



ILSI 2021 Annual Symposium Session 6: Alternative Proteins

Transcript of the presentation, Nutrition and Alternative Proteins, Emanuele Zannini, PhD, University College Cork, Ireland & European Union funded Smart Protein project coordinator

And thank you everybody for the organizer, for inviting me to this very interesting conference. Let's start with the meaning of food. Or, actually, the evolution of the meaning of food through the last centuries. Now, from the '50s consumers were perceiving food as a way to get calories, to get nutrients. But then you see basically by moving towards the '80s, the '90s, consumers were much more focusing on something more than that, so looking for foods that basically were providing health, protect, prevent from non-communicable disease. And now, we... and nowadays, where food is perceived as a way to treat medical conditions. So, you see, there has been a huge jump in terms of the meaning of the food as for consumers.

So, beside the fact that basically the food, let's say [inaudible 00:01:03] evolved dramatically, at the same time we saw that there is evolution of some costs and in particular, in the environmental, let's say, in particular environmental cost associated with food production. As you see here, basically if we are keeping using our food the way we're used to for the last, let's say, 50 years, in 2015 [inaudible 00:01:30] three planets of [inaudible 00:01:31] resource to make sure we basically can feed everybody.

And for this reason, also, the European Union actually is acting very strongly with in this area. In particular, actually, they launched last year the new Green Deal and basically that aid to change the way we are producing, we are processing, we are consuming, and we are disposing of food. This is very, very, very important if you want to be a leader in the food transition, the basic [inaudible 00:02:12].

Well, I'm saying this because if you see some of the vital indicators, you see that basically we are... in the way we are managing our planet, we see that our [inaudible 00:02:25] is rising, temperatures are climbing, and [inaudible 00:02:29] time [inaudible 00:02:32] you see that basically the population is growing and it even is more people than ever before are overweight [inaudible 00:02:36]. So definitely there is something wrong, something that need to be changed, and something need to be changed now.

And this actually is particularly evident when we see the different food systems limitation that basically we are facing nowadays. As you see here... Pointer. Yes, here. We see basically one out of three people suffer from malnutrition. We have a third of our food is basically wasted if it goes to the bin, and our food is also too rich in fat, sugar, salt, and meat, so we need to restructure the way we are receiving food. And [inaudible 00:03:23] at the same time we are producing this food at the expense of the natural resources.

So definitely we need to also make sure that the different actors that playing a role in the food system, we start speaking the same language. So, we need to remove this bar, this side thinking behavior among

different players in the food systems, starting from the [inaudible 00:03:46], producer, consumers, and businesspeople. So Smart Protein was actually aiming to... is aiming to start producing differently and [inaudible 00:03:55] in the way that basically the food is going to be produced would be healthier and also, we are [inaudible 00:04:04] to make sure that we have a fair [inaudible 00:04:06] solution. And among the actors in the food system. This is something else very important. And also, to in a way give some knowledge, the role, the key role, in particular the primary producer has in preserving [inaudible 00:04:24].

[inaudible 00:04:26] as you see, 2015, [inaudible 00:04:32] going to hit. And that's why we are now... EU Commission is actually investing a lot of effort financially in basically developing alternative solution that basically will help us to move towards a fair and just transition.

And of course, in doing this, we have to answer three different questions. How to ensure nutrition healthy and sustainable food for everybody? How to set up a full circularity and how to restore diversity? Well, this is the main answer, the main question that basically Smart Protein's trying to answer and [inaudible 00:05:14] impressive [inaudible 00:05:17] from [inaudible 00:05:17] different partners. You see from... mainly from Europe, also from States and also and Israel and Switzerland.

And they're a very good team. We are making sure that basically we are taking consideration any step that [inaudible 00:05:32] need to take to make sure that [inaudible 00:05:35] we can deliver and reach a safe and just operation space because that's what [inaudible 00:05:41]. Of course, beside the number of partners that basically work in this project, is mainly focused on plant. And there is a reason why, because it's one of the few protein sources that basically are [inaudible 00:06:08] connected to the environment.

The idea here is to produce more [inaudible 00:06:14] less, so we are taking consideration also the fact that basic... the four group to produce [inaudible 00:06:20] food we need also to have or improve [inaudible 00:06:26] in order to make sure their basic needs could have. So, we are taking realistic approach, in particular in our [inaudible 00:06:33].

