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Agricultural Economics will be the Transformative Power of Gastronomy

"Eat Wisely"

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ABSTRACT

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This paper, reviews and sample cases aim to serve as a basis for the studies of experts, academics, scientists, and bureaucrats interested in the gastronomy aspect of agriculture, food, and health issues on this matter, which is the basic need of the gastronomy industry and provide support for such parties with sectoral knowledge at the beginning.

The countries having agriculture and cuisines based on health had the advantage during and after the COVID19 pandemic. We cannot think of gastronomy without agricultural knowledge. The intersection of agriculture and gastronomy is a large area. This paper will only review how the agricultural economics discipline will thrive the transformation of the global gastronomy system, "Eat wisely" behavioral change. Gastronomy is part of the transformation of the global food system; biodiversity and farming are indistinguishably connected. The nutritional quality of food determines our health. The high-capacity food industry, production lines of goods are some of the effects of the temperature of our summers, water pollution and our health. Our culture and habits influence the spaces we leave to our children and grandchildren. Starting with a production focus and moving towards the consumer's health and adding the gastronomy at one of five vital parts of this transformation. These are: 1) Supporting the small-scale farmers. 2) Changing industrialized large-scale agricultural production. 3) Changing agricultural policies 4) Losing less. 5) Eat wisely, mind full eating, eating smarter and food literacy.

The transformation of food systems changes is already happening. UN 2019, the global sustainable development report announces, "Future is now" and indicates "the changes of food systems need to include climate change and health considerations to increase the resilience of food systems for food security and human health and ensure that access to natural macro, micro nutrition of foods itself is not rattled." the society will transform the global food about: Technology, Governance, Finance and Behavioral Change.

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1. Introduction

We are part of a bigger system and without addressing the full implications of our actions, sustainable development of our society is impossible to achieve.

After it is taken into the human body, the health benefit of food may be the most important consideration in the "sustainability of agricultural production". Therefore, sustainability from soil to the fork of beneficial elements obtained from food is important. For this purpose, the development of existing production, supply and cooking systems is a necessity. Reinforcing the message of the sustainability Science Specialists, Economists also mention that the increase of agricultural production is not the solution; we rather need to find ways to thrive in agriculture. By thriving, we mean finding ways to preserve macro and micro nutritional factors, naturally found in agricultural products, without losing them from harvest to cooking.

The transformation in agriculture will guide the gastronomy system. A 5-step model can be applied under the framework mentioned in the UN 2019 report. These steps are in the knowledge domain of agricultural economics; thus, they are regarded as a discipline which, will guide the gastronomy industry. We wish that this paper will serve as a basis it specialists, and disciplines related to law finance, food, and health in their studies on this subject. We will address the 5-step model briefly and emphasize the last step, “Eating wisely”, in which we recognize the health effect of eating on our lives.

We are to feed a world population, that is expected to be at nine to ten billion in 2050. Feeding nine to ten billion with the food system we have today means that we will have to produce more food in the next four decades than all farmers in history have harvested over the last eight thousand years. What is needed within our global food systems then is not an upscaling but a transformation. The Economist Kate Raworth from Oxford University says that “A healthy economy should be designed to thrive, not grow”. As it is mentioned in the previous paragraph, we should take the subject one step ahead and explain the “Thriving point”; instead of growing agricultural production, we should transform the food system to protect macro and micronutrition, naturally found in agricultural products, from harvest to cooking without being lost.

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2. Analysis and Findings:

Current advancements demonstrate that more qualified human resources will be required for artificial intelligence technology, robotization, less use of humans in labor, producing ideas, development, and teaching and utilizing the developed technology. 5-Step Agricultural Policy transformation model, which can be applied to the international gastronomy within this framework, consists of the following items. We will put more emphasis on the 5th item in this paper. 1) Supporting the small-scale farmers. 2) Changing industrialized large-scale agricultural production. 3) Changing agricultural policies 4) Losing less. 5) Eat wisely, mind full eating and food literacy.

We will be discussing this last item further in this article.

2.1 Supporting Small-Scale Farmers, Agricultural Policies and Loosing Less:

In order to improve conditions for small-scale farmers, use of existing technologies, increase government support and consumer awareness, provide know-how, solve their financial problems, and implement thriven agricultural policies will transform the status of farmers.

