Agroforest'ing the World From Machete to Tractor

Generating Agroforestry Practice Through a Network That Already Unites a Thousand Seated Families

Why the Earth Does not Belong to Us
We Belong to the Earth

(Translated to English from Portuguese using Google Translate, so there are bound to be some miscommunications. For any queries always refer to the original Portuguese version)

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"When the Forest is naked, unprotected,
Mofokari , the solar entity, burns the streams and the rivers.
He dries them with his tongue of fire
and swallows his fish.
And when your feet approach the forest floor,
it hardens and burns.
Nothing else can sprout in it.
No more roots and seeds in the soil moisture.
The waters run far away.
Then the wind that followed them and refreshed us like a fan hides also.
Sizzling heat hangs everywhere.
The leaves and flowers that are still on the floor dry and shrink.
All earthworms die.
The scent of the forest burns and disappears.
Nothing else grows.
The fertility of the forest goes to other lands "

(ancestral indigenous wisdom about the forest and the climate,
wisely expressed by David Kopenawa in the preface
to the book Urihi, Yanomami Land-Forest)

Special thanks to

God for his presence in every inch of the world and for granting us the grace to perceive it.

To our mothers, fathers, daughters and sons, companions and companions, family members, friends and friends, and all the people who, in a different way, at one time or another taught us in practice the love that led us to write each page of this book.

To the primitive peoples of America, for the legacy of their sacred knowledge and immense agroforests with great fertility and biodiversity.

To all people, organizations and networks that work for justice and social equity and for the awareness that we are more than sisters and brothers because together with the other beings we belong to the Planet Earth Organism. To all the people, organizations and networks that take on the mission of taking nature, agro-ecology, agro-forestry, traditional peoples and people back into the fields, building an inclusive and popular agrarian reform.

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Summary

1. The Beginning, the End and Restart of the World

In the year 1500, when Portuguese ships landed in Brazil, they found people who felt and acted as members of nature. They recognized the sacredness of the world and the essentiality of the forest with all its beings and spirits in order to enjoy a rich environment suited to life. They planted and dealt with the environment thinking about the well-being of all life, including the animals that they created in freedom and from which they fed. Its agriculture was so integrated with natural processes that the Portuguese could not perceive that they did it. For this reason, in the first letter sent to the King of Portugal, Pero Vaz Caminha stated that they did not cultivate plants or raise animals. Even so, he pointed out that one of the foods that consumed the most was "this cassava, which is everywhere". However, this plant obtained by the indigenous through secular processes, would never be present, without the agroforestry practices of the indigenous peoples.

As the people who inhabited America in 1500 already knew, and as confirmed by the most advanced ecological studies, the functioning of nature is organic in all its levels of organization. Organicity is present in the organelles of individual microorganisms that we call cells. In turn, the cells organize themselves in tissues and organs and, together with other microorganisms that make up the body ecosystem, generate the bodily environment appropriate to the life of all. At higher levels of organization, plants, animals, and microorganisms manifest the sacred organicity of life in ecosystems, biomes, the biosphere, and the Planet Earth. Through this incredibly cooperative system, all the conditions are maintained so that we can live well, such as the rain cycle, the climate and the exact composition of the atmosphere.

Therefore, the idea of basing society and agriculture on the opposite side of cooperation, that is, in the competition and domination of nature and other human beings, is totally anti-natural and therefore anti-scientific. However, it is even more dominant today than in the year 1500. As a result, all the disasters that follow the expulsion of life from the forests and people of the fields, announced in the speech of the Yanomani people, are happening globally on planet Earth. At the same time, there is great human suffering, also resulting from the competition empire have been established as rule in human relations.

This small book aims to contribute to reflection, perception, study, practice and reconstruction from the inside out on the way that each reader sees and participates in the world and in agriculture, from their own knowledge, feelings and experiences. All that is written must be relativized, for the paths will only make sense for other personal and collective experiences when they are reconstructed, adapted and improved from the inside out, in collective processes and also interior of each person.

2 - About this book

This book is itself one of the fruits of the Agrofloresta Project. As a fruit, it gathers and portrays actions, results, texts and impacts that were made and made viable through the Project, carried out by 400 campesino families and their organizations, including schools focused on agroecology and its students. For everything to be possible, a work carried out in great synergy with the Flora Project, which was developed and coordinated by the Con- tested Institute of Agroecology - ICA, was fundamental. The Agrofloresta Project, as well as the Flora Project, was selected through a public announcement, being sponsored by Petrobras, through the Petrobras Socioambiental Program.