Different sources will be taking consideration. The byproducts from pasta and bread, bakery, and breweries [inaudible 00:06:45] will be used for growing yeast and mushrooms. And also, chickpea, lentils, quinoa, and fava bean would be the protein source they mainly would be taking consideration. And we are starting from selecting varieties, developing new processing instruction and [inaudible 00:07:00] and [inaudible 00:07:01] developed.

Of course, the main goal is to deliver a wide range of food product from fish and seafood, pastry, cheese, meat, infant food, and make alternatives. Of course, the main target, the main challenge that we are feeling at the moment is to make sure that basically our... the process and the product that we're going to develop will be natural, will be tasty, will have an appealing texture, appearance. Also, will be affordable.

So, this is another aspect, that basically most of the time companies are developing alternative food, alternative plant-based products, they're not taking consideration. In order to make sure that mass marketing will embrace, or it will cease the opportunity to enjoy, embrace [inaudible 00:07:52] protein transition, we need to make sure that the product we develop is also affordable for them.

So technically, as I mentioned before, Smart Protein is focusing on three main routes to make sure that this transition will happen. So, starting from agricultural development, also primary production, [inaudible 00:08:15] alternative agriculture. So basically [inaudible 00:08:17] our environment, or soil, we want to make sure that basically the environment and the planet will always be able to feed us. At the same time, developing new sustainable food production [inaudible 00:08:31] processing and also endorsing [inaudible 00:08:34]. This is another [inaudible 00:08:36] that basically we are going to address significantly. So, in a few words, we try to build back then after the pandemic.

So, as you saw from the previous speakers, also from [inaudible 00:08:50] from the Good Food Institute, protein, alternative proteins are on the way [inaudible 00:08:56] let's say rise in the next 10 years. And definitely, the reason why in particular plant protein is not have [inaudible 00:09:07] a brilliant future, because they still have first, they are still perceiving their consumer as healthier and also... and much more sustainable than [inaudible 00:09:20] products. Of course, there are several challenges that need to be taking consideration that we are going to address this in few minutes.

Of course, when we are thinking about what we should do, and what should be the trends, and how we are going to shape the plant-based foods, taste and texture are the primary aspects that we should take in consideration. People say that basically, yes, I want to shift to more plant diet, more plant diet because I care environment. But then, the ultimate choice would be only approaching foods that basically are [inaudible 00:09:59] resemble of... [inaudible 00:10:02] provoking and pleasure when they are consumed. Has to be convenient, so easy to process, and also definitely able to improve the health status of the consumers [inaudible 00:10:16] also supporting them in the [inaudible 00:10:17].

Protein content. Protein content is important and definitely something even more important is the quality of the protein. Because this is one of the weak points and most of the time [inaudible 00:10:31] food product basically containing [inaudible 00:10:36] plant proteins have been accused not. And of course, environmental concern is also something very important, as I mentioned before. [inaudible 00:10:47] culture is the most important to make sure that we are reshaping the food environment in which consumers are purchasing, processing, and disposing food. We connect the consumers with the primary production, with the process to make sure that basically they are getting familiar, they understand the meaning and the power of the daily choice when they basically [inaudible 00:11:13].

Emanuele Zannini:

Of course, we are working on plant protein since 2015 when the EU Commission was actually funding a project called Protein to Food where I was actually [inaudible 00:11:27] and [inaudible 00:11:29] advisor. And here I want to just give you a short... show you a [inaudible 00:11:35] short video where basically summarizes the [inaudible 00:11:38] of the protein food.

Speaker 2:

[inaudible 00:11:41] ...

Emanuele Zannini:

I don't hear the sound, so... [inaudible 00:12:03]. Can someone else tell me if the sound is there?

Speaker 3:

No, we can't hear the sound.

Speaker 4:

[crosstalk 00:12:12].

Speaker 3:
Yeah.

Emanuele Zannini:
Okay, so let's move to the next slide. It's not a big deal. [inaudible 00:12:21].

Emanuele Zannini:
But definitely, there is a Protein to Food website where basically you will have a chance to see all the outcomes that basically have been published and achieved. All the [inaudible 00:12:33] publication has been released and they are basically open access so everybody will have access to the outcomes [inaudible 00:12:39] been delivered.

Here, I want to just give you a short overview about the main achievement that's been... we caught on some Protein to Food. As I mentioned before, we were targeting different plant protein and one of them was actually lentil. And here you can see... and we were using lentil for basically developing infant food formula, plant based infant food [inaudible 00:13:08] you see here, when we are talking about plant protein, definitely there is so many advantages. Now, also there are some challenges that basically need to be fixed in order to make sure that basically the food potential of this protein would be [inaudible 00:13:24].

