A.J.H. Willems en C.F.W.M. von Meijenfeldt
Department for Forestry and Landscaping. Ministry for Agriculture, Nature Management and Fisheries

Don't fix on carbon fixation: The Netherlands as an example

Dit artikel is een Nederlandse bijdrage aan het 10e wereldbosbouwcongres dat van 17 tot 26 september 1991 te Parijs zal worden gehouden. Het congresthema is: Forests a heritage for the future. De toenenemende belangstelling voor het broeikaseffect heeft ook bos en bosbouw hernieuwd in de belangstelling gebracht in verband met het vastleggen van CO2. Deze vastlegging kan echter slechts een additionele bijdrage zijn aan het oplossen van het werkelijke probleem. Het broeikaseffect moet bij de bron worden aangepakt. Bebossingen die plaats zouden vinden met CO2-vastlegging als enige argument, gaan voorbij aan de belangrijke rol die bos ook op andere terreinen vervult. Er zou dan onvoldoende rekening gehouden worden met de maatschappelijke context, zowel in de gematigde streken als in de tropen. Dit artikel waarschuwt hiertegen en geeft voor Nederland een voorbeeld van een meer evenwichtige benadering. Pure koolstofvastlegging via bosbouw is niet gewenst.

The understanding of the role of forests in the Carbon-cycle of the planet earth, and especially its importance in relation to the greenhouse effect, is relatively new. Especially for most foresters, scientists and politicians the awareness of this role is growing. The important break-through in spreading of knowledge recently has been triggered by the so called Noordwijk-conference and Noordwijk declaration. In november 1989 about 70 ministers responsible for the Environment met in Noordwijk to discuss the climate problem of the world, as well as possible causes and solutions. Part of their aims focussed on forests and some points of their concluding declaration should be mentioned in this context.

Carbon fixation as a solution to the greenhouse effect is a widely discussed subject nowadays. Most policy makers and ecologists state that fixation should be considered as additional to the real solution: the reduction of the release of carbon dioxide and other greenhouse gases like methane, chlorofluorocarbons, ozone and nitrous oxide. Forestry and especially forestation, can also play its role in the fixation or better re-fixation strategy. It's very important though to estimate this role on its real merit. Furthermore creativity is required in applying forestry as a solution: forestry is always subject to discussion because of the fact that it has such a great impact on landuse systems and on people's needs all over the world.

Restraints: Biological and social

However important forests may be in the question of climate change, they are not the cause of this tremendous fenomenon, nor can they be the solution. Although they can contribute to (a part of) the solution, it should be clear that forests and forestry are not a technological solution for a social problem. There has to be a social solution at the same time. On the one hand this indicates the direction in which work should be orientated, on the other hand it limits the functional role of forests and forestry in this respect. Looking first at the theoretical, biological limits to which forests, and especially a radical stop of deforestation and aggressive reforestation, could be helpful, it seems obvious that without mankind on earth forests would rather fast reclaim most of the areas now in use for agriculture. And probably absorb almost all of the carbon dioxide which has been artificially added to the atmosphere during the last decades. But the planet isn't virginal and men are living on it, in even growing numbers each year. Assuming that the primary objective is to feed all these people one can calculate the area required for food production, now and in future. The area not used for food production could be used for forestgrowing. In practice, even this approach does not work: a huge area is needed for the growing of other non-food products and for other purposes. Nevertheless, in almost every country there is a certain area available for the growing of biomass to replace the use of fossil fuels. Afforestation of all these areas would not solve the whole problem of surplus carbon-emission to the atmosphere. It would not be sufficient to sequester all the carbon emitted by the burning of fossil fuels. Therefore, primary

task should be, now and in the future, to prevent emissions caused by the burning of fossil fuels. But preventing deforestation and stimulating forestation can also contribute considerably. As said before, preventing deforestation and promotion of forestation can only be seen in its social context. Any possible action taken in this field should be the result of a whole complex of economic, social, cultural, environmental and natural inputs. From place to place, these complex conditions will be different. And, therefore, possible actions will also vary from place to place. Only an approach based on these variations in circumstances can be succesful.

In the following the policy of the Netherlands in this matter will be presented. It should be noted that it is just an example and not at all meant to be a blueprint for other countries. However, the approach could be a guideline to others. As such this country to country approach was recommended by the forestry task group of the second World Climate conference, november 1990 in Geneva.

Possibilities for forestation and fixation in the Netherlands

If fixation is mainly considered a solution on the short term, the use of fast growing species is recommendable. This corresponds with the existing policy in the Netherlands concerning the grant scheme aiming at converting arable land into forest or non productive areas. This scheme was created in 1988 in order to lower total agricultural production and the costs associated with it, e.g. the EC subisidies on export of agricultural products. Both schemes are aiming at fast growing species in short rotations.The Dutch on the overall increment of the forest area which was already stipulated in the 1986 Moreyear Plan for Forestry, giving way also to hardwoods. The greenhouse effect has put new emphasis on forestation in the Netherlands, but a special CO2 planting scheme is not yet foreseen. However, we expect the existing schemes will be carried out at a higher or much higher pace, as the CO2 fixation is another motive added to the long list for forestation in the Netherlands. Fast growing species in this country are poplar (Populus sp.) and Norway spruce (Picea abies). The former can reach an average production in 15 years between 10 and slightly more than 20 m3/ha/yr, the latter about 10 to 12 m3/ha/yr in a rotation of 30 years. In terms of CO2 fixation this means that poplar has to be considered the best species. The average annual CO2 fixation of poplar in the Netherlands is: 15(m3 or ton product/year) * 0.35 (dry matter) * 0.45 (C fraction) * 44/12 (moleculair weight CO2) = 8663 kg CO2/ha/yr or 2363 kg C/ha/yr.

