first (the inventory is relevant)
   - Then calculate a simple sustainable yield and aim to harvest that each year

# Instructions– 1) Area control

Set up the game by putting the beer bottle tops flat-side down and crown-side up. Each top covers 1,000 hectares of forest and there are 160 tops across the whole “mystery” island (160,000ha). Malakula is about 204,000 ha, Efate is 90,000ha

1. **For AREA control:**

- participants take turns to harvest the forest by removing 4 tops each “year”, for each of the 40 years representing the years of the cutting cycle, and record the volume of wood harvested (calculate this from the colour code for the volume on the back)
- Blue = 10m3/ha, Black = 20m3/ha,
- White = 30m3/ha, Plain (no coloured dot) = 50m3/ha

# Harvest the forest!

2. Participants now take turns to remove tops, aiming to harvest only 80,000 each year. for each of the 40 years representing the years of the cutting cycle
3. record the volume of wood harvested (calculate this from the colour code indicating the volume on the back)

- Blue = 10m3/ha, Black = 20m3/ha,
- White = 30m3/ha, Plain (no coloured dot) = 50m3/ha

# Key questions AREA control:

- Did the harvest last for the full replacement cutting cycle, or was it exhausted prematurely?
- Was the harvest an even-flow, good for a stable industry, or did it vary greatly from year to year?

# Instructions: Volume control

Put all the tops back on the map flat-side down and crown-side up.

1. **This time control the harvest by VOLUME:**
2. **You need to do an inventory of the forest first:**
   a. First, do a sample inventory of the forest by selecting **2 tops** and turning them over to find out the volume

      E.g. 1 white top = 10, + 1 black top = 30, so sample = 40m3
   b. Assume your 2 tops are “average” and represent the whole forest which is 160 tops in total area. So to get the total forest volume you multiply the volume you got for the 2 “inventoried” (e.g. 40 cubic metres per ha) times x 80 (160 total/2) = 3,200,000m3

# Do the inventory then Harvest the forest!

2. Calculate the allowable cut (annual harvest) by choosing a cutting cycle that you think the trees will regrow (in PNG they used 40 years), so 3,200,000 divided by 40 = 80,000 m3/year
3. Participants now take turns to remove tops, aiming to harvest only 80,000 each year. for each of the 40 years representing the years of the cutting cycle
4. record the volume of wood harvested (calculate this from the colour code indicating the volume on the back)

- Blue = 10m3/ha, Black = 20m3/ha,
- White = 30m3/ha, Plain (no coloured dot) = 50m3/ha

# What are the results using Volume Control?

1. Was the harvest volume an even-flow?
2. Did it vary more or less than in the area control method or did it vary greatly from year to year?
3. If the latter, what could be done to help smooth the variations in volume harvested?
4. How much did the harvested area vary from year to year, and can this be accommodated operationally?
5. Did the harvest last for the full cutting cycle, or was it exhausted prematurely?
6. If the latter, why?
7. Was the inventory adequate?
8. What could be done to make sure that the harvest can be sustained for the full cutting cycle?

# Exercise results

What happens when you used the two methods:

1. Control the **AREA** harvested each year
   - This is easy to monitor (in theory), but in practice leads to a fluctuating harvest as each area has different volume
2. Control the **VOLUME** harvested each year
   - results in more stable harvest volumes but more complex (needs inventory)
   - BUT if the initial estimates of volume per hectare or total standing volume are too high then the whole area will be cut over before the planned cycle time.