Podcast Transcript

Dr. Ron Ehrlich: Hello and welcome to Unstress. My name's Dr. Ron Ehrlich. Today's podcast, wait for it, is about the future survival of the earth and humanity. A big topic, I'll give you that, and if ever there was an understatement, that was it. But my guest today is a fifth-generation farmer who has written a fabulous book [Call of the Reed Warbler] on regenerative agriculture and has not only asked some very difficult questions but he's also come up with some solutions that are relevant to you and me in ways you may have or not have even considered.

What is regenerative agriculture? In order to understand it, you've got to understand how almost all of our food in the Western World is produced and the effect it's having, not just on our health, but the health of the land. More specifically, the soil, which it's worth remembering is a finite resource. There's a limit. If you're saying to yourself, "Don't worry about it," you think they'll get it all sorted out." Well, the current trends of epidemic preventable degenerative diseases, if that's anything to go by, and I repeat, preventable, well, I think we need to all think again.

The alternative, or rather the norm, in our world is that we've got a very mechanistic industrialized approach to agriculture with its concentration on very technological solutions. It's been that way dominating Western society for over three centuries, over this whole scientific era.

This way of thinking has led to a practice of industrialized farming marked by heavy use of machinery, pesticides, and artificial fertilizers. The monopoly of this form of farming has led to a very, very sad situation. We've got degraded soils, reduced productivity, financial hardships for farmers, and a very, very high, above-average suicide rate.

While we're at it, for us, the consumer, it's led to what is seemingly cheap food. I say seemingly because you need to factor in the flow-on costs of medical expenses and environmental degradation, so we're kidding ourselves if we think food is cheap.

To that, I would add, as Charles points out in my discussion with him, to an overabundant supply of calorie-high and nutrient-poor food, which in turn has led to this epidemic in preventable chronic degenerative diseases like cancer, heart disease. There are now over 80 autoimmune diseases. That is the body attacking itself. Not to mention diabetes and obesity, and if all this is connected to what we are talking about today.

This really is a story for us all. Particularly, for those that have any interest in the survival of the earth, and for that matter, humanity. I hope that includes all of us, and I hope you enjoy my conversation with Dr Charles Massy. Welcome to the show, Charles.

Dr. Charles Massy: Thanks very much. Great to be here.

Dr. Ron Ehrlich: Charles, one of the things that's often intrigued me is that homo sapiens as a species have been around for 200, maybe 300,000 years, and we're always told genetically we haven't changed that much. But something happened 10,000 or so years ago that started the

agricultural revolution. Something prompted that or allowed that to happen, which has seen us take over the world. What was it?

Dr. Charles Massy: That's a point that directly relates to what we're talking about, but the fact that we haven't changed much, of course, isn't true. We're constantly evolving, especially with new forms of genetics like epigenetics and stuff. Getting back to that, the homo sapiens, yes, you're quite right that the modern form probably has been around for a quarter of a million years or so when we really evolved, what's it called? A symbolic brain. The last 100,000 years up to 10,000 or 12,000 years ago, was a pretty rugged time. The ice age period, the Pleistocene, and all that.

Then suddenly, you know, dates vary, but 11 to 12,000 years ago we moved out of that into this perfect phase for a geological era that's absolutely suited humanity. It's called the Holocene. The huge challenges of ice ages disappeared, and conditions reined on Earth. Temperature across large areas, rainfall, and post the glacial period, you had a lot of rich soils, and carbon dioxide in the air, of course.

The consequence was that humanity moved into a new phase of culture, which we now know as agriculture. That took thousands of years to evolve, but it started with the domestication of plants and then animals. Dogs were domesticated before that. That led to an enormous cultural shift and change also in our biological evolution.

The rise of agriculture, really, many people say it's led to the modern destruction of Earth, because we started to shift from what you could call the organic mind, where we saw ourselves as totally indivisible with Mother Earth, to a situation where we started to see ourselves as being able to dominate and manipulate and extract its resources. You couldn't have started with a better question, really. It's-

Dr. Ron Ehrlich: Without that environmental period of stability, we wouldn't really be able to have moved on.

Dr. Charles Massy: No, that's absolutely right. We would have been grappling for survival on the margins of the earth where the ice wasn't reaching. Of course, the ice ages were very dry, and so the capacity to grow crops and have access to herd animals for our hunting and all the rest of it ... Survival was just too tough. It enabled all that, absolutely right.

