

ΓΕΩΠΟΝΙΚΗ. — **An interesting method of planting trees «Kallidendron» of Prof. Kallistratos, by J. Papadakis\***.

ABSTRACT

Trees are planted in a big bag, of 50 litres f. i., filled with soil containing substances, that favour the decomposition of root toxins, of high water holding capacity, well fertilized, etc. The advantages and application possibilities of the method are discussed.

1. INTRODUCTION

Trees are usually planted without soil, with «naked roots». But it has been long ago observed, that planting with soil around the roots, or treating adequately the soil of the hole in which the tree is planted, ensures better growth, and permits to gain time. On the other hand in floriculture, unusually big plants can be grown in small containers, by accelerating the oxidation of the toxins excreted by plant roots increasing the cation exchange and water holding capacity of the soil, with some substances; the Japanese excel in such techniques. Prof. G. Kallistratos of Ioannina University, has developed a method of planting trees, that has interesting advantages and applications. The tree is planted in big bags, of 50 liters f. i., filled with soil of high cation exchange and water holding capacity, very permeable to air, well fertilized, etc. Three years ago, the 24 february 1983, the vicepresident of the Academy, Dr. G. Merikas has given a communication on the method. Since then Prof. Kallistratos continued to work, both in Greece and abroad. And I consider useful to give here a discussion of the advantages and application possibilities of the method.

2. ADVANTAGES

1) Universal experience and many experiments (Papadakis 1949) have shown, that there is linear relation between the volume of soil occupied by the roots of a plant and its growth and yield. And that is not due to a better provision of nutrients, because by fertilizing you arrive rapidly at a limit, that cannot be surpassed; on the contrary the relation with soil volume is linear; you should only have a sufficient number

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of plants, taking account of their size. It is due to the excretion of toxins by plant roots (Pickering 1917, Papadakis 1938, 1941, 1949, 1954, 1977, 1980).

Soils differ in their capacity to absorb and oxidize these toxins; those with high cation exchange and water holding capacity, and very permeable to air, absorb and oxidize toxins very rapidly, and they are very productive. The case of volcanic soils is well known; in spite of frequent catastrophes, people gather around volcanos. Materials with high cation exchange and water holding capacity, but very permeable to air are used to grow plants in small pots.

The bags used in Kallidendron method are filled with such soil; moreover some of the substances, that are added seem to favorize toxins oxidation; and the 50 litres of soil of the bags is equivalent to several times its volume of usual soil.

2) Early growth is a critical period in the life of a tree. For a long time its roots occupy only a limited area, and permit weeds to occupy the area around the tree and make its growth impossible; only a few species, under favourable for them and unfavourable for weeds conditions, have a chance to survive. This is the reason trees are seldom sown, but planted. In the argentine pampas there were not trees before the arrival of Spaniards; when you plant trees and protect them against weeds during the first years, they grow very well; but they are not reproduced; all existing trees have been planted by man. Kallidendron is the best method to protect the trees during this critical period, and gain time.

3) Plants can absorb water from one point, nitrogen or phosphorus from another, and so on (Papadakis 1954); drop irrigation is now extensively used; only a small part of the soil occupied by roots is irrigated — usually subirrigated — the rest is dry. With Kallidendron method one can irrigate the bags, which have high water holding capacity, either continuously or intermittently; that simplifies irrigation and permits to economize water.

4) Plants can absorb nitrogen from a point, phosphorus from another point, and so on; it is not necessary to distribute each nutrient in all the soil. Localization of fertilizers is now extensively used in practice, to reduce their immobilization by mixing them with great quantity of soil. With Kallidendron method fertilizers can be applied in the bag.

5) The toxins, that roots excrete, and the mechanism of their oxidation is not yet known. Such knowledge will permit to find substances, that increase yields. Kallidendron method facilitates the use of such substances, by concentrating a part of the

roots in the bag. It may be some substances, already recommended by florists and Kallistratos, have such effect. Control of root parasites and diseases is also facilitated.