First of all, the food [inaudible 00:13:28] content. This is something very important that is potentially most of the time companies are underestimating. Food map actually are [inaudible 00:13:36] main responsible for IBS. [inaudible 00:13:40] around 20% of people suffering from different degree of IBS, so there are fermentable [inaudible 00:13:50] saccharide [inaudible 00:13:50] saccharides [inaudible 00:13:50]. And in particular, legumes are quite rich in this compound.

So, there are extraction process, and the fraction is actually really help to reduce significant the amount of these compounds that basically could potentially challenge our consumers. At the same time also, here in particular, we were comparing two different extraction process. And you see basically I have [inaudible 00:14:21] and [inaudible 00:14:23] filtration, so two different extraction process removing from lentils. You see basically that both processes were helping us to significantly reduce the [inaudible 00:14:36] content and also the [inaudible 00:14:40] inhibitors, so the [inaudible 00:14:40] nutrients that basically sometimes are associated with the legumes. And also, definitely improving the lentil protein digest [inaudible 00:14:50].

So, you see, by processing the raw material, we can actually deliver ingredients that basically will match the nutritional quality that basically we are looking for. Here, in the case of the fava bean protein, we were basically investigating again here two different extraction methods and also, we evaluate the individual protein digestibility. As you can see also here, that as we see for the lentil proteins, the extraction process was significantly able to reduce the food map contents in these ingredients, so basically reducing the risk to create IBS symptoms in our consumers. Significantly also reduce the [inaudible 00:15:48] nutrients, in particular [inaudible 00:15:52] not quite [inaudible 00:15:54] allergenic in the fava bean and also the [inaudible 00:15:54] protein digestibility was significantly improved as well.

So, as you see here, there is a plus and a negative aspect in processing legumes protein. One side, you're reducing some of the anti-nutrients [inaudible 00:16:16] that we see could have a negative effect on

human health and the other side, you potentially... you are depriving the ingredients of some of the micronutrients that basically [inaudible 00:16:30] relevant and [inaudible 00:16:31] thinking about [inaudible 00:16:33] for example. [inaudible 00:16:35] actually very, very, very [inaudible 00:16:36].

As I mentioned before, in this work we were actually using lentil protein for developing an infant food formula and as you see also here, the results demonstrate that the particle [inaudible 00:17:02] distribution was very, very uniform and fine compared to the soybeans formula and the [inaudible 00:17:09] formula, and also this actually allow to show a better [inaudible 00:17:14] performance when the powder is regurgitated. At the same time also, the protein digestibility was actually [inaudible 00:17:22] the [inaudible 00:17:22] protein digestibility was actually important and relevant. Of course, much more than the [inaudible 00:17:31] formula [inaudible 00:17:32] because in that case, we were... [inaudible 00:17:34] were using protein [inaudible 00:17:36] to develop the infant for-

So again, here the more the lentil formula has a similar digestibility [inaudible 00:17:50] than your commercial soy-based formula. So, it could be considered an alternative solution. Of course, this was [inaudible 00:17:58] starting point of an investigation. Now, on the Smart Protein follow-up project, basically we are moving to an industrialization, so an evaluation demonstration of [inaudible 00:18:09] and these ingredients [inaudible 00:18:10] involving nutrition.

And of course, again here [inaudible 00:18:18] before was actually talking about [inaudible 00:18:20] food categories and it was mentioned bread and pasta. In this case, we were actually using different protein from buckwheat, fava bean, and [inaudible 00:18:31] for developing a high protein [inaudible 00:18:34] pasta and we see here when we're developing these particular products, you also have technological challenges because in the pasta you have the al dente effect, so the strengths of the pasta need to be kept even after... not during the cooking and also the consistency of the pasta itself.

And you see here basically that when we did individual digestibility, individual nutrition balance, that the protein efficiency rate was actually improved when a combination of different protein sources would be used by replaced portions of wheat flour. As well, here you can see the [inaudible 00:19:20] was actually significantly reduced in particular after pasta was cooked. So also, the process, the technological process, we actually have [inaudible 00:19:35] in motivating these compounds.