Dr. Ron Ehrlich: Yeah. Of course, we're going to move on to how things have changed, but in Australia of course, people always change the landscape. That's happened every time a human has moved into an area, and the native Australian aboriginal moved into Australia, again, anywhere from 65 to 80,000 years ago, and they changed the landscape, too, didn't they? Because there was megafauna around then, there were animals over 50 kilos, and the landscape looked quite different. But they changed the landscape, haven't they?

Dr. Charles Massy: They did. Subtly, maybe. Not as profound as some might argue, but the irony is that the driest continent on the earth, and what's regarded as overall the hottest, was settled because of ice. In other words, in the ice ages, the sea levels were very low, and that

enabled the crossing of the aboriginal population from, we now know, at least 65,000 years ago. Australia then was known as tundra land. It's 30% bigger because New Guinea, Tasmania, and vast reaches of continental shelf were then dry land.

We've got to be careful we don't extrapolate the noble savage concept because as indigenous people settled all over Australia, probably within 10, 15,000 years to every corner, they would've made mistakes, et cetera, etcetera. It's remarkable they survived because running around Australia at the time were these giant megafaunas. Elephant-sized wombats, Diprotodons, giant lizards that make the Komodo dragon look like a little skink, and things like that. There were some fearsome predators. Also, Australia's got a range of the most poisonous plants, sea life, et cetera, that you can encounter.

They survived that trial and error, and what they encountered was a landscape that had been adapted to fire. 65% or so of our vegetation needs fire, or molecules in smoke, to germinate and propagate. Somewhere along the way, they evolved incredible skills at burning to create, for example, fresh food for kangaroo and other macropods.

Bill Gammage writes brilliantly about this in his book, The Greatest Estate on Earth. Even though it's a challenge to some of the biophysical side, I think the basis of his thesis is right. That when Captain Cook and company sailed up the east coast, ironically he thought that indigenous people were just very primitive and just wandered around vicariously harvesting or hunting. At the same time he commented on the smoke, and what he actually saw was a sophisticated land management where fire was used to create and shape resources for food, et cetera, et cetera.

Dr. Ron Ehrlich: I've heard you say that you're in the rural fire service, but the aboriginal skill with fire pales your knowledge. They're very skilful with their use of fire.

Dr. Charles Massy: Extraordinary, and look, I've had the privilege of working with a local indigenous elder, a Ngarigo man, and we run an annual burning workshop with him. I thought I knew a little bit about fire; I was fire captain for a period when we had a really bad fire, about 60-odd big fires. In that case you're fighting hot fires at the worst time of the year.

But the indigenous people knew how to use cool burns, whether it was in the top end, in the early dry season, without conflagration and a lot of carbon emissions. I'm just in awe of the skills I'm learning from this guy. It's something we'd like to implement a bit more in our own management.

Dr. Ron Ehrlich: Now let's just get on to the subject of industrialized farming. Before we talk about what are the features that kind of challenge our landscape, just so our listeners know, we are talking about food that they are eating. What proportion of our food in Australia, or for that matter in the Western world, is produced by industrialized farming?

Dr. Charles Massy: Look, I can't give you the exact amount, but compared to indigenous cultures and peasant cultures, it would have to be well into the 90%. When we're talking about

industrial food we're talking about, in a nutshell, the destruction of food, plants, and animals, the destruction in those species of a huge range of nutrients.

If I go back a step, plants and animals and humans, we didn't just ... If you take a thorn bush, it didn't just pop up with thorns. It co-evolved in that landscape over hundreds and hundreds of thousands of years. Take the thorn bush, it evolved thorns because animals kept grazing it for its leaves, so its protection device was either thorns or bitter chemicals or something like that.

Conversely, those animals, including humans, who ate those animals, we were co-evolving at the same time, and so we're hard-wired internally for detecting a huge range of nutrients. I'm talking about tens of thousands. Primaries, the basics like amino acids and minerals and stuff. A vast number of secondaries, you've got what are called phytochemicals, that come through plants from photosynthesis. Some of them are medicational factors, some of them are high nutrition and health preventive and stuff.

If you put that in the back of the mind and then think about what we've done with the industrial world, we've gone and destroyed our soils by and large and that's still accelerating through ploughing and poisoning. A lot of those nutrients out of the healthy soil come via microbial bacteria and fungus and other bugs.

That source the minerals for the plants, and in exchange, they get plant sugars out of photosynthesis. Once you start ploughing and poisoning, et cetera, et cetera and beating up the landscape, those nutrients aren't sourced. Our food plants, for example, are dependent on the modern fertilizer they're given. They become drug addicts, but only for a very limited range of nutrients.