The Agroforestry Project is created, coordinated and advised by the Association of Agroforestry Farmers of Barra do Turvo and Adrianópolis - Cooperafloresta, which brings together around 100 families of Agroforestry Systems (SAFs). For 20 years they have been developing, practicing and irradiating agro-ecological SAFs. For this irradiation to contribute effectively to agroforestry implantation in other social, economic and environmental contexts of family agriculture, it is fundamental, however, to adapt techniques, perceptions, species and technologies.

Thus, in order to contribute to a broader adoption of SAFs, in 2011 Cooperafloresta assumed the function of seeking resources that enabled its active participation in training processes, stimulating the practice, costing and development of SAFs in others contexts of family agriculture.

Cooperafloresta's disposition met full resonance with a broad process of construction of agroecology in the context of agrarian reform. There are a large number of schools that promote training in agroecology within the settlements, such as the six schools directly involved in the Agroforestry Project. Another action in this direction is the realization, for fifteen consecutive years, in the state of Paraná, of the Agroecology Day, gathering annually about 4 thousand settled families and their organizations in the scope of family and peasant agriculture.

In a very intense and special way, the families who settled in the Contestado Settlement, in Lapa / PR and in the Mario Lago Settlement, in Ribeirão Preto / SP, were the main actors of the Agrofloresta Project - and hence of this book. In both cases, families and their organizations, in broad debates also about 15 years ago, decided to conceive and implement these settlements to serve as references in agroecology and SAFs. Great effort and a lot of learning has been done in this direction. In both cases, settled families and their organic network of national and international organizations, such as Via Campesina, have been building agroecology schools and training people from many other locations in Brazil and neighboring countries. Many have had decisive participation in the Agroforestry Project and in the development of what is reported in this book. Of particular note are the Latin American School of Agroecology (ELLA), the Contested Settlement, and the Dom Hélder Cândara

Socio-Agricultural Training Center in the Mario Lago Settlement. The protagonism of the Cooperativa Terra Livre in Contestado Settlement was also fundamental.

Another aspect of fundamental importance to make this process feasible - and which greatly enhances the results obtained through the Agrofloresta and FLORA Projects - is the organicity and fraternity that exists among the more than 50 settlements in which almost 1,000 SAFs and many thousands of settlements have been implanted scattered throughout Brazil. In the same way, the results are being strengthened by the determination of the various organizations involved in transforming agroecology into the hegemonic productive matrix in the context of Popular Agrarian Reform, Family Agriculture and even more comprehensive scenarios.

It was also of great importance that the extensive social and environmental processes reported resonate with the determination of the farmer Ernst Götsch to develop techniques and strategies aiming at agroforestry principles to be applied in mechanized processes. Ernst has worked intensively in this direction and the techniques and ideas he has developed have, directly and indirectly, fundamentally oriented a large part of the work carried out within the framework of the Agroforest Project.

It would be impossible to do full justice to Ernst's importance for the agroforestry concepts and techniques discussed in this book. The vast majority of the techniques and concepts that appear in it have come to us, and generally to the world, through it. However, we do not have the capacity, authority or pretension to present them in their original form, nor to separate what came directly from Ernst from what has already been transformed into the praxis of other people, from what was added, or from what came to us by other paths and people. Mentioning Ernst at one time and not another would be arbitrary and mentioning it in every line of this book would be immensely repetitive.

"I have no doubt that this work is a work that came from God and from our knowledge here in Barra do Turvo. And Ernesto brought a very important reinforcement, not only in the part of the knowledge, but in the examples. I passed on his property. It is a pioneer property where we learned what we know today. "(Sezefredo, agroforestry farmer Cooperafloresta)

Immediately above, the unit of Ana Rosa and Sezefredo, the first left in the year 1998, during consulting by Ernst Götsch (right), with the participation of the group that gave rise to NGO Mutirão Agroflorestal. Nelson and Osvaldinho, who participated together in the first years of Cooperafloresta and the Mutirão Agroforestry Group are also present. In the photo above, consulting by Ernst (right), in the Contestado Settlement, in the year 2,014 in Lapa PR, through the Agroforest Project.

We then chose to merge all the contributions and visions indistinctly, reflecting in the book the living and collective process of reconstruction from within the agroforestry praxis, carried out by peasant families, quilombolas, settlers and their organizations. We understand that it is indispensable that each person and collective process appropriate and reconstruct all the time the knowledge, visions, techniques and theories that they use. Ernst himself inspires us with his personal example. Its relation to nature can be used to define what we understand as agroforestry praxis. Ernst starts from direct observation of nature, and then synthesizes his observations in theory. Subsequently, he applies the theory and consequences of the theory with his own hands. It observes the results and from them corrects details, or even leaves the theory, adopting or formulating another one that considers more useful for the improvement of the work. This is a way of working highly recommended by the greatest scholars on scientific knowledge, in which peasant, quilombola and settled families and the organizations that carried out the actions reflected in this book believe.