We regularly hear from the companies with a large market share engaging in agro-business that the global food amount must be increased to remedy famine. A major change will occur in the current century, whether we like it or not. We have heard from the news and the industry leaders that today, half of the seed market is controlled by three companies, total grain trade by four companies, and the total fertilize sale by seven companies. (Richardson K., 2019). One-third of food produced for human consumption is lost or wasted globally, about 1.3 billion tons per year. Food loss and waste cause as much as 940 billion USD of economic losses every year. The key point is losing less. Food loss and waste are global issues, but the concrete challenges are regionally specific while it is present worldwide (FAO, 2020).

The loss of macro- and micro- nutrients in the produced goods from harvest to table and the damage sustained during transport is food loss. Therefore, today, an improvement in the supply chain stages of the small sized producers from harvest to transporting their produce to the consumers is mandatory.

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For example, the system established by Nnaemeka Ikegwuonu, Farmer and Innovator, Entrepreneur & Founder from Nigeria, among the small sized establishments to preserve the post-harvest nutritional values of the product and preventing loss is very successful. Solar panel powered walk-in coolers for storing the produce immediately after harvest. A system, which offers energy savings and prevents nutritional loss. It is called "ColdHub" Solar powered cold storage for developing countries. ColdHub walk-in, solar-powered cold stations ensure seven days, 24 hours storage and preservation.

Nutritional losses of the products occur in countries lacking food supply systems due to not transporting the produce under proper conditions until the consumers purchase them. The loss from production to consumption can be decreased by improving the current transport chain and providing knowledge and financial support instead of making the product durable for transport. The fact that trucks arrive at small-scale producers for collection after the harvest leads to the product being stored in the open and under the sun for an extended period. This is the point in time when a product's loss in value begins gastronomically. Unrefrigerated trucks are the reason for loss during transport. The products sustain certain losses during unloading at the market.

Nutritional loss increases growingly until they are placed into the pot. Rotting starts with the harvest and continues at all stages of this transport chain. At this point, the system established by Nnaemeka Ikegwuonu, founder of ColdHub, works as follows, as explained in his own words:

> "ColdHub"s is to build these solar- powered working cold rooms, very close to harvest area, and consumer points. It is a kind of new supply chain, so small scale farmers can have an opportunity to store food and sell when they want to sell. They sell when the prices are confident for them or whenever they want to sell. The system is building up these 100% solar-powered working cold rooms and they are situated in farms and market places. The goal is to use them to store food for as much as 21 days - as much as possible. So actually how the technology works is we have a 5500 watts power generation capacity which is in solar panels formats, and these solar panels actually charges the monoblock refrigeration system and the monoblock refrigeration system cools the food - but in the daytime we are cooling food off the solar panels, but at the same time storing energy in high-capacity batteries and these batteries is for night cooling, days

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of cloudy weather and days of rain, when there is no optimal sunshine. Excess power from the ColdHubs are also used to wire and to power Internet hotspots. There is an upcoming relationship we have with Microsoft, where we use the excess power. From this 5500W capacity energy, we are only using about 580 watts, and that leftover power is used to power Internet kiosks and wi-fi hotspots."

The benefits of the system:

I. Increases the income of these farmers, retaiers and wholesalers because typical food that is wasted can now be stored and sold at another time.

III. Creates employment by recruiting and training women who run hubs in farms and marketplaces. Thus, it builds social interactions. Brings all these things together and including gender perspective of creating employment for women."

III. Using renewable energy brings energy savings, food security, nutrition, having nutritious food available, storing food in a safe and hygienic manner.

IV. Relatively, internet stations by using excess power will help community learning systems and digital education.

2.2 Behavioral Change "Eat Wisely"

People are becoming more aware of the environmental, health and social consequences of their food choices. However, it is difficult to identify the most sustainable food, as products can be measured in so many dimensions. Therefore, the essential element for achieving a sustainable food system is changing our diets.

When you have food literacy, you know the effects of what you eat on your health, apply healthy cooking techniques, and learn to read and inquire about the labels. Today, the points of sale lack information about the breed of animal from which the meat and dairy products originate, their geographical regions, and breeding, processing, or harvesting methods. There is more to what we eat than we see on our plates. Our food choices have the power to affect our health and world food trade. The respective awareness can be raised within the scope of "gastronomy law". Having respect for the soil, producer, nature, yourself, and your health is the basis of food literacy and can be further developed.