I think what's behind your question is, has our food changed under the industrial system? In Western world, well over 90% absolutely. Dramatically. The other component of that is not just what we're doing to where it comes from, but it's what we're then doing in the food processing, which is destroying most of the rest of the nutrients. So, the way we overprocess and denatured and add in additives and all the rest of it. To have it on a retail shelf, it's gotta be able to last long periods in packets. Basically, it's denatured crap, a lot of it.

Dr. Ron Ehrlich: It's so interesting because in health, the big breakthrough in health is now said to be the gut microbiome. We're learning so much about whether we're feeding our friends or our foes and there's 10 times more microbes in our body than human cells. Yet, we're also learning about the importance, although it's been known for some time, but we're learning about the importance of the microbiome in the soil.

Dr. Charles Massy: Absolutely right, and the two go together, of course. Each of them are now ignored and crewed by an industrial capitalist system that destroys both. The modern foods just aren't providing the fibre. That doesn't just mean rough fibre and material. It means all sorts of materials that we ingest that aren't immediately absorbable, like easy sugars, and proteins and things, and salts. It means the leftover material, which our large intestine, our gut, really needs to function. They're only getting about 30% of what they need.

Really, if you look at it, the interface between us and our environment and our entire immune system as you quite rightly point out is that second part of it, which is the microbiology in our gut, which is equivalent to a second brain. That's where the whole immune system's set up.

If you're not looking after that, and more importantly as we can probably discuss later, the world's most widely-used herbicide, glyphosate, otherwise known as Roundup, is specifically knocking out a key amino acid pathway and therefore destroying much of our immune system. I think it's incredibly closely linked to a lot of the modern diseases. Maybe we can touch on that later.

Dr. Ron Ehrlich: Yeah, no I'd like to because I think the other thing about the gut microbiome, and I am assuming this is true of the soil microbiome, too, is the issue about resilience. Building resilience.

Dr. Charles Massy: Absolutely right. Let me give you an idea of ... I don't have the specific figures at hand, but if you take a teaspoon of healthy soil, that's soil that gets lots of plant sugars and organic material, the bugs can see it, it's like it's a whole zoo. There's about 10 different types of major animal or microbial families in there. It starts with bacteria. You can have billions of these different varieties in just a teaspoon of healthy soil. The other guys that people aren't aware of are what are called a root funguses, is the mycorrhiza fungi.

Just to give you an example, in a really healthy soil, just think about a cubic meter, like a kitchen table, meter high, meter wide, deep, et cetera. In a cubic meter of healthy soil, these funguses, they've got this nice exchange partnership with plants. The plant roots give them sugars.

Their part of the deal is to go out and hunt for all these nutrients for the plant. Tens of thousands of different types of nutrients and basic minerals and stuff. To do that, they have these microscopic tubes called hyphae. Now, in a healthy soil, just one cubic meter, there might be 40 kilometres of these hyphae hunting these nutrients for the plant, so therefore, for us and/or the animals we eat.

You go nuking that soil with too much fertilizer or chemical or over-ploughing and beating the hell out of it, the hyphae shut down. There's no fungus there, the soil's compacted, and they don't work. So you're restricted to a very, very narrow range of nutrients. Our entire pharmacy, natural pharmacy and nutrition centre shuts down.

Dr. Ron Ehrlich: Yeah, the comparison between the gut microbiome and the soil microbiome, it's fascinating. It's interesting also because, in the human body, we've taken this adversarial approach to the microbiome. Everything with antibiotics, first of all, but then everything antibacterial. "Killing 99% of all" is a great sales pitch. "Killing all 99% of all bacteria." Of course, the use of herbicides and pesticides and the way that the industrial farming goes on, it's taken an adversarial approach to the soil microbiome.

Dr. Charles Massy: Absolutely right. Of course, driven to the benefit of the great multinationals, whether it's the farm ecological side or the industrial ag side or whatever. But there's a bigger story, here, which I tell early in the book [Call of the Reed Warbler]. That is that there's been a

shift in the human mind, which has led to all this. If you go back to the indigenous people you spoke about, but also early Medieval farmers or something, they're what you could call an organic mind. They still saw themselves as an individual part of Mother Nature, Mother Earth, etcetera, etcetera.

Then through a process, and this is all logical, but the brilliant process of agriculture led to towns, and then cities, and civilization, and advanced culture.

