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Experiments with chemicals to check vegetable growth along the autostradas and highways in Germany

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All non-metalled parts of the road terrain, such as parts of the benchings and shoulders as well as the dams, cuttings, slopes, central reserves, and finally the interspaces at parking lots, at rest places, at connections, round-abouts and crossings are planted with grass. All these spaces, small in themselves, add up to a total of considerable extent, thus charging the Road Authorities with yet another problem.

So far the total extension of these spaces has not yet been measured out, but there can be no doubt that in numerous sections of the autostradas, especially in hilly countries, they make up a surface about twice as large as the surface of the actual road.

As road building goes on one can expect these green spaces in future to be still larger in proportion per road mile on an average than they are now. Modern building technics have made road building less dependent on the accidents of terrain and as a rule highways can now be built also in rugged landscapes without steep ascents or extensive detours. But this means deep cuttings and high dams. Modern traffic calls for a steadily growing number of generously dimensioned connections, crossings as well as for more and more parking lots and resting places. And finally more and more highways have to be enlarged to dual carriage roads with green belts as central reserves to segregate directions.

Only 15 years ago maintenance work of these green spaces along the highways could in the main be confined to sections were the highways passed near or through built up areas. In the open country they were no problem. If these spaces were of any size farmers would gladly undertake to cut the grass regularly, although the quality of the grass was by no means first class in most of the places and even for the narrow center bands one could always find people only to glad to use this grass for their rabbits or other small domestic animals. Today the situation has changed completely. There is hardly any demand for grass growing along the highways. Not only because these slopes are often very steep, difficult to get at and hard to mow and because, on the other hand, thanks to the general prosperity the number of those who keep small domestic animals has decreased. Another reason is that the greater density of traffic has lead to soiling the grass by litter and exhaust gas to such an extent that in certain parts it is no longer suitable as fodder. As the grass is no longer used by farmers and small-holders to the same extent as formerly the Road Authorities have now themselves to undertake the maintenance work of these slopes also in the open country, as these surfaces with their high growing grasses and herbs cannot just be left alone. Even if the ugly sight presented by the wild growing grass and weeds along the highways were acceptable as long as for safety reasons the sign posts and mile stones were kept free, there would still be enough compelling reasons to keep these spaces clean. Neglected green spaces mean a constant danger of wild fires during the dry seasons resulting from accidents or simply due to careless drivers throwing away burning cigarettes. They also favour the breeding of vermin and field mice which will not only do damage to the road terrain but could soon invade the neighbouring farm land. So would the seeds of the weeds growing exuberantly on those uncared for spaces — a state of things to which farmers would quite rightly object.

Normal maintenance, even if confined to cutting the grass twice a year, is however, no easy task nowadays and will always necessitate certain measures. The workers carrying out this job will be in constant danger, especially while working on the benchings and the central reserves, and therefore something must be done for their protection. Narrowing down the road to one lane while the grass is being cut and carried away slows down traffic considerably and frequently means creating another source of danger to the motorists. And finally also the Road Authorities are nowadays often short-handed while on the other hand shape and location of the green spaces and the tendency to equip autostradas and highways with railings and other protective measures frequently make the use of labour saving mowing machines difficult or altogether impossible in many sections.

These difficulties of proper maintenance of the green spaces has induced the Road Authorities to plant some slopes and interspaces at road connections with small wood trees wheresoever they would not obstruct sight and thus to reduce the number of spaces requiring attendance. In addition to this one tries at newly built sections of autostradas to reduce maintenance work by checking vegetable growth through careful selection of seeds and by adequate lay-out.

Along existing autostradas, however, the extensive spaces planted with different sorts of species cannot be broken up over night and newly sown with a mixture of low growing grasses. Here maintenance is bound to remain a problem for a long time to come. Therefore the Road Authorities are greatly interested in any methods cutting down maintenance work on all these spaces. The use of chemicals reducing growth, perhaps in connection with suitable herbicides, could possibly reduce substantially the difficulties of maintanance with conventional methods. Means of this kind used with success in the United States and Britain may, however, not necessarily yield the same results in Germany and therefore the Minister of Traffic recommanded to the Road Authorities not to go in for large scale experiments yet, but to try them out first on small surfaces in order to gain the necessary experience.

