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COSMO PIETERSE: This week we hear from two botanists; one in Nigeria, the other in Zambia; the former talking about a symposium on experimental biological sciences and applied biological studies, in Nigeria; and the latter telling us about botanical research in the area where he works. Well, the Zambian research seems almost to be the application of some of the ideas and suggestions that come from the symposium recently held at the University of Ife in Nigeria. The symposium itself dealt with "Perspectives and Applications of Experimental Biological Sciences in Developing Countries". And it was at Ife that Akin Euba spoke to Dr. Abiodun Adebona who lectures in Botany at the University.

Akin first asked Dr. Adebona about the application of experimental biological sciences in the local sphere. What are the areas of value of these sciences to Nigeria, in the country's present stage of development

DR. A ADEBONA: Well there are several areas, for example, plant protection. We can control diseases in plants by plant breeding, and also we can improve the genetic make-up of maize, for example. There is some maize which is deficient in lysine, and we can breed for high lysine maize which is used for feeding livestock . Experimental biological sciences can also

DR. A ADEBONA: CONT'D. come in the question of food storage and preservation in food processing, and in the making of our gari here. Then there is plant breeding, for cocoa, cow-peas and maize and also research into medicinal plants.

COSMO PIETERSE: Dr. Adebona, a botanist of Ife University, on the practical value of experimental biology. In a recent "University Report" from Kumasi, Ghana, the question of investigating local plants for medicinal drugs, and for other useful products, was also emphasised by Ghanaian pharmaceutical researchers. But now back to Nigeria. There facilities for research are spread over the areas of agriculture and industry. There are mainly Governmental research institutes. But they are spread widely over the country, and this creates a problem. What other problems do theexperimental biological scientists face.

DR. A. ADEBONA: The first one is a shortage of equipment, a shortage of man-power, trained men, scientists, and also a shortage of supporting technical staff.

COSMO PIETERSE: Dr. Adebona is voicing a concern, and a need, that affects virtually the whole African continent. At the same time he is implying one of the remedies to this situation. Now on a slightly different line - how does this situation of a country whose science, technology and industry are developing affect research?

DR. A ADEBONA: The main guide line here is adaptation. The scientists must be adapted to work with local materials The work the scientists are involved with should have something to do with the problems in the country. It would be wrong if a man has worked on very basic research abroad, and then comes here and is not able to contribute anything to improving the situation at home.

COSMO PIETERSE: The aim then,fundamental research and the adaptation of research to local materials and local problems. But then there is the eternal problem of funds. What, Akin next asked Dr. Adebona, what at present, are the chief sources of funds in Nigeria for this nationally vital research?

DR. A. ADEBONA· Obviously the Government, and we also hope for some funds from the various foundations.

AKIN EUBA: What abou tthe industrial concerns in Nigeria? Have they shown much interest in the progress of experimental biological sciences?

DR. A ADEBONA: I'm sorry to say no. No. A very big 'no'. Only one or two have so far done anything. There are people who have given some money for research in pharmacy. But most of the big firms don't seem to want to do anything. We have the situation where we are producing gin in this country, producing brandy, but this is not from local materials, the materials are all imported. Yes we have raw materials which ought to be developed, and the Companies which have these businesses ought to finance some part of the basic research that is involved - but they are not doing so at present

COSMO PIETERSE: Dr. Abiodun Ad bona on the relative lack of participation and interest in nationally vital biological research on the part of private industry.

And now to other aspects of experimental biology. Ife held its first symposium on "Perspectives and Applications of Experimental Biological Sciences in Developing Countries" early this year. Akin Euba now spoke to Dr. Adebona on the symposium itself.

AKIN EUBA: Your symposium was attended mainly by scholars from within Nigeria, but also by scholars from other developing countries in other parts of the world. Did you find that some of their problems were similar to the problems you have in Nigeria.

DR. A. ADEBONA: Some of the problems, of course, were similar, we are at different stages of development . We had a Professor from Hungary who gave a talk on the problems he's had with breeding new wheat and resistence to rust and so on. We have these sort of problems here with our maize, the same problem here also in a different fashion with the cassava mosiac virus disease and also with the rice.

There is a problem of food science in Ghana where they are just developing their own food science curriculum and we too are just developing ours so that to a large measure there are similarities and then there are other areas where we had different problems. In the case of fermentation industry. It is alright for the developing countries to take beer and various other alcoholic drinks, but here when we think of food fermented in Nigeria, we have to consider the flavour.

DR. A. ADEBONA: CONT'D. Materials here are not produced in a mono-cultural way, loss of innocula are involved, different fungi, different micro-organisms playing their part at different times of the preparation of the material. So that this is a problem that is common to Nigeria specifically and maybe other West African countries and we are taking a look at this.

COSMO PIETERSE: Dr. Abiodun Adebona, lecturer in Botany at the University of Ife. And so to Zambia for a report which, as I said earlier, seems almost to be an application of some of Dr. Adebona's recommendations. A case of great minds thinking alike? Or of similar needs giving birth to similar solutions.