The remarkable sides of the Renaissance, the Scientific Revolution, and then the Industrial Revolution, and capitalism, all extraordinary stuff with wonderful knowledge. At the end of that, particularly with modern economic rationalism and industrial capitalism, we humans now don't see ourselves as an indivisible part of Mother Earth. We see ourselves as separate.

If you think about the white settlers that arrived in Australia, they carried that mind at the very cusp of all those revolutions we're bedding down. Earth, and indeed indigenous people, were seen as exploitable resources or inferior beings, in the case of indigenous people.

The Earth was seen as just a resource base, a substrate, for plunder and profit. That's really what's behind. I mean if we really, truly saw ourselves through an organic mind, that we're an indivisible part of Mother Nature, we'd be nurturing our bacterial world, microscopic world, et cetera, et cetera, rather than treating it as an enemy.

Dr. Ron Ehrlich: Now, we're gonna get on to how you proposed in your wonderful book, which is called Call of the Reed Warbler, which I'm gonna ask you about in a sec, but you're a fifth-generation farmer. Presumably, your family and your farming were part of this thing. In health-wise, people often face a major trauma before they turn around and rethink things. Is that what happens in the farming world as well?

Dr. Charles Massy: Yeah, that's a good question. I guess, to cut the long story short, I was always very keen on nature, a naturalist. I went to ANU [Australian National University] as an undergraduate in the early 70s to do zoology; wanted to become a wildlife ecologist and behaviourist. I also did one of the first courses in Australia on holistic thinking, human ecology, there.

At the age of 22, my father had a major heart attack, so I decided being an only child I'd come home and run the farm. Well, growing up on a farm doesn't equip you to be a good landscape manager, I knew bugger all. I proceeded to make every mistake in the book. I ploughed soils I shouldn't have and they washed away, or I left my animals on paddocks, which destroyed the valuable perennials. All that sort of stuff.

It was in the process, then, when I developed a Merino sheep stud using new medically, genetic and other scientific knowledge to evolve a new sort of fibre and evolved an animal-friendly sheep that didn't need the cruel practice of mulesing, et cetera, et cetera.

I had hundreds of clients across six states by the end of that. Many of them were what you'd call the early adopters who had picked up new ideas, and I noticed that quite a number were also

adopting some of the new thinking in regenerative agriculture. This new ecological agriculture. I thought it was so important I went back in my mid-life 50s to do a PhD at ANU. Examining why these people had totally transformed from one form of thinking to the other, and I'm getting to the question you asked ...

Dr. Ron Ehrlich: No, no.

Dr. Charles Massy: I interviewed 80 of the top farmers, men and women, across Australia into this new field and then analysed their language. Metaphor is a great indicator of what's going on in people's thinking. We're hard wired as part of the evolution you talk about a quarter of a million years or so ago.

What I found, that in 60% of these leading innovators who'd developed new types of farming or adopting it, some sort of major life crisis has cracked open their minds. It might have been, one case, burned in a bush fire, marriage breakup, major drought of the 80s affected a lot of us, et cetera, et cetera. Other people were poisoned by chemical.

That sent a crack open in the carapace of their mind. The other 40 odd percent wasn't always some shock, but it was often a series of destabilizing shocks or they're already predisposed to that. I thought that was a really intriguing fact that it just shows you how deeply entrenched what I call this mechanical mind, this post organic mind really is.

Dr. Ron Ehrlich: You know, over 10 years ago I used to think, what does farming have to do with me anyway? I started realize with the help of some very dear friends who were connected, very closely connected with the farming industry, that I started to realize that actually had an awful lot to do with me.

If I wanted my kids, and for that matter my grandkids, and their kids as well, well, we need to leave a legacy and not a mess. By the way, I also asked Charles about glyphosate, which is the technical term for Roundup. He mentioned that at a recent beer festival, 12 of the top beers had glyphosate in, that is Roundup, in the beers. It's a very big story and he had this to say about glyphosate.

Dr. Charles Massy: If you want to know, I think glyphosate is the coming tobacco issue. It's huge. It's just starting to unravel a bit. Obviously, the vested interests are sitting on it, but I think it's going to be absolutely enormous an issue when it blows up.

Dr. Ron Ehrlich: Yes, because it's in everything, isn't it? I think I heard you even mention once that it'd had even made its way to a German beer festival.

Dr. Charles Massy: It did, it's in baby's milk. The key point is, you picked up very quickly earlier, it targets the key metabolic pathway in our guts. The amino acid pathway for our entire immune system. That's why it's implicated in most modern diseases. I think it's the most terrifying thing. Rachel Carson, you can invent Silent Spring number two all over again and just build around this chemical alone if you wanted. I think it's a huge story, yeah.