3 - Some of the disasters caused by artificial farming

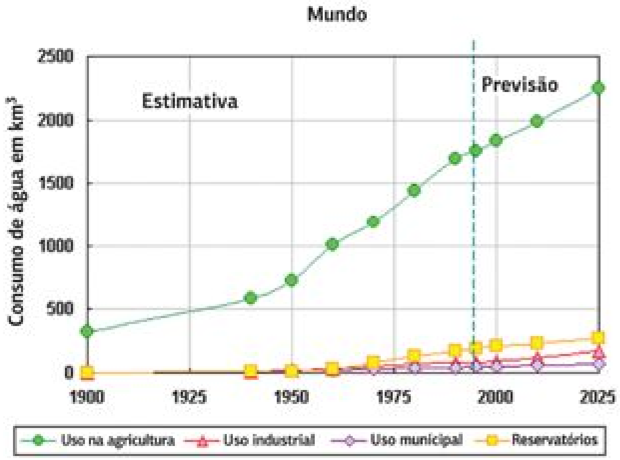
In most of the world, especially in the last 60 years, forests, trees, animals and rural families, with all their knowledge about nature, have been driven from the field. Instead, an artificially manufactured environment was put in place to produce food, while money, land, and power are concentrated in a very small number of companies. All this happened as a result of public policies dictated by the interest of large transnational corporations.

In this way, rural activity has become only the link of an industrial chain that involves everything from mining, heavy equipment industries, irrigation, fuels, fertilizers, genetically manipulated seeds, plastics, transportation, packaging, advertising, toxic to human health and sophisticated stores to sell them. Thus, these productive chains involve gigantic interests.

Fields without people and without nature and urban stretch, almost totally artificial.

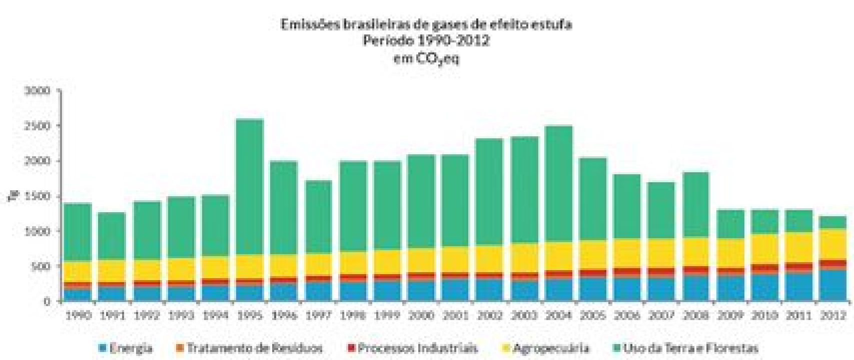
With so much power and money, companies have a great capacity to influence what we believe. They take advantage of the fragility of public power to use the infrastructure and teachers already paid by society to enter a small part of the resources for research, financing what they want to be researched. They also dominate the media, as well as advertising and marketing from careful scientific studies on the art of deceiving ourselves. For all of this, most people today believe that this is the only possible way to feed the world.

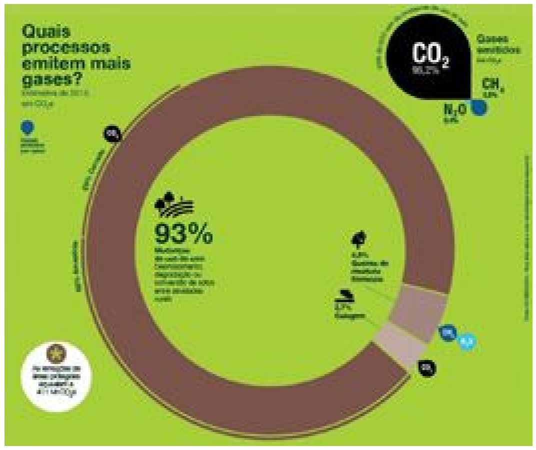
This model of agriculture and livestock is several times more determinant than all other causes combined so that the forests are felled and continually prevented from growing again. In this way, this model is the major reason that springs and rivers are drying and soils become unable to store water, causing irrigation to consume about 80% of all the fresh water available in the world and that has already been extracted in quantities much larger than nature can replenish and withstand. Among the many consequences, there are already more than one billion people suffering with severe water shortages, in a situation that worsens every year.



