

## What's there to eat? Population growth, food, and bugs

Outline:

Bugs are insects?

How many people are there in the world?

Gussed yet? It is 7.8 billion.

And this is how the world's population has grown: From 1/2 billion in 1600, it doubled to 1 billion in about

200 years, doubled again to 2 billion in 123 years, and doubled yet again to 4 billion in just 47 years.

And now, in the last 46 years we have nearly reached 8 billion.

Do you see a trend? The growth has been exponential for a long time.

There is some good news, at least for the developed nations. World population growth is currently at 1%, which is a decrease from the 2.1% peak rate registered in 1968. Currently the world's population increases by 81 million people a year, but the annual growth should decline to 48 million by 2050.

Unfortunately, most of the nearly 2 billion people that will be added in the next 30 years, will be in the less developed regions of the world.

The United States exhibits the same exponential growth curve. There are about 331 million people in the

United States. That is 3 times as many as we had in 1950, just 70 years ago! And the US is expected to reach 434 million by 2100.

So, did you ever hear of this guy, Rev. T.R. Malthus?

Over 200 years ago, when the world's population was only 1 billion, he published his Essay on the Principal of Population. Malthus wrote that we were heading for a crash because our population was growing exponentially. The problem was that there would not be enough food.

Malthus established, from the evidence available to him, that while our population grew exponentially, available food only grew at a steady rate.

At some point there would be more people than food to feed them. Darwin, for one, had his thinking strongly influenced by Malthus's essay when postulating his evolutionary mechanism of survival of the fittest.

In college, I read Limits to Growth and The Population Bomb. In the 1970s, those authors certainly thought that Malthus's prediction was coming true.

But was Malthus right? After all, we haven't had a crash yet.

The answer is that we have used science to boost food production and avoid the crash - so far. The Green Revolution gave the world new crops, expanded monoculture agriculture, opened up new but marginal land to cultivation, and utilized extensive mechanization, irrigation, fertilizers and pesticides.

But science and food are having a hard time keeping up with our huge population increases. We are running out of new land to crop, we are losing land to the growth of cities and erosion, we are running out

of water, we are using more pesticides and fertilizer that are expensive, made from non-renewable resources, and are otherwise hurting our environment.

And eating meat has exasperated the world's food insecurity.

In the last 50 years, while the world's population has doubled, consumption of meat has quadrupled. Livestock are now fed about 40% of all grain harvested. For example, China and India each have about 1.4 billion people. As those people get wealthier, they want to eat animal products like we do.

Raising animals for meat certainly wastes lots of grain! It takes 10 pounds of grain to get one pound of growth in a steer. If we keep Chickens in cages so small that they can't move, they are more efficient, but it still takes 2 pounds of grain for each pound of growth in a chicken.

It goes beyond just meat. If every person in China adds 3 chicken eggs a week to their diet, it would take all the grain grown in Australia to feed the hens!

Now here we come to Insects. Insects are as efficient as chickens in using grain. And crickets, for example, are 12 times more efficient than cows at converting food to biomass. Here is an efficiency comparison with our usual meat sources.

But of course we don't eat insects.

But insects eat our food! FAO estimates that 20 to 40% of all the food we grow gets lost to pests, much of it eaten by insects. Eliminating insect feeding losses would give the world more food security, but that has been beyond our science and technology.

So, if insects are eating our food, maybe we should return the favor and eat the insects!

Dr. Ronald Taylor wrote a book called "Butterflies in My Stomach" where he argues that insects will be an important future protein source, and that we will have bug farms dotting the countryside turning out insect protein to add to food like the cereal we eat for breakfast.

A 2013 UN report recommended improving human food security by raising insects on human

waste and slaughter house blood, and then using their biomass to make animal feed.

Insects as part of a circular economy would reduce waste products and make production even more efficient.

Why not? Insects make up 57% of all the plant and animal species. Of course insects are tiny, nothing in comparison to a cow or pig.