Dr. Ron Ehrlich: Yeah, and it's ubiquitous. It's everywhere.

Dr. Charles Massy: Absolutely, absolutely.

Dr. Ron Ehrlich: Yes, well I know that you also have an issue with the word sustainability, which leads us to this, what you are championing and this is this regenerative agriculture. Can you explain why sustainability doesn't really capture it for you?

Dr. Charles Massy: It's played an important role. In the last 20, 30 years, it was the buzzword in science, et cetera. Sometimes used not necessarily to positive ecological ends, as in sustainable development or something. It's played a role, but to me now, it's a sort of, it's not quite a weasel word, but it just means marking time, hold firm to me now. It's overused. Whereas the concept of regenerative agriculture means moving forward to a new, healthier state. The word regeneratus comes out of the Latin root. There's moral implications with that with it as well.

I guess one of the big ideas ... When I went back to uni after 30, 35 years or something, I'd obviously been preoccupied and doing other things, and I hadn't kept up with a lot of the modern thinking and systems thinking in ecology.

In the last 20 years, there's been huge developments coming out of computers and modern systems thinking, and some of the extraordinary way out physics, whether it's chaos theory or complexity theory, and stuff. Out of that had emerged an understanding across all the disciplines that these giant systems, and not just giant, can be say, healthy soil. What scientists call complex adaptive systems, they're all hugely interrelated across all the different elements.

Even Earth is a complex adaptive system. It has all these elements that function together to maintain helpful resilience I guess in teaching Master's and third year students, I had to get my head around it. There's about 12 properties with it. I won't go into them, but the big idea, the big story that really hit me in the face, and I think it's nearly as big as the concept of evolution, et cetera. Certainly, one of the big ideas over the last century is this idea of self-organization.

I call them complex creative systems, not so much adaptive. They're living systems and very creative. If given the chance, and that's the proviso, if you keep building our landscape, it's not giving it a chance, but if you step back and allow our farms and our Earth, and other systems to get on with the job that they've co-evolved for over millions of years, they will self-organize themselves back to better states or health or resilience. May not be where they came from, it usually never is because too many variables in there.

That's what these farmers were actually doing intuitively. I kept hearing so many of them saying in their interviews to me. Look, my job is just to get out of the way and Mother Nature, let her get on with it. I kept thinking about this, what the hell were they saying?

Then I realized even without understanding how complex creative systems worked, they intuitively knew that if they enabled natural systems to work again by not interfering and building, their paddocks or their farms, nature would regenerate. That's what's happened. We're

now seeing extraordinary changes in all the landscape functions. What I'm doing teaching students is sort of five basic functions of for ecological literacy.

Dr. Ron Ehrlich: Now you know, Allan Savory is a person who comes to mind here. I had the privilege of hearing him speak in Australia a couple of years ago and actually interviewing him. He's one of my heroes to find as a holistic dentist to find holistic land management happening as well, I think holistic is the way the world works.

He challenges our notion about animals in agriculture being part of the problem, whereas in fact, they're part of the solution. You've come up with these five crucial functions or processes in these systems. Can you just outline us to it what they are? I think people really, this starts to make sense to people.

Dr. Charles Massy: Yeah, they're critical. I'll just jump in first with a comment, a really wonderful holistic dentist who I'm sure is one of your heroes, Weston A. Price, who started to caught onto how we were contravening a lot of the ancient health systems that you and I have just been talking about. Allan Savoury, a Zimbabwean ecologist, ran big game ranches, and et cetera, et cetera.

Brilliant naturalist, he, starting in the 60s really pondered why the great mobs of African wild animals that used to migrate, you'd think a million or more animals they're going to pulverise the landscape and it's going to be in a bad shape. Actually what he found was that was the healthiest grasslands anywhere.

He pondered on this, and so those animals in huge mobs, they're dunging, and they're urining, and they're stirring up the ground, but because of the predators that are driving them, they're constantly on the move. In a big migration, whether it's the Serengeti or other parts of Southern Africa, they'll move through and they might not even be back for many months if not six months.

Being an ecologist, you put together the story that it's good for the plants because once you eat a plant or a part of a plant the roots die under the ground and that'll feed your soil bugs. Good for plant, yes, they degrade because they're adapted to it. They need rest to recuperate and recover.

Eventually, he nutted out that what we were doing as humans managing landscapes, we were contravening that. We constantly graze the plants. They never got a chance to recover, build up their energy reserves, et cetera, et cetera, put down deeper roots. He came up with four basic biophysical functions.