The starting point of these practices could be through acting according to the season. Let me put it this way: once upon a time Nasreddin Hodja was sawing the branch he was sitting on.

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The children saw him and said, "be careful Hodja, will the lake ever get fermented?" Hodja answered back quickly, "Why don't you believe that it died, but you believed that it gave birth".

This does not feel quite right, does it? Yes, it does not. Because all of them were different jokes and none of them got along with each other. Thus, they did not provide any insight nor made us laugh. Likewise, fruits and vegetables will have similar outcomes when they are not consumed in the season because each fruit and vegetable ripen in the respective season to satisfy the needs of such season. Therefore, when consumed in the off-season, foods will come and go without providing any benefit, just like the sentences mentioned above, Nasreddin Hodja jokes coming one after another. Without providing us with the vitamins and minerals that we need now, during that season.

This type of seasonal nutrition dates to prehistoric ages. The relationship between agriculture, health, and food can be found in manuscripts such as "The Ebers Papyrus" Medical papyrus - 1500 BC (850 herbs, 700 magical formulas), Edwin Smith Papyrus-1600 BC. One of the most important books on agriculture, the harmony of taste, and medicinal plants is the "Shennong Ben Cao Jing" "The Divine Farmer's Materia Medica". (Jing, 2017).

This food culture from Ancient China, deemed as the world's oldest nutrition and eating diet, is the basis of nutrition based on 24 solar cycles. It is known as "eating in season" in our culture. This is followed by the "De Materia Medica" by Dioscorides, authored in 50-70 AD. Translated as "Kitabü'l-Haşa'iş fit Tıb" kept in the library of Süleymaniye Complex. The most important aspect of these manuscripts is the fact that they give us tips on food and nutrition by using agriculture and nature. We need to read nature and follow it.

Scandinavian countries are the leading countries that align nutritional recommendations with the sustainability objectives and collect the data. Turkey needs to create its health and nutrition data. As a result of this information, eating behaviors and habits must be gained by the society like a culture as part of the agricultural economics and policies. Agricultural economists must assume a big role at this point. Research, studies, and recommendations of the Agricultural economists will lead the way in processing the rules and policies of gastronomy in its relationship with other disciplines in harmony with the interests of the country, world, and nature.

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2.3 What You Eat Affects How You Behave

Our brain processes food as a chemical. Macro and micro elements and how our hormones and intestines work affect on our behaviors and the decision-making mechanism in our brain through chemical means. Food gives us energy and directly interacts with our behaviors (Orhun and Akıllı, 2019)

It is a new challenge to help people eat sustainable and healthy eating. In order to focus on teaching children to like healthier options should be a part of human culture. The case for food is that some things we are born to like and others that we must learn to like. We are born with a preference for flavors that are sweet and fat, which is very appropriate because that is how breast milk usually is.

When we reach four months of age, we begin to like salty flavors. Whereas we typically reject sour and bitter flavors and must learn to like them. Besides those, any other preferences are acquired.

Our preferences will differ all depending on where we grow up and, which foods we are introduced to. When adjusting children's food habits, simple things such as how it is presented can have a huge impact, while rewards carry some significant risks. The way food is displayed for both children and adults, age and papilla conditions can play a significant role. Early induction and patterning of taste buds occur via processes inherent to the developing tongue. Therefore, the amount and types of taste intake vary with age (Mennella, & Beauchamp, 2005).

We can taste five tastes bitterness, sourness, saltiness, umami and sweetness. We also taste "kokumi" as a flavor modifier.

Bitterness: Bitterness is caused by compounds such as phenylthiourea, polyphenols, which we found in a lot of plants, flavonoids, terpenes, and organic bases like glycosides. Therefore, these are usually associated with toxic substances.

Sourness: We are sensing the number of hydrogen ions present in the food. Therefore, it always comes with the acid such as the lactic acid, acetic acids, citric acid, like that.

Saltiness: It is largely because of the minerals such as sodium is because of all this ionization of organic salt that gives the sense of saltiness.

Sweetness: We monitor the presence of the hydroxy group in many of these sugars, such as glucose or fructose, and sometimes even ethanol or glycerol.