Dynamics of water use in the world by economic activity. By replacing natural life with equipment and inputs, artificial agriculture makes soils unable to store the water that would be supplied from springs and crops. Therefore, the green curve of the figure above shows the impressive increase in water consumption in agriculture that will force us to change or have to choose between food and water. Source: UNESCO - International Hydrological Program.

Hundreds of scientists studying the climate show that the burning of fossil fuels and the replacement of forests by agriculture and livestock together are the major reasons for the growth of the greenhouse effect and global warming. An FAO study covering 223 countries and territories concludes that around 130 million hectares of forests worldwide have been converted to other uses or lost only between 2000 and 2010. South America had the largest net loss of forest cover in this period , with 40 million hectares, with 26 million hectares occurring in Brazil. Dissemi- data cattle by the Ministry of Science and Technology show that the replacement of forests by agriculture and livestock accounted for approximately 80% of net emissions of greenhouse gases in Brazil, from 1994 to 2005. Even more serious than the greenhouse effect is the loss of biodiversity because the scientific community already recognizes that due to the actions of the human being, we are living the sixth, largest and most general mass extinction of species in the life history of the Planet Earth Organism. The consequences are difficult to scale, but probably include the end of civilization.





In the chart above the sum of green bars (change in land use) and yellow bars represent most of the Brazilian emissions. In the graph immediately above, 93% of the emissions occur due to the loss of soil organic matter, when forests are replaced by the currently dominant artificial agriculture.

Despite this, it is striking to know that the amount of carbon in the soil is still at least twice as high as that in the atmosphere and about eight times greater than the increase in carbon in the atmosphere during the industrial era. In the aerial part of the Earth's current forests, there is still more than twice the amount of carbon that increased in the atmosphere in the industrial age. This is despite the fact that more than half of the forests no longer exist and have been replaced for the most part by agriculture and livestock. When forests are replaced by modern artificial agriculture, much of the carbon present in soils and almost all of the carbon present in the aerial part, when not quickly burned, are gradually digested and consumed by living beings, also reaching the atmosphere.

Fortunately, other mechanisms in which living organisms generally participate, such as increased photosynthesis in the remaining forests and oceans by algae because of the increase in carbon in the atmosphere, has had a positive balance, consuming a share of the emissions . Because of this, not all the carbon dioxide that has been emitted due to the removal of forests is in the atmosphere. However, it also hinders the fair analysis of the contribution of the agricultural model, the fact that it also burns a lot of fossil fuels in agricultural machinery, in equipment and food industries, in the planetary circulation of food, and even more by concentrating people in urban areas, where the individual carbon emissions are very high.

Even more underestimated than the contribution of the agricultural model to global warming is the amount of carbon that could be withdrawn from the atmosphere if we reengage in agriculture and livestock based on the return of natural processes and people to the countryside. The numbers cited in previous paragraphs confirm the immense capacity of soils to store carbon, if we regenerate the forest dynamics, at least in the areas in which agriculture replaced the original forests. This possibility is underestimated mainly because developing and proving the productivity of agroforestry systems (SAFs) does not interest the large industries that finance almost all agricultural research. In addition, propaganda and media dominance mean that most of society believes that artificial agriculture alone is capable of producing the food that the world population needs. The small amount of research carried out with SAFs has shown that they produce more food per area than artificial agriculture, while at the same time extracting as much or more carbon from the atmosphere as the natural process of forest regeneration.

In the photo above SAF of Ana Rosa and Sezefredo. In the photo just above, meeting in the residence of Maria and Pedro, surrounded by SAFs, with many of the researchers who carried out the researches cited in this legend. Both SAFs are among the 16 studied in Cooperafloresta, which in general average take 6.7 tons of carbon per hectare annually, while producing large quantities and diversity of food, according to a study presented along with several others, in the book " Agroforestry, Ecology and Society, "published by Editora Kairós in 2013, under the Agroforest Project.

4 - Seeing the world with other eyes

The owner of a heart hardened by the idea that the world is a competition has no eyes and ears to perceive, understand and appreciate the greatness and beauty of the giant cooperative work that nature accomplishes.

