DISCUSSION

Chairman :

If there are any brief comments or questions, you may ask them now.

Dr. Smith :

It is obviously, extremely important with these experiments to know what the relative humidity of the air, to start with, is. Did you measure this?

It's perfectly obvious that if you dry anything the rate of drying will depend enormously on the relative humidity of the air before you start. Did you measure this ?

Dr. Ghosh :

Yes, measurements were taken.

Dr. Maner :

Did you take into account the particle size of yuca (cassava) and sweet potato in your drying experiments? Does particle size have any effect on drying intensity?

Dr. Ghosh :

I am almost certain that particle size will have an effect, because in the comparative study which we have done between cassava and halitose beans, halitose beans had the smallest grains which were used in these experiments, and the drying rate was comparatively faster than others.

Now the reason why we used a standard value for cassava and sweet potato is that it is about the size to which it will be prepared for drying. It was beyond the scope of this experiment to study the effects of particle size. We know that as particle size is reduced, drying will change, but we kept that as a standard value for these two root crops.

Prof. Stephanson :

Two of the questions which I had, have already been asked. What conditions are optimum for storing these crops ? What is the moisture content of the crop, the temperature condition, the rate of ventilation, used for this kind of root crops? And if we know the optimum environmental condition, how much different is that from the ambient condition that they are now stored at in the shed or outdoors? Do you have to provide some drying, or do you have to provide some cooling? How much drying has to take place after a crop is harvested? How far down do you have to take the moisture content? And then, how does this compare with the actual environmental conditions that you are storing it under natural temperature conditions? Will the moisture continue to go down, or will it go up again?

Dr. Ghosh :

With cassava and sweet potato (we shall confine ourselves mainly to those two) the moisture content is in the region of about 60%. For safe storage, the moisture has to be reduced to a value of about 12% to 14%, so there is a considerable amount of water which has to be got rid of for storage in chips.

Prof. Stephanson :

In other words, once you get the temperature down to 12% or 14% it will stay at that. You don't have to provide any more drying.

Dr. Ghosh :

No. It will stay at that provided that you have a certain minimum amount of air flowing through the material.

Prof. Stephanson :

In other words if the air is dry enough it won't add moisture to the material.

Dr. Richardson :

What was the source of energy to move the air through this experimental set up? And what temperature did you use for air that was pumped through the dryer?

Dr. Ghosh :

This is very much of a laboratory experiment, and therefore how much it cost us to heat the air is not of primary importance. We used electrical heaters, and the air was moved by electrically operated plants. The drying temperature was in the region of 75° to 80°C.

Dr. Richardson :

Did you take any information on the economics of drying under this system?

Dr. Ghosh :

Not at this stage of the work, but drying is usually carried out at those temperatures. But when we try to convert these figures into actual drying, then we have to consider what is the best source of getting that heat (of heating them). It may not necessarily be electricity. It is very unlikely that in most countries it will be electricity.

Dr. Richardson :

Just one brief question. What is the use of these dried chips of cassava, sweet potatoes and yams in Uganda?

Dr. Ghosh :

In Uganda, as Dr. MacDonald has pointed out yesterday, we have a peculiar situation where cassava is of no use really. In the second paper which I shall be presenting a little later on today, I have tried to describe a use for this cassava, which is in excess of requirements normally. And it is being used for the production of starch.

Mr. Gooding :

The last speaker has asked the question which I was going to ask. What was the ultimate fate of this material intended to be, because I have serious doubts as to whether it would be suitable for use as human food dehydrated, because when you dehydrate a piece of potato ¾" thick you never, never rehydrate it into its form again. But of course, if it is to be made into starch it makes sense.

Dr. Ghosh :

Some of the materials of dried sweet potatoes and cassava is converted into flour, and three-quarters of an inch is somewhere near the standard that is used.

Dr. Jeffers :

I would like to known how optimistic you are about the commercial possibilities of dehydrating root crops — not necessarily as a source of starch but possibly as flour or meal for use in human food or as stock feed.

Dr. Ghosh :

Personally I think that there are a lot of root crops, like any other crops, which, having been grown, is wasted because of bad storage and bad processing. And when we take an overall picture of how much malnutrition and hunger there is in the world, it is a shame to have to grow something and throw it away. If we can establish an industry, economically by which root crops can be converted into flour and then used, there is no reason why it cannot be done. In the actual economics of it, I would

not suggest for one minute that we do anything like what I have done for commercial use. The source of energy in most of these cases, should be solar, and as most of these crops are grown in tropical countries where solar energy is available, we are, in fact, trying to develop a programme for studying the use of solar energy in the drying of these crops.

Mr. Wilson :

I would like to ask if there is any direct experimental evidence to substantiate the statement that to ensure even drying in a deep bed it is necessary to invert the material, it's extrapolation in this paper as I see it. I'm not asking this so much as a quibble, but from the practical difficulty as agitation of the type of material used with the root crops.

Dr. Ghosh :

Yes, there is experimental evidence and there is also practical and commercial evidence, in saying that. In East Africa itself a lot of even high quality coffee is dried mechanically, and almost invariably there is a means by which the crop is inverted. Because if you do not mix the materials well, you are creating a condition whereby the whole crop is likely to be spoilt. There will be too much heat at the bottom, and too little heat at the top and you will spoil the quality completely.

Dr. Maner :

Just a comment. I think that his studies here indicate the necessity of using less deep or shallower layers of drying material and possibly that a flow type drying apparatus, if you are using artificial energy, such as petroleum, heat not using sun, this might be indicated since your particle size and your exposure of your particle to drying in the entire surface, will determine the length of drying and energy required.

Dr. Ghosh :

That is correct, and I think that if one is using deep drying, one should restrict to about 18" to 20", not very much more than that , because you are going to use too much extra energy for the same drying effect with a deeper depth.

Chairman :

Thank you Dr. Ghosh.