Numerous reasons for forestry and forestation

In the Dutch circumstances main reasons for forest-expansion, from the national point of view, were the lack of open-air recreational facilities in the vicinities of the main cities, the need for a smaller dependency on wood imports and the creation of self-sustaining forest-ecosystems (nature development areas). Also the creation of an attractive landscape plays a role, as well as creation of an attractive settlement-athmosphere for new industries and new population centres. These arguments have a more or less general validity, althoughy the differ in importancy from place to place and from locality to locality. The carbon sequestering capacities of new forests are a new, added argument. The value of this argument varies according to growth speed and type of forest. But it is applicable to every forest. Decisions on establishing new forests are normally a comparison of costs and benefits. Up till now planting schemes projected a net forest extension of about 2500 ha per annum until 2000. The additional argument of carbon sequestering surely adds a new aim to the existing schemes. The reason is a simple one. Money invested in planting trees is to a certain extent more cost effective than other possible measures for preventing CO2-emissions or sequestering it after emission. This is certainly true in regions where, in the previous circumstances, only a little money failed on the benefit-side to decide to plant. In regions where ground prices are low this is especially the case. If there is a price offered for the carbon sequestered, e.g. guilders per ton, the normal market forces will lead to a further expansion of the forest area, even in densely populated countries like the Netherlands. But, in the Dutch circumstances a CO2-sequestion can never be the sole reason for planting trees; it is only an additional argument which can dip the balance in favour of planting. In fact, the other arguments remain the basis of any analysis, because the needs of society for wood, recreation, protection and amenity will continue to be important and will probably even grow in importance.

The tropics and conditions for afforestation

Compared to the growth in the tropics the figures for the Netherlands are satisfactory. Recent literature mostly shows figures between 3 and 5 tons average per ha per year (Brown et al 1986, Wiersum & Ketner 1989) over the same period of time or longer.

The Dutch electricity generating company "SEP" is planning to plant forests in the Netherlands as well as in the tropics in order to compensate for the CO2 which is released while producing electricity. They also calculate with above mentioned figures.Their goal per ha per year is 4500 kg C. Because of the fact that the price of land is relatively high in the Netherlands, forestation can be achieved cheaper in the tropics. For these financial reasons SEP chooses to concentrate on the tropics. Main guideline for their forestation programm will be a report made by SEP and the Ministry for Agriculture, Nature Conservation and Fisheries. In this report it is emphasized that ecological and social conditions in which the forestation has to take place are essential. The new forests have to be planted:

- in accordance to the ecological circumstances;
- without any risk for causing major diseases or malfunctioning of adjacent areas, especially agricultural areas;
- on land that is not used as agricultural land or for other highly importand land use activities;
- on land which wasn't forest before, so as to avoid the risk of destroying forest pointing at the reforestation which is at hand;
- with the knowledge that after harvesting the forest will be replanted;
- in order to bring forth products that are beneficial to the people who are living in the forested area.

Another important issue in the discussed field has to be pointed at. How long will the CO2 fixation be lasting? Three strategies are possible. First of all the wood can be used as fire wood or for other energy reasons. In the case of power plants this would mean that an electricity company could produce their own wood for the production of electricity. This option will probably not be seen as realistic. Secondly the wood can be used for pulp, paper or paperboard.This more down to earth option has the following characteristic features. Short rotation forestry produces mainly short living products, the CO2 fixation per rotation does not last very long. Reforestation after the harvest however can keep the fixation on a high level. In the third option sawnwood or wood-based panels are produced.This goes with long rotation and long lasting products and fixation. The growing speed of the trees used in this option is lower and this option doesn't have priority when fixation on short term is desired.

Conclusion: CO2 as a new factor

Co2 is a newly acknowledged factor in forestry, in regional development and hopefully very much so at its sources in the industrialised world: industry, traffic. To some extent the CO2 fixating capacity of forest can be an extra stimulating factor and maybe even the decisive push in the back for forestry projects. On the other hand it would be dangerous if CO2 fixation would be the most important or even only goal for a forestry project. Forestry as a landuse activity and the use of forestry products as a logical and necessary element of society can not be pushed away by CO2 fixation. This would be at least as dangerous as the greenhouse effect.

Literature

Brown, S., Lugo A.E. and Chapman J., 1986: Biomass of tropical tree plantations and its implications for the global carbon budget. Canadian Journal Forestry Research vol. 16, pp. 390-394.

Wiersum K.F. and Ketner P., 1989: Reforestation, a feasible contribution to reducing the atmosferic carbon dioxide content? P.A. Okken, R.J. Swart, S. Zwerver (eds) Climate and Energy: The feasibility of controlling CO2 emissions. Dordrecht, pp. 107-124.

Summary

Forestry and Reforestation can be very important as a solution to the greenhouse effect. However, forests have always to be looked up on as a part of a landusesystem and as a vegetation type which plays a tremendous role in people's every day life. The fixation argument may and can never be the only reason for forestation. As a case the example of the Netherlands is presented.

* This paper will be presented at the Tenth World Forestry Congress, Paris, September 1991.

Keywords: CO2-fixation, forestation.