4.1 - The transformation in the way of seeing the world in Cooperafloresta

"Nature is intelligent. When I started observing the agroforestry system, I began to realize the value of nature. "(Felipão, agroforestry farmer, Cooperafloresta)

Underway at Cooperafloresta in 1996, Ernst Götsch talked about agroforests. It opened our eyes to the fact that cooperation and organicity are the greatest law of life. He told how he noticed that the forges did not cut their fields at random, without any criterion. Instead, he realized that if he pruned a tree that needs sun under one that needs shade, the ants would correct their work, pruning even lower the tree that needs shade. Other examples, of more subtlety and complexity, led him to recognize the ants as great masters for agroforestry practice. From these and in other ways, all of nature became her greatest teacher and made her realize that all beings always worked organically, doing what resulted in the greatest good of the forest organism. Ernst also taught us that by seeking to participate in and contributing to nature's path, he ended up harvesting more and more food, wood, and other benefits.

His organic vision of the world, totally consistent with his agroforestry praxis, was forever imprinted in the hearts and minds of several of the pioneers of Cooperafloresta. In this way, it had importance of greatness impossible to be described, for the formation of Cooperafloresta.

"It is a multiplier crop, in a system of life ... That calls the life of nature near us ... The birds and even some small animals close to us. This encourages us a lot. I say this, multiplier, because Mother Nature does not stop working at all. And with this work, we take advantage of the service she does for us. "(Sezefredo, Salto Grande group)

Cooperafloresta's formation processes provoked among peasant families, mostly quilombolas, processes of re-reading local history, the life experiences of each one and the heritage of their culture forged in a relationship of great intimacy with the processes. All this cultural heritage interacted with the great conceptions about the organicity of life and with the agroforestry praxis presented to us by Ernst. All this resulted in a passionate process of reconstruction, from the inside out, of concepts and knowledge, experienced by peasant families in communion with the technicians who accompanied the process.

In the photos above, moments of the training process of the first group of multiplier agents of Cooperafloresta in the year 2005.

"What people knew about plants and soil quality was a big thing. They know the abc of the earth. I think this is pretty strong. And it is also interesting that it was complemented, because what some did not know, others knew. So this was quite rich. "(Pedro, an agroforest farmer, Cooperafloresta)

The campesino vs. rural methodology was an essential aspect of Cooperafloresta formation. From the first steps, peasant families played a decisive role in multiplying praxis, provoking a real revolution in the way we see and act in the world.

"The work of multipliers is the key point of agroforestry. I was very excited .. I learned, I liked it and everything we like, when I put it into practice, it works well. Then we also get that taste of moving forward. Work together, take that practice with a lot of affection. Through this friendship, this union, this taste that the multiplier already has inside him, he then passes on to that family, which does not yet have this practice. Then the thing grows. "(José Baleia, agroforestry farmer, Cooperafloresta)

"That's where I went on that Sidinei visit. That visit was very important. Then we saw that changeover one next to the other. I thought that was impossible, but then we saw it. We have seen that one plant serves as manure for another plant. I did not believe that! But now I'm feeling it's just working. My biggest interest is planting the saplings. I'm already not even Sezefredo. I want to see if I fill in more with seedlings of bare roots, palmetto, fruit, trees. My area is quite and I do not stop. "(Dolíria, agroforestry farmer, Cooperafloresta)

In the photos above agents multipliers of the first group acting, on the left, Nelma receiving students from municipal school, on the right, Pedro receiving visits from consumers of agroecological products.

The rescue of the mutirões, a traditional practice in local culture, has contributed decisively to making the values of solidarity, mutual aid and the collective construction of knowledge the basis of Cooperafloresta's organization. In this and other ways, organicity has been fundamental, both in the processes of formation and production, and in the processing, certification and commercialization of agroforestry production.

In the photos above process formation in Cooperafloresta, soon will mutirão workshop in the unit of Jorlene and Gilmar, further mutirão workshop involving the neighborhoods of Estreitinho and Aroeira.

Various professionals in the areas of health and social well-being, as well as people from different cultures and backgrounds who visited Cooperafloresta, testify that the feeling of belonging to nature and the acknowledgment of the divine perfection of their processes appears even in their way of speaking, bringing positive reflexes on the health, joy of living and self-esteem of the peasant families who lead the construction of Cooperafloresta.

"Here came consumer visits, when they got there at the fair, wow! It was a joy. There were three, four customers, there was one who had already come here. He explained to other customers how he was and said: you have to buy! They do that! They are delighted to know! "(Clóvis, Cooperafloresta)

The Agrofloresta Project enabled a number of actions through which Cooperafloresta was able to share its best fruits and seeds and be sure that seeds were delivered to the heroes and heroes who have been caring for them, reproducing, re-creating and sharing with the world in a rich, competent and generous way.