Meanwhile the Minister of Traffic has put the necessary means for research at the Road Authorities' disposal enabling them to find the answers to all the open questions in connection with maintenance work in the green spaces along the roads and the use of chemicals to reduce growth. The order to carry out the research was handed over to the Federal Road Office which, in turn, invited several institutes and scientists to cooperate.

In consequence the station for instituting scientific experiments visited a good many grounds spread by order of the Road Authorities with the growth reducing means MH-30 in September and October 1964. The journey took the experts over more than 5000 km of autostradas and highways, giving them a general impression of the effects of this means as well as a rough idea of the quantities to be used in the coming years.

The order to carry out research work was given rather late and in consequence the inspection trip could only take place at a time when in many places the surfaces had already undergone the last cutting before winter time. Furthermore the results of the year 1964 were largely influenced by the fact that the early summer was exceptionally dry in large parts of Western Germany and therefore they cannot be considered as entirely conclusive. If it has been pointed out that last year thanks to the treatment with MH-30 one operation of cutting could be dispensed with in many places, one might also put the slow growing down to the abnormal drought which had its effects everywhere on vegetable growth. This only would justify continuation of experiments, as one should be in a position of studying the reaction of the plants under different weather conditions during a number of years.

In accordance with the instructions for use set down by the manufacturers 15 to 18 liters were spread per ha, in some cases 20 to 22 liters. These quantities, if they had any effect at all, were considered quite sufficient. As a rule herbicides were used at the same time. They were applied also in strict accordance to the manufacturer's directions and were of different kinds. In some cases they were just taken from stocks which local firms had on hand or from what been left over from weed-killing actions carried out by local authorities on some other occasion. Anyway, by spreading herbicides at the same time one expected to save one operation of maintenance work.

The spreading was carried out generally at the end of April or at the beginning of May, in some cases, however, only in July, immediately after the first cutting of the grass.

In summing up the results of the action one can say that while in some places the experiment was highly satisfactory there were just as many spots where the attempt to reduce vegetable growth by chemicals showed no noticeable effects or where the results fell at any rate short of expectations.

What seemed dissatisfactory was the fact that on many spots the grass was discoloured after spreading. For a period of 4 to 6 weeks the spaces looked yellowish or brownish. To be sure, they recovered after that time, but while this discolouring lasted it made an unpleasant impression on road users, especially in spring when elsewhere everything looked fresh and green. It did not happen everywhere nor is it quite clear under what conditions these symptoms occurred, but at any rate such ugly sights would rightly invite objections and should certainly be avoided.

If the attempts to reduce growth with the means described proved a failure in many cases it may very well be due to faulty application. Correct or incorrect timing may obviously also be one of the reasons why the results were satisfactory in some places and disappointing in others.Much seems to depend on choosing the right moment in spring, and here again the correct time may vary from one species of grass to another. The high growing species should in all likelihood be sprinkled when they are 10 to 15 cm high, the lower species when they have reached 5 to 10 cm if it is really worth while as far as the latter are concerned. If carried out at a later state of growth there is often no noticeable effect at all or at least the results are dissatisfactory. The period during which these means should be applied is therefore relatively short, depending also on weather conditions in the spring. The right time can furthermore be earlier or later in the year according to ecological circumstances prevailing at the different sections of the roads and the vegetation growing there. In the warm places in the low lands, on soils easily warmed up, sprinkling should probably be done some weeks earlier than in rough mountainous regions on heavy, cold soils. In many cases the action should most probably have been carried out earlier than it was actually done. In some parts it was done rather late on purpose, because better effects of the herbicides against the tougher sorts of weeds could be expected if the action was not undertaken too soon. These weed killing actions thus set in later than would probably have been the correct time for any attempt to stop growth. On the other hand there were places where the action to reduce vegetable growth was done at the right moment, with the result that the weed killing effect of the herbicides was insufficient so that later growing high weeds such as thistles had to be dealt with subsequently, which meant an extra operation. In fact the herbicide action in spring had hardly any effects on the later growing species like camomile, orach, pigweed, tansy and mugwort against which only a second action undertaken at a later time of the year might take effect; for most of these species, it must be added, are very tough and will usually resist such treatment.