Umami: That is a taste of amino acid. Amino acid is the nucleotide. Both can give you the sense of umami, largely because of this glutamate

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structure. Now, these taste substances have one common property. Whatever it is, acid, minerals, these polyphenols, or amino acids are all polar, which means they carry charges, and they are water soluble so that they can easily be dissolved in water and so that when we taste, we want them to be in the water as a solution so that we can perceive them. Moreover, most of them are relatively stable in water because they are not volatile.

Kokumi: The search for other kokumi substances. By 2010, the Ajinomoto Group had identified several so-called gamma-glutamyl peptides that activate calcium receptors on the tongue. It turns out this potent kokumi substance is found in many foods: yeast, scallops, fish sauce, soy sauce, shrimp paste, cheese, and even beer. In addition, the natural mechanism by which it is synthesized has been revealed in yeast. (Ohsu, 2010) It is a flavor modifier; it is not the sixth taste. It creates more mouthfulness, (Toelstede, 2009) continuity, thickness on umami, salty and sweet tastes.(Ajinomoto group, 2010)

The taste map on the tongue is very important. What we need to consider is that, when we say that we are sensitive to a particular taste, we need to question whether it is because of the density of the papillae, the density of the sensory cell, and also how the sensitivity is related to the number and amount of receptors available in that particular region, the temperature of the food, or our saliva. For example, the sensation of sugar is triggered by a receptor we call the T1R3. This particular receptor is a G protein coupled receptor. It is present in our tongue. They are not evenly distributed in our mouths. They are more heavily focused on the tip of your tongue, but different regions of our tongues can sense the sweetness. Therefore, the tongue map has no sharp lines.

Sour and salt tastes are directly transmitted to the brain via ion channels. Sweet, umami and bitter tastes are transmitted to the brain using “G” proteins. Taste buds are found in a scattered array on the surface of the tongue. We know that the taste bud development is initiated and proceeds via nerve-independent processes, which occur long before birth and are governed by cellular and molecular mechanisms intrinsic to the developing tongue. This will lead to variations in the order of sensing the tastes. A study by Kapsimali and Barlow (2013) ,says that “It is confirmed by incorporating important new data obtained through the use of two powerful genetic systems, mouse and zebrafish, that the taste bud development is a molecular and cellular regulation. In conclusion, the taste is a primary sense of all vertebrates and reliably conveys important chemical information from the mouth to the brain to regulate ingestion. For most animals, sweet, moderately salty or certain amino acid stimuli

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trigger appetitive behavior, while bitter or sour substances typically are rejected. The ability of animals to distinguish between nutritional, versus potentially lethal, fermented or unripe food items may mean the difference between survival and death". Under these circumstances, there is a possibility that the breeding efforts for protecting an agricultural product against vermin may affect the taste chemistry of such products and, therefore, the gastronomic value thereof.

How is the food prepared?: Is it raw, cooked, or baked? But also, the way the ingredients are sliced. If we take a cucumber, for example. If it is lying in the fridge, there is a high possibility that children will not bother eating it, but if we cut it into shapes or slices, add a little bit of salt then cucumber and serve them when the children are hungry, then it is more likely that they would want to eat them. Appearance, cooking method, spices used, and sauces change the degree of the desire of the food.

Besides that, a reward system is another approach to help children. It usually works like this: "If you eat your peas, you get an ice cream." In most cases, children need to eat a vegetable or something similar to get the reward. Even though it works, this method is not recommended, as it usually results in the child liking the peas or vegetable even less and the reward even more. If we use a reward that is not food, it could be a way for the child to try new flavors, but it is still not recommended. If we want to change eating habits soon and fast, it is not enough to focus on the "do's and don't's", especially when it comes to children. The best way is the concept of the family diet, in which the eating habits of the family are changed. Dietitian Neslihan Öztürk Aktepe (2020) has discussed the concept of "family diet" in detail in her book "Diet in the Taste of Love".

Making more visible agricultural products will nudge people to eat them. Nudging is a phenomenon that can be used to change these eating habits both at a personal and societal level. Nudging can be used to change what you eat and how much you eat. In a small context, the nudging can be used to eat something else. For example, if you typically would eat some candy in the afternoon but really would like to choose a healthier option. Then a solution could be to have some vegetables, fruits or nuts, that you could take out when you felt the need to snack. In a bigger context, the nudging can be used to support healthier eating habits like for example reducing in some areas and increasing in others. When we look at the way the supermarket is organized, not having the candy at the end would result in us buying less of that. Another suggestion would be having small portions during a meal to avoid a waste of food.