But there is a lot of cumulative biomass in those little bugs. There are a million ants for every human, and by weight, there are 300 pounds of insects for every pound of us.

And insects can have as much protein as chicken, pork and beef. Take the Giant water bug as an example.

And here are other insects that would also supply fats, minerals, and vitamins in addition to amino acids.

And here is one more nutritional comparison our typical meat sources regarding protein and fat.

So, why don't we eat insects? It is because of Entomophobia. What does entomophobia mean?

Yes, it is the fear of insects. In a University of Arizona survey, less than 1% of those responding liked insects, while 90% were afraid of insects or strongly disliked them. But how did we all get entomophobia? Is it inherited like the color of your eyes? Can you catch it like

the flu? No, it is a learned behavior.

Here is a little story about getting entomophobia: two-year old in the garden.

That's right. We are so afraid of insects in America that we will even pay good money for a device to suck up bugs so we don't have to touch them. And we certainly don't eat them, do we.

Yet, historically, people throughout the world ate insects.

The ancient Greek playwright, Aristophanes, wrote about grasshoppers being sold as food in the Athens marketplace.

Leviticus Chapter 11, verse 22, tells the Israelites that they can eat locust, a type of grasshopper. Grasshoppers were also popular with a tribe that lived in Ethiopia. The Romans called the tribe "Acridophagi", which means "grasshopper eaters".

Dr. Turpin told me that the Aztecs preferred ears of corn with corn-ear worms.

But do people of the world eat insects today? Yes, over 80% of the people in the world eat insects on purpose.

In Thailand there are fast food stands serving all sorts of insects to people on the street. Giant water bug and meal worms.

In southern Africa, people harvest Mopani caterpillars from the trees.

Some are canned in tomato sauce and sold in the stores.

In Japan it is not unusual to eat insects in a sushi bar, or you can buy canned insects in the store.

But we don't eat insects, do we. Do we? Well, let me tell you a story about this ketchup bottle: have you ever wondered why that little piece of paper rings the top of a ketchup bottle?

You think that that is just a story?

Well, maybe you should read this very authoritative piece of information –

Yes the rules of the Food and Drug Administration allow certain amounts of insect residue in our food because it is perfectly healthy.

Spinach can How many of you have eaten canned spinach this week? Well, a 16 oz can could contain up to 212 aphids or 8 leaf miners and it would still be perfect legal to sell and absolutely safe to eat.

Peanut butter jar How about peanut butter this week? A typically sized jar is allowed to have up to 102 insect fragments and it would still be perfect legal to sell and absolutely safe to eat.

Tomato Paste Pizza anyone? An 8 oz can of tomato paste is allowed to have up to 51 fruit fly eggs or 3.4 fly maggots and it would still be perfect legal to sell and absolutely safe to eat.

So maybe we have been eating insects all along and just didn't know it. And why not, insects are good food. We eat other things like shrimp, and crab and lobster which make our mouths water and wallets shrink. But those Crustacean are close relatives to insects. Dr. Turpin calls lobsters the cockroaches of the sea.

Well, now some people in the United States are joining the rest of the world and eating insects on purpose. These are young people at an insect eating party in Maryland.

Here is pasta garnished with the meal worms . Wait, are meal worms insects? And I have

sautéed and eaten meal worms myself.

Unfortunately, Zoom does not allow me to cook up any samples for you tonight.

And so it is time to end the talk, and on a more sober note: While there may be growing interest in America to try insects as a novelty food, we are a developed country and there is no immediate need for us to consume insects. But there is a growing and dire food security crises throughout the developing world, where the population growth curve again threatens to use up the world's remaining resources. Insects, as both feed and a meat source, may be a good and necessary way for the world to stretch those dwindling resources and to avoid further environment degradation.

And here, in the USA, we can help too, if not by eating insects, then by at least moving to plant based diets.