Above, moments of fraternization and prayer, left in assembly of Cooperafloresta, to the right during training workshop in the Neighborhood Terra Seca.


Exchanges at Cooperafloresta, left with the Dom Helder Câmara Training Center based in the Mario Lago Settlement in Ribeirão Preto SP and right with the Latin American School of Agroecology based in the Contestado Settlement in Lapa PR.

But this story is not over yet! The deeper interaction between Cooperafloresta and the web of organizations that lead the construction of the Popular Agrarian Reform, which has agroecology as one of its fundamental pillars, will still bear great fruit for both parties. However, the size of these fruits seems so great that it makes the historical perspective, which will only fully reveal itself with the passing of the years, indispensable for its entire vision.

"Today I reap the rewards. I say not only the fruits, that people can measure, that can be sold, but the fruits that I give the most value, the inner satisfaction of seeing such a beautiful thing blooming and that we are an effective part of this process. (Pedro, Cooperafloresta)

4.2 - The importance of seeing with other eyes the construction of agroforestry Agroecology

Over the past two centuries, the development of science and technology has made it possible to make tremendous change on the face of the Earth and in the way we live. This brought, although in a very unequally distributed way, comforts and benefits never before imagined. However, riches and power over science and technology have increasingly focused on meeting gigantic corporate interests that stand in the way of the well-being of all beings that are part of the Earth Planet Organism, among which we are included.

It is an indispensable part of the strategy to accumulate power over life and society, to use the most refined methods and techniques, which include marketing and domination of key sectors for opinion formation. In this way they try to imprint on our minds a way of seeing the world that believes in the illusion that science and technology can replace almost totally and with great advantages to God and to nature, bringing benefits to all.

Failure to convince us would make great powers crumble. For this reason, the most organic views on health, environment, agriculture and livestock or other fields will always be attacked in the most diverse and subtle ways. Therefore, it is decisive to base them, to strengthen them and to remain alert.

Replacing the natural environments with artificial environments has increasingly intensely prevented the nature of carrying out processes indispensable to our lives. This contributed to the fact that the share of science, made more independently of the great interests of capital, accumulated more and more evidence that there is an immense interconnection between all the animate and inanimate beings of Planet Earth. In the scientific community, there is growing understanding that attempting to replace natural processes is a suicide to civilization. Recognizing and preserving the central role of nature, with its divinely mysterious processes, is once again recognized as indispensable to civilization.

"If the human being declares himself autonomous from reality and constitutes absolute dominator, the very foundation of his existence collapses"

(Pope Francis, Encyclical Praised)

On the other hand, many studies of scientific knowledge recognize that our worldview directly interferes with what we can see or discover. Over the years, in our experience with peasant communities, we have heard many testimonies that show that strengthening faith in the divine and infinitely intelligent conduct of natural processes is decisive so that we can observe and expand our knowledge and discover more about these processes. Along with the growth of this faith, we witness the flourishing of great agroforestry masters, who have been learning and teaching that in the natural world the ultimate rule is also "to love one's neighbor as oneself." After all, we all belong to a single and sacred organism.

5 - Some essential fundamentals in the life of the Earth Planet Organism

"We see that nature is complete, it is people who uncontrol it and think that it is God who is to blame for this. Because without nature, without water, without green, there is no life. So that's why we have to get the knowledge, the value it has and enjoy. So this is where we're showing. Having quality of life and showing that this is a path to development. It is a garden for the new generation. Because people who live in the countryside go to live in the city is a waste of time. Because I'm always doing it is for our children, for our grandchildren. When I plant a tree that goes its two hundred years for it to grow large, I know that it will be a point of leisure for birds, to call rain, to call a wind, this air that we receive. Many people do not even know how to thank the air they breathe. "(Sezefredo, agroforestry farmer, Cooperafloresta)

5.1 - The power source

The sun is the source of energy. It is the capture of increasing amounts of solar energy that enables the improvement of the work of improving living conditions and also the continuous increase in the diversity and quantity of living beings that carry out this work, in each place of the planet.

We often forget that when every living being on the planet moves, sprouts, thinks, breathes or does any activity that demands energy, it is using solar energy. It is with energy that comes from the light of the sun that

the plants make the photosynthesis, producing sugars that will form their bodies and enable their activities. When beings that do not take photosynthesis feed on the plants, they seek these same sugars to release their energy, allowing their life.

This is why an ancient Chinese proverb says that "agriculture is the art of keeping the sun."

Horta agroforestry, in which banana trees and trees, as well as the excellent occupation of the vegetable garden, capture solar energy for the work of generation and maintenance of fertility by living beings.