If you want to look at the cycles in the landscape, there's chemical cycles, weathering cycles, and carbon dioxide. You could have about a dozen or 20. He simplified all that into four. The solar energy cycle, which basically through solar panels and photosynthesis drives all the sugars that drive the entire Earth system.

Dr. Ron Ehrlich: By solar panels, you're talking about plants.

Dr. Charles Massy: I'm talking about, yeah, sorry. I use metaphors in my teaching of solar panels in the plant leaves. Yeah, the photosynthetic cells, chloroplasts and stuff. They're basically solar panels. That's what drives the system. You've got your water cycle, so if you get healthy plants and you've got deep roots, and you've got lots of large bugs in the soil, your soil absorbs a lot more water and recycles it, and so on and so on.

The critical one to human health of course, I mean this is all critical, but there's a mineral cycle. All those ingredients in the soil that are recycled because bugs eat other bugs, and soil breaks down if it's healthy, and all that's recycled and put into the plants and the animals, and so on.

The fourth one you could summarize it as biodiversity or dynamic ecosystems, which is if you have diverse ecosystems that are co-evolved over long periods you've got all your pest control bugs and critters, and there's all these corrective balancing systems that goes for diversity and complexity.

We, farmers and humans, generally have a great capacity to simplify systems and wonder why the wheels fall off with locust plagues and all the rest of it. I guess I've added a fifth. I teach all this to farmers and student. The fifth I've added is, what one farmer said to me that one square foot of real estate between our ears, it's what we think. It's our world views, our paradigms we've grown up with.

I show photos to students of a fence line between one farmer regeneratively grazing or cropping, or doing whatever, and the other side of the fence line is just beaten into the ground and degraded. That's purely what goes on in the different minds of those two farmers. The fence line is a stark contrast. I call that the human social function.

Through my own mistake ridden journey I came to realize, if you like, I was landscape illiterate. I could not read the landscape because I didn't understand its functions. I didn't know if it was working properly if it was healthy or unhealthy. Really, I guess what I mind about in my teaching and that's a core part of this book because the bulk of the chapter through lots of great stories describe these five functions.

If we can get our landscape managers or our urban gardeners or whoever, or people making policy, et cetera, to understand how ... and the Australian landscape's quite different to others as well. We can understand how they actually work and function. In other words, if we can become literate we can start to read them. Once we can start to read them, we can understand what we're doing to them or what we need to do, etcetera, etcetera. Basic stuff, but it seems to work.

Dr. Ron Ehrlich: There are two things in those five systems, the soil cycle, water cycle, soil mineral cycle, dynamic ecosystems, biodiversity and the human social cycle. Now the soil mineral one is so interesting because by putting the superphosphate, which is three minerals, what is that? Nitrogen, phosphorus, and potassium?

Dr. Charles Massy: Yeah, and PK, yeah.

Dr. Ron Ehrlich: Yeah, and PK. I mean, the human body needs 60 to 70 minerals, elements to function properly not three. Although a plant looks good with three, a human looks much better with 60 or 70. Those 60 or 70 come from a healthy microbiome. Yeah, healthy soil microbiome.

Dr. Charles Massy: Absolutely right. Because it's got a lot of acid in it and it kills off the soil biology, it's shutting out the other 67 or whatever it is. That's only half the picture. The secondary elements, nutrients or what are called phytochemicals, which come from plants photosynthesizing, there's tens of thousands of them.

A lot of them are absolutely fundamental to our immune system, to our health, talking about all those organs and parts of our body that essentially we are hard wired for all that long period we evolved in, in the savannas of Africa, et cetera. We're eating both animals who were grazing these plants and ingesting these wide range of nutrients, and eating plants as well.

We became hard wired and our immune and health system is hard wired to detect when these are lacking, and so signals go to the brain whether they detect this in our organs or our gut or our elementary canal. If you think about people eating a modern diet, the rest of a lot of these are over processed food, junk food, or industrial plants which are basically, as you're saying, only got a few elements. Their brain is constantly being told, "Listen I'm missing this important manganese," or "I'm missing this weirdo alpha something phytochemical that I usually used to get out of healthy meat." Your brain's saying, "Look, I'm still hungry, I'm still hungry."

I know obesity is a hugely complex issue, but it's an undoubted fact that the fact that we're overeating this empty crap food, is the brain is still saying, "I'm still hungry," and so you keep eating this empty crap. Big issue that you've just that you have just raised.

