# The average carbon-stock approach for small-scale CDM AR projects

*B. Schlamadinger, D. N. Bird, I.M. Emmer, J. Garcia, B. Muys, Z. Somogyi*

Harvesting forms an integral part of many forestry activities, involving a significant temporary reduction of carbon stocks. A small-scale CDM project could consist of a single forest stand where all accounted carbon may be removed during a harvesting operation and the time-path of carbon stocks will typically look as in the hypothetical example given in figure 1. The problem with such a project is that it would create lCERs (long-term) or tCERs (temporary) initially, but each time harvesting occurs, some if not all of the lCERs would have to be replaced.[1]

**Figure 1. Rotation periods in a forest stand**

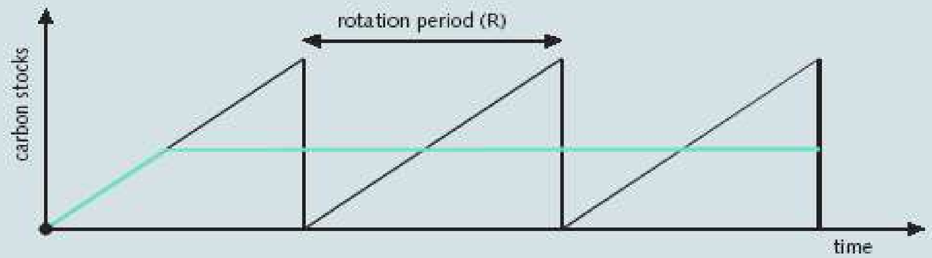


Figure 1 shows a hypothetical forest stand with rotation length R years. Time-average carbon stocks (horizontal green line) versus actual carbon stock (black line). The red line follows the actual carbon stocks, until the average carbon stock has been reached.

There are 2 options to address this issue:

a.) If the project area consists of many stands of different age, the growth and harvest rate match each other and only small fluctuations of carbon stocks exist. Hence, no replacement will be necessary.However, especially for small-scale projects, this may not be feasible.

b.) A simplified approach for carbon accounting in small-scale projects that are subject to significant variability in carbon stocks over time.

The latter should be a non-mandatory option, which leaves the possibility for projects without thinning or harvesting to use accounting based on actual sequestration over the entire lifetime if thisis more appropriate. The aim of the simplified approach is both to reduce transaction costs by simplifying carbon crediting, and to reduce the need for scheduling harvest operations just for the sake of avoiding carbon debits. The issuance of lCERs will be based on the timeaverage carbon stock, shown by the green line in Figure 1. This line follows the actual growth of the project until the average carbon stock has been reached and,subsequently, stays constant at the level of the average carbon stock.

Generally, the average carbon stock is calculated as the mean carbon stock over a number of rotations. If any rotation goes, at least partly, beyond the project's end it will be excluded from the calculation, thus avoiding a random influence on the average carbon stock resulting from the arbitrary position of the project end relative to the end of a rotation period. This may cause a disincentive to plan rotations for the best silvicultural results and it would be an incentive to plan the rotations to fit exactly in the CDM project lifetime, e.g. a 4th rotation period, which falls only partly within the CDM project, would lower the carbon average. Project developers in order to optimize a project, will thus always try to end their project on the day afterharvesting. The CDM EB might consider projects with a 'forced' fit between rotation length and 20 or 30-year lifetime not to be long-term sustainable, thus 'bad practice'.

In addition, each time the baseline is recalculated, for example, when a new 20-year installment of a project begins, the average carbon stock must also be recalculated - for the remaining years, *e.g.*in case the project involves 4 rotations of 8 years, the 3rd rotation period will be only half way at 20 years. For the remaining 1.5 rotation periods over the next 20 years a new average must be calculated.

The time-average carbon stock must be determined and reported as part of the project design document, and has to use verifiable information, and be based on assumptions about tree species, climatic conditions, soil type, management regime, *etc.* Monitoring would then have to determine if the variables used to calculate the average carbon stock are indeed correct, and if adjustments to the predicted average carbon stock are required.

Should a project choose to make use of the simplified procedure, then the project would only create lCERs during the 'ramp up' period (increase in the green line). Should monitoring show that the average carbon stocks are greater than predicted, additional lCERs could be generated. Vice versa, lCERs would have to be replaced if the average carbon stock is less than expected, *e.g.* due to a decrease in the harvest cycle length, a decline in growth rates, if the project fails to regenerate the forest after harvesting, or in case of a natural disturbance (*e.g.* fire, pests, droughts). However, if the subsequent land use is an attempt to regenerate the forest, then a portion of the lCERs could still be retained, thereby serving as an incentive to enhance successful forest regeneration after disturbance.

Thinning of a forest stand affects the average carbon stocks over the entire harvest cycle. The thinning process is usually a silvicultural requirement to grow a healthy forest stand. It is a normal part of forest management and, therefore, can be accounted for in advance. However, thinning can take place at a carbon-stock level below the average. If thinning happens before the average carbon stock has been reached, then monitoring may give 2 different sets of results. For instance, it is possible that from one monitoring event to the next (*e.g.* 5 years apart) the carbon stocks will still increase. In this case, lCER issuance can still be based on themethod described above. In the reverse case it is suggested that further lCERs should not be issued, nor should lCERs be retired, provided that the project is operating as planned. Otherwise there could be a disincentive to thinning, which couldhighly compromise timber harvest and other sustainable development objectives. We suggest the calculation of timeaveragedcarbon stocks to be accepted as a valid approach also for baseline calculations.

[1]For simplicity the discussion in this paper is restricted to lCERs.