5.2 - The control of the composition of the atmosphere

The air we breathe has a large amount of nitrogen (N_2), with 78%, and oxygen (O_2), with 21%, plus 1% of all other gases, including carbon dioxide (CO_2). The composition of the atmosphere has radically changed throughout the development of the life of the Earth Organism, being the fruit of the cooperative and coordinated organic work of all living beings. About 4.5 billion years ago, for example, the oxygen content was 0%. At present, the composition of the atmosphere is relatively stable, being maintained and controlled in these perfect conditions for life by the work of the living beings themselves. Water vapor and other gases present in small amounts also play important roles in the Earth Planet Organism.

He compared the composition of the Earth's atmosphere with that of other planets such as that of Mars, revealed through the study of light coming to Earth from these planets, which in 1968 scientists James Lovelock and Lynn Margulis concluded that there was no life on Mars . This was long before the spacecraft landed on that planet. It was also through comparisons that they found that the Earth's atmosphere completely disobeyed what could happen if it were subjected only to the laws of chemistry, like the other atmospheres studied. The main impossibility was the great presence of oxygen, gas with a great tendency to unite with other substances, which would never exist in the free form and in great content, was not continually produced by living beings.

The above-mentioned studies left no doubt that the precise composition of the Earth's atmosphere was generated and controlled by all living beings. This happens in a very similar way that the individual microorganisms - called cells - control incredibly coordinated and precise the composition of our blood. The spectacular conclusion was similar to the view of many primitive peoples, who considered the Earth a great living organism. It includes all living beings and also processes not previously associated with life, such as volcanism. They called this scientific hypothesis, which considers the whole Earth as a great organism, "Gaia Hypothesis."

* A great insight into this subject can be obtained by reading James Loveloock's book "Gaia, Cure for a Planet" (available at https://books.google.com/books?id=Tx- as well as in a text of rare beauty, depth and scientific rigor also called "Gaia" that comments on this hypothesis, also revealing facets of the scientific knowledge, intuition and sensitivity of his / her / author, the great Brazilian agroecologist José Lutzemberger (available at http://www.fgaia.org.br/texts/t-gaia.html).

Montage with photos of Earth and Mars taken in space by NASA, in its striking contrast, reveals beautiful faces of the miracle of life that happens in the Planet Earth Organism

5.3- Carbon dioxide and its main functions

The carbon dioxide content in the atmosphere before the industrial revolution was approximately 0.028% and currently about 0.040%. This seemingly small amount of carbon dioxide has a number of fundamental functions to make life possible for the Planet Earth Organism.

5.3.1- Carbon dioxide in the storage and circulation of solar energy

Higher vegetables and algae capture solar energy through photosynthesis and store it in the form of chemical energy that holds together the molecules of carbon dioxide and water in a kind of vital solar battery, which we call food. Without the carbon dioxide in the atmosphere photosynthesis would not be possible, nor the life of almost all beings on Earth.

The body of plants, animals and microbes is also composed largely of foods produced in photosynthesis, even though processed through various processes. For this, it almost always ends up serving as food for other animals and microbes. In this way, accumulated solar energy in food flows through living things along what we call chains and food webs. Almost all of the organisms either get energy through photosynthesis or eating plants or algae or beings have eaten them.

5.3.2- Carbon dioxide in the Earth's temperature control

It is mainly the presence of carbon dioxide that causes the atmosphere to retain a portion of the heat generated by the solar rays that pass through it, the retained portion being proportional to the content of carbon dioxide in the atmosphere. To this process we call greenhouse effect, which is indispensable for life, because without it the planet Earth would be icy.

By controlling the concentration of carbon dioxide in the atmosphere, the Planet Earth Organism controls its own average temperature within certain limits. The control of the concentration of carbon dioxide is performed in a complex way, through cycles in which living beings play a central role. In one cycle, the process is continuous, but much slower. It occurs on the same time scale as movements such as those of the rocky plates that cause the continents to slowly move, which is why it is called the geological cycle. In this cycle the carbon dioxide is slowly dissolved in the rainwater that penetrates the soil, forming an acid solution that extracts calcium and silicon and other minerals present in the rocks, in the process called rock erosion or weathering. This was the main cycle for the withdrawal of carbon dioxide throughout the history of life. It is very much prior to the slow creation of the conditions that made life possible for the forests on Earth.

Calcium, silicon, other minerals and carbon dioxide diluted in water are carried into the oceans. Several beings that inhabit the oceans use them forming the most diverse types of beautiful shells, including the shells. After the death of the beings that build them, the different shells accumulate in large deposits, thus conserving the carbon dioxide that forms part of their composition in the depths of the oceans.