Here also again we were using the same approach for the bread production. And also, again, you saw that a different combination of protein was actually allowed to develop a better [inaudible 00:19:54] products. Also, the protein digestibility was actually improved and also the [inaudible 00:20:04] nutrients [inaudible 00:20:05] was actually significantly reduced as well. So, there is a way to now successfully incorporate these protein ingredients in different food categories. [inaudible 00:20:16] then that there is a wide range of potential.

Of course, the last but not the least, we were also working on the plant-based milk substitute. And definitely the main... the force that guide consumers towards this new type of products is basic digestive [inaudible 00:20:40]. [inaudible 00:20:41] as Claire was mentioned before, lactose intolerance or allergicity seems rising and that's also the reason why consumers are much more focusing on alternative solutions. And [inaudible 00:20:57] the reason why you see basically that they increased in the market trends [inaudible 00:21:00] for the next [inaudible 00:21:02].

When we decide to focus and work on this, we just have a look on what was on the market. And then we just have a quick look on the composition to see basically that what we are having is [inaudible

00:21:20] ... I'm not saying healthier than milk, but healthy. And that [inaudible 00:21:25] we compare the position, the visual appearance, the [inaudible 00:21:31] properties. [inaudible 00:21:33] result that basically half of the sample had very low protein content so what they were doing is that they were selling water and sugar. And only soy was actually the milk... the plant-based milk [inaudible 00:21:49] have [inaudible 00:21:50] considerable high amount of protein. Yeah.

And also, when you see basically here the separation rate was basically showing poor suspension stability without stabilizer, only soy-based products showed good results. The carbohydrates, considerable low carbohydrate content, rice, due to the starch [inaudible 00:22:14] show very high glucose content. Also, you'll see basically [inaudible 00:22:19] that you'll see the coconut and the rice milk was basically very, very high.

When you are approach this [inaudible 00:22:27] much healthier or [inaudible 00:22:29] could be [inaudible 00:22:30] solution for your problem. And then, when you look to this data, you see basically you have to be careful when you are choosing what you're purchasing. So definitely products with a high glycemic index, low protein content, low suspension stability, low mineral and vitamin content, especially when compared to milk.

So technically, there are room for improvement. Now, using different technology, different ingredient, [inaudible 00:22:57] fermentation. Here are just the last slides. I want to show you basically what we did and [inaudible 00:23:03] using here in this case, we were using completely different approach. We didn't functionalize, we didn't purify [inaudible 00:23:11] we used [inaudible 00:23:12] flour [inaudible 00:23:12] from quinoa and using different [inaudible 00:23:17] process amylase and protease, we were able to improve protein solubility and the protein content in the [inaudible 00:23:26] extract. Also, to compare to the glucose in fructose by [inaudible 00:23:30] and then by fermentation we were converting fructose [inaudible 00:23:41].

So basically, reducing the glucose content [inaudible 00:23:41] the glycemic index. So, there is a way to improve basically the products technologically, in term of texture, flavor, but also a nutrition aspect. So definitely there are several [inaudible 00:23:55] still [inaudible 00:23:57] that basically need to be overcome before a great proportion of the population adopt this type of food products. Definitely consumer [inaudible 00:24:06] need to make sure that basically consumers are understanding... and perceive the relevance on this protein [inaudible 00:24:15].

Emanuele Zannini:

Nowadays, when I'm going to purchase a steak, I'm not paying the real value, the real cost of the steak because I'm not [inaudible 00:24:26] the consumers, I'm not taking consideration the environmental cost associated with the purchase of the steak. And this is something that basic [inaudible 00:24:34]. Technological [inaudible 00:24:37]. Definitely here we can... we have the tools to functionalize proteins in a way that basically will fulfill our expectation [inaudible 00:24:46] texture, color, flavor, and aroma. Definitely, as I mentioned before, [inaudible 00:24:52]. We need to make sure that the ingredients [inaudible 00:24:57] delivery are affordable and have a relatively low cost. And this is [inaudible 00:25:04] very important. We, otherwise, we are going to... we always have [inaudible 00:25:09] consumers embracing our products and never the mass market. The mass market I think we need to make sure that the change could happen. [crosstalk 00:25:20] ...

Female:

Emanuele, I'm sorry, we are out of time. You need to...

Emanuele Zannini:

Oh, okay. The last [inaudible 00:25:26] [crosstalk 00:25:26] ...

Female:

Thank you.

Emanuele Zannini:

...definitely we understand basically how the impact of differences in protein digestion, digestibility, absorption, satiety, [inaudible 00:25:38] everything is [inaudible 00:25:40]. Thank you so much for your time.