6) To facilitate cultivation trees are usually planted in rows. But now with herbicides cultivation is not necessary. In mountainous soils instead of planting in rows, we can plant trees, where soil accumulates; such points are also those, where water flows. Kallidendron method facilitates that.

7) In some soils there are saline or alkaline spots; instead of planting in rows, one can plant the trees in the spots, where there is sufficient good soil. Kallidendron method facilitates that. And by irrigating only these points, we extend the area of these spots.

### 3. APPLICATION POSSIBILITIES

1) Private and public gardens, parks, avenues of trees, torrent protection, etc. The chief disadvantage of Kallidendron method is its high cost; but in these cases cost is not so important, while to gain time is essential. I may add, that with our days technology, man can produce everything he needs with very little work, and people will have plenty of free time; a garden is an agreeable occupation; the fruits of flowers it produces seem us better than those bought in the market; therefore we can expect a multiplication of home gardens and it is the same for parks, avenues of trees, torrent protection, etc. Kallidendron method permits to gain time. Moreover it permits to obtain high production in a reduced area.

2) Fruit production in mountains. By planting only the spots with sufficient soil, we can have a good production of fruits in mountains, even with low rainfall, because water flows into these spots. Kallidendron method facilitates that; many of these gardens will have as object, to offer agreeable occupation to retired people, etc.

3) Fruit production in low rainfall, but not deserteic regions. By planting trees at great distances from one another, and controlling weeds with herbicides or otherwise, between them, we can have a satisfactory land use in many cases. Kallidendron method facilitates that; it also facilitates irrigation, when it is given only exceptionally or with drops. Moreover it permits higher production per unit of water even in deserts.

4) *Combination of timber or fruit production with livestock production or agriculture.* Such systems, extensively used in primitive agriculture, have now attracted the attention of scientists. Once the trees have reached a certain height, the soil between trees can be used as pasture; when goat are excluded or the trees planted are not

palatable, grazing can begin earlier; grazing reduces weed competition and favours trees; weeds that have not been eaten by livestock, should be killed immediately after grazing with herbicides. Herbaceous crops are often grown between trees to provide grazing, etc.; grazing checks growth and reduces damage to trees; moreover the critical periods do not coincide, and this fact makes the association advantageous. Naturally trees planted at great distances grow lower and more branched; but some species grow straight, even when distanced. In this way the forester has an income since the first years of the plantation.

5) Forage producing trees. The foliage of some trees is nutritive; some fruits also; trees have the great advantage of providing forage in periods of scarcity (summer in mediterranean climates, winter or spring in others); little attention has been hitherto paid to trees as forage producers, therefore plant breeders have not yet created varieties with high forage productivity. But goat is now appreciated as milk and meat producer; trees can be planted in pastures to feed goat; grazing trees can be facilitated by cutting branches with appropriate implements, provided with a small motor. A family may have some trees to feed one or a few goats. The space between trees can be grazed by sheep or cattle also; it could be sown with barley, vetch, etc. for grazing, eliminating weeds with herbicides. *Kallidendron* method facilitates all that.

Prof. Kallistratos is more optimistic. But usually new technology begins to be applied in the cases, where its advantages are greater, and practice shows how far it can extend. A few figures are added.