In several cases the effect on growth was insignificant or there was no effect at all because soon after the action rain set in. The only way of avoiding such disappointments is the use of some special means that make the chemicals stick.

The effect was also insufficient wherever the grounds contained some high-growing grasses which are somewhat difficult to check in growth by MH-30, such as oat-grass, cock's-foot and couch-grass, but also other species (rarer along the roads) like pinna and timothy-grass will usually not respond in the way it is hoped for. Even though the stems did not develop as usual in many cases, these grasses all the same went on growing and their high blossoms or sprouts were a nuisance. It is quite possible that these species might further develop at the expense of the species responding to the MH-30 treatment and remain lower—which would not be desirable.

To be sure, documentation about the reaction of the different species of grass could be collected, but the result is not conclusive. Here again, timing of the action may partly be responsible for the differences, but the location, the landscape in which they grow, the ecological types may have something to do with it. Whereas the growths of cock's-foot, for example, could not be substantially be checked in the great majority of cases, there were instances, other hand, where the

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«Lärmzone» in den tieferliegenden Teil des Areals «versenken» (Stadion/Eisplatz). Höhendifferenz die durch Absenkung der Lärmzone entsteht, wird für Stehrampen und für Bauten unter Terrain ausgenützt.
Speziell für den Winterbetrieb muss gegen Osten und Westen ein Windschutz aufgebaut werden, durch vorgenannte Absenkung oder durch Gebäudefronten!
Parkplätze nicht auf einem Platz konzentrieren, sondern in der Nähe der Hauptsportanlagen (Eisfeld, Stadion, Concourplatz) dezentralisieren.
Das ganze Areal sollte intern verkehrsfrei gehalten werden. Lediglich für den Zubringerdienst zu Kiosken, Restaurant usw. sowie für den Notfalldienst dürfen die in genügender Zahl vorgesehenen internen Strassen und Wege benützt werden.
Nur eintrittspflichtige Sportareale wie Stadion, Eisfeld und Freibad werden eingezäunt. Das ganze übrige Areal steht der Bevölkerung frei zur Benützung offen.
Spielplätze für Mutter und Kind müssen, dezentralisiert über das ganze Gebiet, entlang den Wegen angeordnet werden.

Kosten:

Kostenschätzungen lt. kubischen und Flächen-Berechnungen ergaben eine Summe von etwa Fr. 18 000 000.—. Die Kosten für die Landbeschaffung sind in dieser Summe nicht enthalten.
Preisstand 1965.

Diviser le terrain en zone de bruit et zone de calme. Placer la zone de bruit dans la partie la plus basse (stade/patinoire). Utiliser la différence de niveau pour des tribunes debout et des infrastructures.
Protéger le terrain de sports contre les vents d'est et d'ouest soit en l'abaissant (voir ci-dessus) soit au moyen d'une rangée de bâtiments.
Ne pas concentrer les parcs pour véhicules mais les répartir aux environs des différentes places de sports. La circulation est interdite sur le terrain. Prévoir pourtant un nombre suffisant de chemins et de routes pour les urgences et le service de livraison nécessaire au restaurant, aux kiosques, etc.
Seules les places de sports avec droit d'entrée (stade, patinoire et piscine en plein air) seront protégées de haies. Le reste du terrain sera librement ouvert au public.
Les places de jeux réservées aux mamans et bébés seront réparties sur tout le terrain et se trouveront à proximité des chemins.

Coût:

Le devis établi d'après le calcul des volumes et des surfaces se monte à la somme de Fr. 18 000 000.— environ, non compris les frais d'achat de terrain. Barême des prix 1965.

tators' terraces and for underground installations. These slopes, together with some buildings, should also afford some shelter against the east and west winds which will be especially appreciated in winter time.
The parking lots should not be concentrated to one single spot, but alloted to the main centres (the ice rink, the stadium, and the race grounds).
The whole estate should on principle be closed to motorized traffic, the roads being open only to emergency vehicles and for lorries carrying supplies to the restaurant and the refreshment stands.
Only the grounds to which admittance has to be paid will be fenced in. The rest of the area will be at the free disposal of the people at any time.
Playgrounds for mothers with their children should be decentralized over the whole area along the paths.

Costs:

Estimates, including the cost of buildings and lay-out of the grounds, but not including the purchase price of the land run up to about 18 million swiss francs. (Quotation 1965.)