The Zambian Research deals with the application of botanical research to agricultural problems. Dr. Drew, Department of Botany, of the University of Zambia, Lusaka is researching into the water-relations of the natural woodland trees in the Chizamba Forest Reserve - and he has, naturally enough, concentrated his research on Zambia's most common tree. John Barnor asked Dr. Drew - why?

DR. DREW: I'm interested in this particular subject because in Zambia we have a very long dry season, which means that we have water problems and that water must be conserved. Water transpirations by the natural vegetation has not been very much studied, and very little is known about it. As a Scientist, I am curious as to how the trees survive the long dry season; and not only that, but also produce their new leaves before the rain comes.

COSMO PIETERSE: The area of Dr. Drew's research has an average annual rainfall of 853 millimetres. It has a dry season of seven months with hardly any rain. The small showers that do fall, dry up soon. What is worse, and what is of importance to any area - with little rainfall or with much - is Dr. Drew's findings about evaporation The water evaporation that he measured in an open pan was potentially higher than the rainfall! But then how does he explain the existence of water resources like wells, boreholes ...

DR. DREW: During the rainy season some rain goes straight through the soil, and is stored below the soil, and this is where we get our water for wells and boreholes. Some moves along to low places and comes out as steams and rivers. Even so we should not get much water if transpiration from the leaves was like evaporation from the surface of ordinary water. The ground would be very quickly dried out.

JOHN BARNOR: How in fact does transpiration compare with evaporation

DR. DREW: I've measured transpiration from small bunches of leaves and then found out the area of the leaves. Then I can calculate the amount of water transpired per unit area and convert this value into the depth of water that it would represent if present on the leaf altogether. Then I cam compare these values directly with rain fall or evaporation from the water surface. To take an example - in F$_e$bruary, 1970, I measured a transpiration rate of nearly 33 grams per square metre of leaf per hour. This represents the equivalent of a loss of 0.033 millimetres depth per hour. This was the miximum rate measured , and we can assume that transpiration for the day would be about

DR. DREW: CONT'D.

ten times this - that is about 0.33 millimetres. Evaporation from a water surface for the same day was 6.35 millimetres, nearly twenty times as much, and this was in February when plenty of soil water would be available for the trees. In fact, I found that evaporation is ten to twenty times as great as transpiration throughout the year.

JOHN BARNOR:

Can you explain further what your results mean in terms of the water balance of an area?

DR. DREW:

What the results indicate, is that transpiration from the trees is very controlled, that is, there is a very great resistance to water loss from the leaves. But comparisons with evaporation have only a limited usefulness because, in fact, there is not unlimited water available. The evaporation rates measured with a 'pan' never occur in practise, except perhaps from a lake. It is therefore better to compare transpiration with the water that is potentially there, rainfall in other words.

Now 1969-70 was a particularly poor rainy season, there were only 656 millimetres. Assuming transpiration continued every day of the year at the high February rate of 0.33 millimetres per day, this would give a total of 120 millimetres for the year. That is, we have 120 millimetres of transpiration from leaf surface and 656 millimetres of rain. So even in this very poor rainy season, the rain was five-and-a-half times greater than the transpiration.

COSMO PIETERSE: To pursue this engrossing botanical enquiry: how does Dr. Drew account for the behaviour of the trees. Why don't the trees just go on transpiring till the soil is dry, then shed their leaves and wait till the rain comes?

DR. DREW: It seems that the trees are very well adapted to our climate conditions. They have very few pores or stomata through which the water can be lost. Not only this, but these stomata are hardly ever widely open. This may be associated with very high suction values for the leaves. That is, the leaves have a very big capacity to suck up water, or, to put it rather crudely, the leaves are somewhat dry - this would tend to keep the stomata closed. Also, I've looked at these leaves in cut sections under the microscope, and see that the cells inside the leaf are very closely packed together. This means that water vapour cannot easily pass between the cells, and out into the atmosphere. These features give the leaves a very high resistance to water loss, and explains the very low transpiration values and how it is that the trees can remain leafy for such a large part of the year.

COSMO PIETERSE: And to pinpoint the implications for agriculture of this research, and its interim findings, John Barnor asked Dr. Drew the last question of our "University Report" this week.

JOHN BARNOR:: So what in fact would you expect from clearing the woodland for cultivation? Would this mean less water or more?

DR. DREW: I can't answer that question yet. Crops would almost certainly transpire faster than the wild tree. But they are in the ground for only a part of the year, while the trees carry their leaves for most of the year. Some calculations could be made from existing data about crop transpiration, but only results should be confirmed by actual measurements made in Zambian conditions. Certainly the results seem to indicate that we should not wantonly destroy natural woodlands as there is a liklihood of changing the water balance and it could easily be a change for the worse.

JOHN BARNOR: Have you any information about any species other than the one you have mentioned?

DR. DREW: Yes, a little. I have worried mainly with the one tree, but I have made a few measurements on three other species and they appear to be rather similar. However, I should not like to say that all the woodland trees are like the one I've studied in detail - this is extra information that we need.

COSMO PIETERSE: And with those observations from Dr. Drew of the Department of Botany, University of Zambia, Lusaka, we also end this "University Report". So, till next week, it's goodbye from me, Cosmo Pieterse.