Dr. Ron Ehrlich: The other one of course, about phyto-nutrients is in this time in our history, where we are exposed to literally hundreds, tens of thousands if not hundreds of thousands of chemicals. We need those phyto-nutrients to deal with some of those environmental toxins. The other one you mentioned also is biodiversity. I know that whenever we talk about a healthy gut microbiome, the more biodiverse the microbiome is, the healthier the individual is.

Dr. Charles Massy: Absolutely right. A pretty good rule of thumb, isn't it? That's again, that long phase of co-evolution. Let me give you a quick example on a practical sense. When I took over in the mid 70s, I was a pretty naïve farmer, I didn't know anything. I made all the mistakes. I remember my father telling me, ever since the 20s when he came, we would regularly be wiped out by little wingless grasshopper plagues.

Not the plague locust, but a smaller variation. I was so geared to eat green that I did the green paint of a veranda post, and I think my mother had a table cloth on the line. They had a green leaf pattern. Anyway, every five or six years, these damn things would come through and clean us out and drop us into sort of temporary or instant drought.

It was a result of a simplified ecosystem, where we weren't creating diversity and the soil wasn't covered up, it was bare for their eggs and stuff. What then happened, when I shifted my own management in the late 80s and early 90s, is that within a few years we haven't had a wingless

grasshopper plague since. We've put in a lot of trees and shrubs. You've got more birds and predatory insects. We've got moister, deeper soils, so the nematodes are eating the eggs and they can't lay the eggs, and so on and so on. That's just economically and production wise, that's huge. That's just a simple example of the need for diversity in an ecosystem.

Dr. Ron Ehrlich: In building resilience. Now, you also mentioned the human social cycle and I'm going to ask you as we come to the end to include listener into this human social cycle because it's not only the square foot of the farmer's brains that are affecting this cycle, it's the square foot of the consumer's brains. I want to just come back to the issue of climate change. We hear a lot about it, it's a big issue of course, but this kind of regenerative agriculture, this kind of land management of animals is actually a big part of the solution, not the problem.

Dr. Charles Massy: Absolutely.

Dr. Ron Ehrlich: Can you explain that for us.

Dr. Charles Massy: Absolutely right. I think I probably didn't follow on with one of your earlier questions about agriculture and human civilization evolved in an ideal period called the Holocene. Where I am now at ANU, friends and people I know just down the corridor across the road at CSIRO, they're a lot of the leaders and the key commissions in the global climate change issue.

There's no doubt in the last, particularly since the Second World War, that we've moved out of the Holocene due to what humans are doing. As everyone knows, that's why it's now called the Anthropocene, the human caused new geological era on Earth.

Yes, climate change is a key player. We're putting out too much stored carbon, and stored carbon that came from plants, a couple hundred millions years ago, whenever it was. It's only one of eight other major geophysical, bio geophysical systems of Earth that the self-organizing planet that where life created conditions for life.

That planet does self-organize itself for health, like our ecosystems and ... The carbon now that we've pumped up into the atmosphere in acceleratingly ... because we're doing it, is a major factor, but so are destabilization of eight of the other nine. The one that we've saved in which agriculture isn't involved in is the ozone layer. We're now in the sixth greatest extinction event the Earth has ever seen. This one caused by we, humans. The nitrogen and the phosphorus cycles, we're over-clearing land.

Anyway, to come to your question. Australia's about the third worst land clearing nation on Earth after Brazil and Indonesia. If we stop clearing land now, we'd save 20% carbon going into the air immediately. The other exciting thing about regenerative ag is not only can we address all those other issues I've spoken about. The nitrogen cycle, I mean over 90% of nitrogen fertilizers comes from industrial fuel, and it does a lot of harm. We can create, improve biodiversity in all the rate of it. We now know that through healthy regenerative farming, we can pull a lot of carbon out of the atmosphere.

You hear lots of arguments, "We've got to stop this," and stop the emissions and all that. Not many concrete solutions up to now. There's some good books now talking about draw down, et cetera. We know we can fix a lot of carbon in the soil once you get healthy soil biology going. You need your soil bugs to do that in a healthy soil. I won't go into the chemistry of it, and I'm talking about carbon that can last hundreds of thousands, millions of years just like the fossil fuels that we pulled out of.