#### 5. RESEARCH SUGGESTIONS

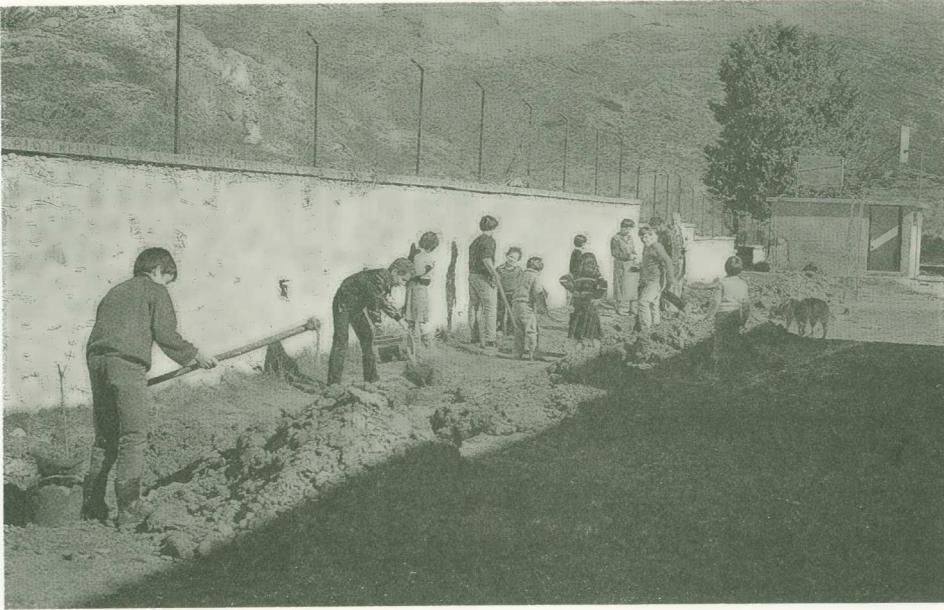
The discovery of substances, that help to oxidize Pickering toxins, will greatly increase the efficiency of the method; moreover they will increase crops productivity in general. Many of the applications we have suggested are new, and they need further elaboration in practice, and adaptation to each case with adequate research, trial and error. That is why I invite both research and practical men to pay attention to the method, and not to be discouraged, if some exaggerated expectations do not come true. If chemical industry is interested in the method, and produces substances that activate the decomposition of root toxins, the problem of food will be solved, even for livestock producing animal food.

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## ΠΕΡΙΛΗΨΗ

Τὰ δένδρα φυτεύονται σὲ μεγάλους σάκκους, 50 λίτρα π.χ., γεμάτους μὲ ἔδαφος ποὺ ἐπιταχύνει τὴν ὀξειδωσὴ τῶν τοξινῶν Pickering καὶ συγκρατεῖ πολὺ νερό, καλὰ λιπασμένο, κ.λπ. Οὐσίες ποὺ πιθανῶς εὐκολύνουν τὴν ὀξειδωσὴ τῶν τοξινῶν Pickering προσθέτονται. Αὐτὸ ἐξασφαλίζει πολὺ γρηγορότερη ἀνάπτυξη τοῦ δένδρου. Τὸ πότισμα καὶ ἡ λίπανση, ὅταν χρειάζονται ἀργότερα, μποροῦν νὰ γίνουν στὸ σάκκο. Ἡ μέθοδος παρουσιάζει μεγάλα πλεονεκτήματα, ὅταν ἐπιθυμοῦμε γρήγορη ἀνάπτυξη τοῦ δένδρου, ὅπως σὲ κήπους, πάρκα, δενδροστοιχίες, προστασία χειμάρρων, κ.λπ. Ἐπίσης εὐκολύνει τὴ φύτευση στὰ βουνά, ὅπου φυτεύονται τὰ δένδρα, ὅπου ὑπάρχει χῶμα καὶ μαζεύονται τὰ νερὰ τῆς βροχῆς· σὲ βοσκές· σὲ ξηρές, ἀλλὰ ὄχι ἐρημικὲς περιοχές, κ.λπ. Προτείνονται ἔρευνες γιὰ τελειοποίηση τῆς μεθόδου καὶ τῶν ἐφαρμογῶν της σὲ κάθε περίπτωσι. Αὐξάνει τὴν ἀπόδοσι κατὰ μονάδα νεροῦ καὶ ἐδάφους.



Pupils of the primary school of Louka, Arcadia plant trees with the method Kallidendron.



Tree plantation with the method Kallidendron in A. Ababa. The ambassador of Greece and Prof. Kallistratos follow the plantation.



Plantation in the islands of Capo Verde.



Plantation in Djibouti by the method.



Plantation in Nianing, Senegal with the method.