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Questions such as the thermic effect of the active ingredient of each food we consume, the route they follow, what kind of role nitric oxide and adiponectin have, how the blood values change, and whether the specific hormone is affected or not are each research factors. We can start the research with the following information from the past and found in Far Eastern medicine and traditions.

Cucumber has a cooling effect on the body and the somewhat bitter taste of its skin can become not exactly sweet but somewhat appealing taste when eaten only if we consume it by salting. Apple has the role of decreasing body temperature. While green grapes increase the body temperature, red and concord grapes have cooling properties on the body. While red rose tea heats the body, white ones cool the body. White rice hass a cooling effect and brown rice has a heating effect, and the thermal effect of ginger is preferably consumed during winter and spring. What we eat affects our health and how our digestive system works (Orhun & Akıllı, 2019).

It will be easier to change our behavior when we remember that these are physical and chemical reactions. Harmony of food chemicals and taste is crucial. Dyspepsia, gas buildup in the body, fermentation, or toxic effects as a result of interaction must be avoided. Prolonged exposure will affect your intestinal flora leading to inflammations and, thereby, disorders. Furthermore, if you have a familial medical history, you need to pay more attention to what you eat, consult your physician and dietician, and be aware of where and under what conditions of produce is grown. Nutrition in season and organizing your food and recipes are what is important.

When you eat according to the 24 Solar cycles, you need to consume each fruit and vegetable in season. Seasonal feasts and agricultural knowledge provide us with archival data on this subject.

Climate changes affect the soil temperature and the producer. For example, soil and air temperatures are factors, which affect the sugar retention ratio of plants. Soil's mineral structure is also crucial. Boron content affects the cell wall endurance and immunity level of the plant. When you cook and prepare to eat what the plant absorbs from the soil with the suitable method, you will absorb the nutritional values of the plant in your body from the table. The plant's appearance and cooking technique change when you are aware of the soil structure and its mineral-rich contents. You can reach the right place, i.e., the right results, by starting from properly growing the right seed in the right place and through right transfer to the market, right preparation at the

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place of production, and using the recipes created using right cooking techniques and right interactions at home. We can benefit from the macro- and micro-nutritional values of the produce harvested from the soil when we go through these process phases. This is called "Eating wisely".

Seasons can serve as the starting point of learning how to eat wisely. Agricultural engineers and agricultural economists are the disciplines that will revive the knowledge that is a part of our culture yet not frequently used in our daily lives, for eating in-season nutritional models. Moreover, this is a discipline equipped effectively in spreading this phenomenon. The sociological effects, which will emerge, will be measured with agricultural policies determined and the gastronomy law formed.

Some of the natural phenomena, which we can use to transform our eating habits:

One of the constellations that determine the seasonal cycles in Anatolia is the Pleiades. When the older people engaging in farming were unable to see this constellation, which can be normally seen with the naked eye on the first days after the summer solstice or were able to see it dim-lit due to the shielding thin Cirrus clouds at high altitude, they believe that the next six months will be droughty with low precipitation. Therefore, they delay the seeding time by 4 to 6 weeks to have them come into leaf in the rainy season since the foliation time of the crops will be during the drought and they will become highly sensitive. In addition, the elderly seamen believe that there will be a storm and refrain from setting sail if they cannot see the Pleiades.

Aerography scientists Ben Orlove and Mark Cane from Columbia University Lamont-Doherty Earth Observatory say that "the fact that the climate scientists having knowledge about what agricultural local forecasting practices are will serve as a primary source in determining the new forecasting techniques". Likewise, gastronomy specialists say that knowing such agricultural local forecasting and practices will positively change nutritional habits.

The part, which is of interest to us, is that there will be no water loss in the fruits when the air is humid and this will affect the taste of the fruits and their fleshy parts. Skins of certain fruits, such as grapes, will get thinner when it is windy, and it will be easier to eat and process such fruits. Getting the right prepared food on your table in the right season will make sure that we get the right macro- and micro-nutritional values. Eating wisely is only possible through following the producers and nature.