What I've been going around in my talks to students and saying, "Yes, we're in the Anthropocene. Let's not lose hope. The solution to there and a key player that's damaged a lot of the systems in the Anthropocene is industrial agriculture, yes. But regenerative agriculture can undo that and pull in carbon and address a lot of the other issues." It's really, my book's really a story about hope and solutions. Just to pick up a point you made early on, the title of the book [Call of the Reed Warbler], and it came from one of these stories about biodiversity. I went out, just quickly-

Dr. Ron Ehrlich: Yeah, no, that was my next question, actually. You've read my mind.

Dr. Charles Massy: Okay, it'd been one of Australia's senior economists who then bought a small farm not far out of Canberra, and he was working with regenerating his watercourse for using some of the work that Peter Andrews natural sequence farming had done. We went for a drive over a hill, here's a neighbour's place where there's Merino running all year round.

The place was pretty bare and flogged. The ground was hard. There was salt. No water in the creek, because they're all poured off to quickly. We went down the next fella and his, his neighbour's place, a lot of green vegetation, which I didn't see previously in the neighbour, spreading out from this creek, which was now gently trickling through a lot of reeds and vegetation.

This guy had only been doing this for nine years. As we were chatting and examining this transformation, there's a little patch of reeds. It's not bigger than a kitchen table that some waterbird must have brought in and then it started to regenerate.

Out of the middle of that came this beautiful call of this reed warbler. I suddenly realized that was probably the first time in 140 years since a reed warbler had been back in that valley. To me it became such a metaphor or symbol of how we can regenerate our landscape through enabling self-organization, et cetera.

Dr. Ron Ehrlich: Yeah, well it's a great book. It is a great book of hope because setting it up, as you say, it can all seem rather overwhelming and depressing when we think about how big an issue, or how pervasive industrial farming is. It's a book of hope about regenerating not just agriculture but regenerating the planet. Hey, I think that's in everybody's interest. It brings me to a final question here, Charles. If we're in the city, how can we participate in this regenerative agricultural movement? How can city dwellers get involved?

Dr. Charles Massy: That's a great question. I was going to raise it if you hadn't because I sort of coined the term for what these farmers are doing because we're taking on a big end of town,

the big food processors, the big multinationals, the big pharmaceutical companies, the Monsatos of this world that propagate this poisonous crap et cetera, et cetera, and then the big retailers.

I call these farmers and the urban people that are supporting them, underground insurgents. Playing on the underground of healthy soil, but it's not going to change from the top down. God for big, our politicians don't show leadership and the vested interests of this madness of economic rationalism isn't going to change.

We can regenerate our landscape with healthier food with regenerative farmers, but we need the partnership of the urban draw through of demand. Not just urban people getting their head around healthy soils and food gardens. It's definitely Stephanie Alexander teaching in schools, and growing local communities again. That's just as important as what we farmers are doing.

There's a wonderful movement now spreading as you've been more than aware of. I've got my youngest daughter working in it in Melbourne, and it's very, very exciting. It's got to be a two-way team. It's underground insurgency and all power to the urban part of it.

Dr. Ron Ehrlich: Yeah, well that's kind of the whole message of this podcast and actually, when Allan Savory said that to me when I was interviewing him, and he said, "If you're waiting for the change to come from above, you'll be waiting a long time. It's got to start from the ground up." Being part of a regenerative agricultural underground movement sounds like a very good place to start. Charles, thank you so much for joining us today.

Dr. Charles Massy: No, thanks very much for the opportunity. It's a great program that you promulgate, so great.

Conclusion

Dr. Ron Ehrlich: Now a theme that I feel very strongly about is that the coming century should be the era of the revered farmer who grows nutrient dense, low chemical food, and nurtures the soil and land for future generations. Remember, our legacy, not a mess. Last century, if that's anything to go by, I think was the era of the revered economist. When we reflect on that, I think a lot of the current disillusionment with government is that everything seems to be about money and corporate influence. We're encouraged to spend, we're encouraged to borrow, we're encouraged to be good consumers.

We're all stressed maintaining that kind of lifestyle. Striving to unstress and be well is another theme we're going to obviously be covering a lot of. Supporting this movement of regenerative agriculture seems like a win-win all around. Good for your health by building resilience, and building also resilience in the health of the planet. The two are inseparable. Now, Dr. Charles Massy's book is called, Call of Reed Warbler. We'll have links to that on our website. It's worth remembering that half of the food we produce in the Western world is thrown out, it's wasted.

There is an issue there, which I've covered in some other podcasts as well. It's also worth remembering that 70% of the food grown globally is grown by local farmers. The possibility for change is there, but like so much else, this change has to come from the ground up. From you and me, voting each and every day with our money to effect change. Until next week, this is Dr. Ron Ehrlich. Be well.