Interviewee: Mr. TANG, organic farmer of Hande Farm
Interviewer: Ho-Yin Thomas LEE
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Transcript prepared by Rina SAKATA

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1. **So at the university, we are currently working on a biosensor, although we haven't fully constructed it yet.**
   What does living organism does your biosensor detect?

2. **Well, it doesn't actually detect loving organism, it uses a living organism (bacterial E-coli) to detect nutrients in soil, mainly N, P, and K.**
   Oh, that sounds cool.

3. **I would like to ask have you ever used such sensors (for monitoring soil nutrient content).**
   No, I had never even heard of it, I have no such resources. It's too technologically advanced. Maybe larger farms would, but small farms like mine; we don't usually use such devices.

4. **How do you control your soil nutrient content?**
   Usually, as an organic farm we don't add any chemical fertilisers or GMO products into the soil. We use these fertiliser, it's from Netherlands, it's organic. For different plants species we use actually different fertilisers, we also use peanut "FA SAN FU" (dont know the term) as fertilisers. This we make ourselves.

5. **Does the agricultural organisation help you test the soil?**
   Yes, once a year to test the water and soil, whether or not or soil is suitable for farming, what nutrients it may lack.

6. **Do you think once a year it is enough?**
   Yes, I don't even think it is too necessary honestly. Because just because it does not contain sth, I wouldn't add extra non-organic fertilisers just so that it would grow faster. I just use it as proof that its check by the government.

7. **Do you think is helpful?**
   Yes, at least I know that water, soil is healthy enough for plants.

8. **The device that we plan to build aims at giving you immediate information on the NPK values. Do you think that the immediateness is necessary?**
   How much is it? Because I think money would become an issue.

9. **An example of a detector is one that is one time use only, because the soil is will contaminate the sensors.**

Is it electronic?

10. **Yes, so it mainly consists of three parts. First, the part that contains the cells.**
    Animal cells?

11. **Bacterial cells.**
    But these bacteria are safe right?

12. **So I suppose you hope to use it without requiring special training?**
    Of course.

13. **As an organic farms do you focus on the quality or the quantity?**
    I focus on quality; I don't focus on the quantity. People, who appreciate, would pay higher for a better quality.

14. **Is there a reason why organic farmers focus more on quality?**
    Because we don't produce much, we have to sell them at a higher price, when we do that, we have to produce the quality that can ensure that the customers get what they pay for.

15. **What kind of special organic farming methods do you use?**
    Rotational farming, we use it as well. For example, after planting melons, we would plant leafy vegetables. We don't plant the same species on the same land each time.

16. **So how do you judge the soil nutrient level, it is based on experience?**
    Yes, I can tell, through naked eye. For example, look at this one. You see this side on the side is darker and the other. This is because of the amount of sunlight it gets.

17. **Have you heard of the recycling of nutrients, such through use of compost?**
    Well yes, but that is very energy consuming, you have to turn the compost every one to two days.

18. **If the sensor could tell you very precisely the NPK content, and ratio, what would be your opinion on such sensors?**
    That would be great; I would take the information into consideration, and adjust the nutrient accordingly.

19. **Do you wait until all the nutrient content is ideal before planting? or do you plant directly then only change the nutrients?**
    Well what i have learnt is that once a harvest is over, its better to leave the soil to rest for one or two days. But, I usually i don't have much time to wait. When I do I do leave the soil to rest, but mostly, no, I just continue.

20. **Have you ever encountered a situation where only after the plant has grown for a while, or half-way, you realise that it has not been absorbing enough nutrients?**
    Yes, I very often, like this one. It's growing too far off the ground. When this happens I later add the corresponding nutrients they need, hoping to replenish the nutrients that they lack.

21. **Would then the immediate information on soil nutrient quantity be useful then?**
    Of course, because ideally all the nutrients should be added even before planting. So if I know the nutrient quantity before I start,

22. **Could there be too much nutrients?**
    Yes. It would cause the soil to be acid or alkaline. You can tell through the abnormality, usually through the colour. The best would be that the sensor can tell me if there is too much or too little of the specific nutrient. Not just how much.

23. **But doesn't different plants require different nutrients content?**
    That not that much of a problem. I take consideration the soil quality generally.

24. **Our sensor can only sense certain forms of NPK, not the total. Would it insufficient if the information is only partial?**
    Of course because if it is only partial, it would be incomplete. And give me false information for my soil. Maybe If i think certain nutrients is not enough due to what the sensor tells me, but is could be just not measured right? Then, I would end up adding access nutrients.

25. **Is there anything else that should be measured?**
    Yes, I don't remember but there are several. Too much of a nutrient is not good as well, I think the other nutrients (besides NPK) are less important though.

26. **If the sensor can sense other harmful bacteria in soil as well, would it be better?**
    Obviously, more information would be better. It's the matter of whether or not you can do it. I would like the sensor to be durable though, water and heat proof.

27. **If the genetically modified bacterial sensor has to come into contact with the soil on your farm. Would you think it goes against the values of being organic?**
    Well. I think it does go against the values of being organic to some extent because you do genetically modify the bacteria right? Are there any no-modified bacteria that can do the same thing? I mean certainly I understand it is not going to directly affect the plants, but still, it's a difficult question.

28. **Also, is the soil quality more important? or the plant productivity more important?**
    Of course, soil quality.

29. **Lastly, if you add nutrients only after you can see that it is nutrient deficient is it actually too late?**

Yes, it is. It’s always better to have sufficient nutrient from the start.