Betrachtungen

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sehr wenigen Fällen irrtümlich sogar Totalherbizide angewandt worden, die zur restlosen Zerstörung der Vegetation auf den Strassenrändern geführt hatten. An einigen Stellen waren durch die Anwendung zu aggressiver Herbizide so starke Schäden entstanden, dass eine Neuansaat zumindest ratsam erschien, um wieder einen befriedigenden Grasbestand auf den Böschungen und Mittelstreifen zu schaffen. An steileren Böschungen ist sogar eine gewisse Gefahr für Erosionsschäden nicht auszuschliessen.
Zusammenfassend lässt sich feststellen, dass aus den eingangs geschilderten Gründen den Mitteln zur Hemmung des Pflanzenwuchses im Strassenbau grosses Interesse zugewandt wird. Vor ihrer generellen Anwendung ist es aber notwendig, alle Fragen der Anwendungstechnik und der möglichen Nebenwirkungen eingehend zu klären.

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Observations

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moins l'influence fortement. On a recouru non seulement à des produits de faible pouvoir destructif, tels que le 2,4-D et le MCPP – qui exercent cependant une action suffisante sur la plupart des mauvaises herbes –, mais également à des herbicides particulièrement efficaces comme l'ester 2,4,5-T. Quant à l'action du MH-30, elle a été souvent favorisée par celle exercée antérieurement sur les autres plantes par des herbicides. L'emploi de ces derniers, notamment de l'ester volatil, a parfois provoqué, par déviation, de gros dégâts dans les bois avoisinants, voire leur complète destruction. Il est même arrivé, très rarement il est vrai, d'utiliser par inadvertance des herbicides qui ont supprimé toute végétation en bordure des routes. Il a donc fallu à certains endroits procéder à un nouvel ensemencement pour que les talus et les bandes médianes soient suffisamment recouverts d'un nouveau tapis de gazon. Signalons encore que le danger d'érosion menace certains talus à forte déclivité.
Si donc les motifs exposés au début de cet article justifient les mesures envisagées pour régulariser la végétation sur le réseau routier, il faudra se garder d'une application générale des produits entrant en ligne de compte tant qu'on n'aura pas examiné plus à fond les techniques de cette application ainsi que se isncidences.

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Experiments

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results were very satisfactory. The growth of bromes could easily be stopped on poor, dry grounds, whereas on rich soil the effects were altogether insufficient. Thus in order to judge the efficacy of means to reduce vegetable growth the research work on the reaction of the species should go much further, bearing also on all the variations of the species. (Richter/Skirde).
The effects of the spreading of MH-30 might further have been influenced by the after-effects of salt spreading during the winter month in the interest of safety in traffic. Where large quantities of salt were used and the salt water spread like a mist on the greens one could be certain that the grass suffered considerable damage too. If in addition to this harmful measures the grass is spread with vegetable growth reducing means and herbicides than it is very likely that the damage done during the winter months will be all the greater. The condition of the grass on the central reserves of some autostradas with heavy traffic seem to bear out this conjecture.
Furthermore the effects of means intended to reduce vegetable growth was no doubt reinforced or at least strongly influenced by the use of the herbicides which were applied at the same time. Apart from relatively mild herbicides like 2,4-D and MCPP, which had all the same the desired effects on most of the weeds, also herbicides of a more aggressive kind were used such as 2,4,5-T-Ester. The effects on growth produced by MH-30 was most probably strengthened in many cases through the weakening of growth due to the application of herbicides. The use of herbicides, especially the application of the volatile Ester, had in some cases disastrous effects on the neighbouring woods, leading here and there even to total destruction. Obviously in a few cases even herbicides with effects of total destruction of vegetable life had been used by mistake, which completely destroyed everything along the roads. In some places the use of herbicides of too agressive nature had as a result such damage that the only way of having again satisfactory conditions on the center reserves and the slopes was to re-sow the spots altogether. Where the slopes were steep there still remains even a certain danger of soil erosion.
In summing up one can say that the Road Authorities give their close attention to the question of using chemicals to reduce vegetable growth, but before general application can be taken into consideration the correct technics and all the possible side-effects have to be studied thoroughly.

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