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Acids, minerals, polyphenols and amino acids are soluble in water and we can detect them when we taste them since they are in the water. They relatively remain in the water since they are nonvolatile. They do not evaporate and disappear. However, foods with different chemical structures can bond with each other to have adverse effects on human health. Thus, sometimes mixing food may have worse effects than we think. Your cooking technique and various practices affect the mineral and chemical compounds available in the food, affecting our body's absorption capability. Weiwen Chai and Micheal Liebma from Wyoming University have studied the effects of various cooking methods on certain foodstuffs in March 2005, and published them in the Journal of Agricultural and Food Chemistry. Agricultural techniques affect food cooking methods.

Reduce, Reuse, and Recycle is the main condition of managing the agricultural and food waste and the ingredients in the kitchen. We need to reduce the portions. Today, the ideal intake for Women is 1900 calories and 2300 calories for Men. We need to modify our eating habits to the ideal figures then what is today for transformation and behavioral change.

Today, one Turkish sesame bagel (simit) is 350 calories, and one pastry bun is 400 calories. When you start the day eating two pastry buns for breakfast, continue with one serving of Arabaşı Soup (308 calories), one serving of Sultan Reshad's Pilaf (410 calories), one plateful of Sultan's Delight (539 calories), salad, dessert, etc. at lunch, followed by dinner and the snacks in front of the TV, you intake much more calories than you should daily. The necessity to reduce to lower eating to a normal level rather than reducing eating is the topic of our times. Eating wisely is a way of behavior we need to include in our lives in this regard.

Today, what we eat in a day makes almost 4000 calories. In terms of health, fattening belly and constipation are the signs of unhealthy nutrition and excess calorie intake in people with no specific disorders. Thus, the "Waste-Free Kitchen" training, ensuring waste and behavioral transformation, must be organized as courses starting with the soil. Only then, the value of production will be understood. This type of training must be provided to organizations by the agricultural economics department under the title "Food Supply Chain" to the chefs who make the purchase lists and personally taking care of the food supply.

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In addition to all we have mentioned, a system under development in Sweden and Japan can be widely applied in the future for waste utilization. The engineered machine dehydrates the food and leftovers by completely removing the moisture content and utilizing the remainders as a source of protein in animal feed production is a great way of utilizing food waste.

Today, the only nutrient on which humans can live is "breast milk". If you apply the right agricultural technique with knowledge and not requiring any genetic technology, you will have the nutritional values just like in breast milk when you put the right combinations on your plate. In addition to the endurance properties, corn is now produced with x, y, z additives since we will lack certain nutritional values when we only consume corn. Beans are not produced with a, b, c additives since we will lack certain nutritional values only when consuming beans. However, if you grow corn, any crop from the gourd family and beans in the same soil, zucchini's large and hard leaves will prevent weed growth, and the hard leaves are more resistant to pests; thus, they help the other two plants grow. Roots of beans that make the soil's nitrogen content usable allow the corn to grow more easily. Stems of corn and bean support each other. When this perfect balance ensured in the soil is combined with a recipe featuring the right technique and ratio on your plate, you can support taking in the nutritional values that a healthy normal person needs.

It may be a good choice to equip ourselves with knowledge on the natural balance of agriculture. This knowledge may influence our shopping and consumption habits as well.

Another aspect, which is never observed to be preserved during the supply of agricultural products, is the natural odors of the produce. In April 2019, Dr. Mehmet Hakan Özdener and his teammates proved olfactory receptors on the tongue. This signals that our eating order, taste, and identification forms will change in future. Like we always say, "I am full with the smell of the food".

3. Conclusion

Agriculture, food and the form of food on the table, gastronomy and our health are joint sets. It seems that the concept that the right food is our medicine will continue in the future, just as we have experienced during the COVID-19 pandemic. A healthier diet that improves life quality, we need behavioral change "transformation". The topics of food waste, acquainting with the producer, providing support, appreciating the value of soil and learning about the agricultural policies are out there to understand the concept of "eating wisely". The discipline of agricultural economics and the discipline of gastronomy has joint fields of study. The common starting point leading to "behavioral change" in all humans is the "season". Starting from the seasonal feasts, using the seasons to change the eating habits and behavioral changes is offered as a solution.

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