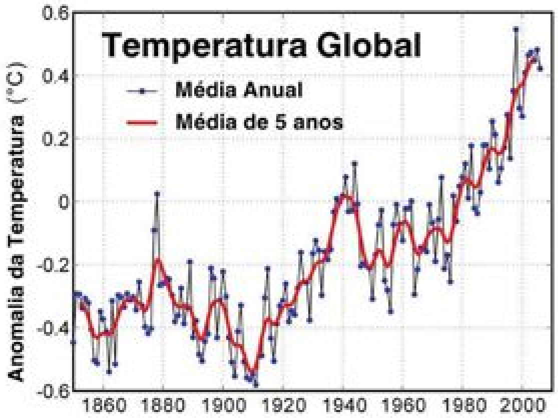

In this way, over time, a large amount of carbon dioxide has been withdrawn from the atmosphere, with the decisive participation of living beings. A portion of these deposits reach depths where heat and pressure melts them, forming magma, which can later be spilled on the surface of the planet through volcanic eruptions, returning carbon dioxide to the atmosphere.

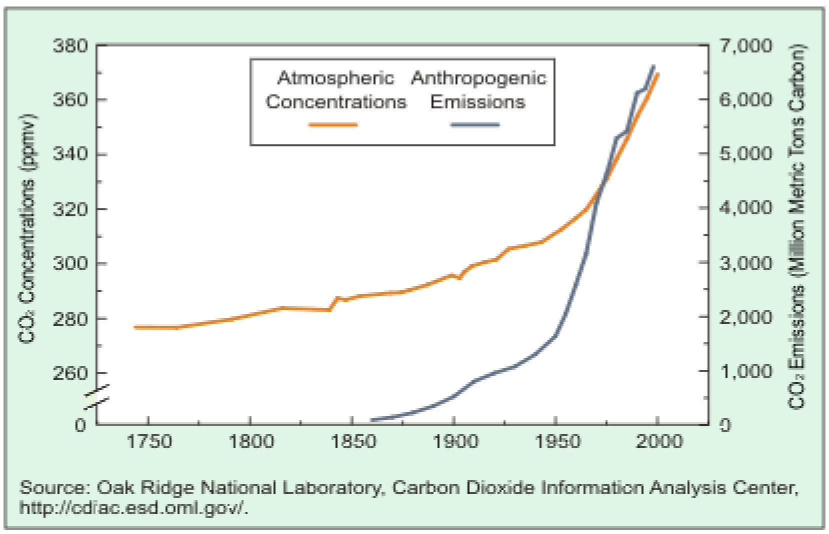
The rate of carbon dioxide extraction through the geological cycle has been greatly increased by the life of the forests because the carbon dioxide content in the air that penetrates the forest soils is forty times greater than in the atmosphere due to the breathing of the living beings, which consume the organic matter initially generated in the leaves through photosynthesis. In this way, the dilution of the carbon dioxide in the water that penetrates the soil increases greatly, multiplying the speed of the extraction of the calcium and the silicon embedded in the composition of the rock of the soils. Another reason is that all the action of life multiplies the grinding of the rocks and the channels through which the solution of water and carbon dioxide flows, multiplying the amount of rock surface under the action of this acidic solution.

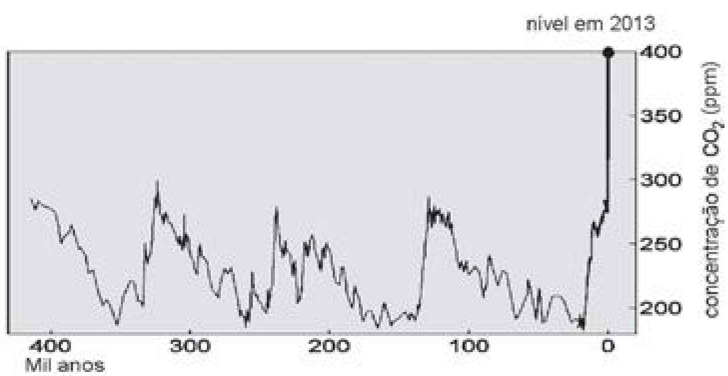
The cycle through which a larger flow occurs and a faster control of the carbon dioxide content in the atmosphere occurs, with even greater participation of living beings, by the removal of carbon from the atmosphere by vegetation through photosynthesis. The carbon dioxide withdrawn is partly accumulated in the body of living beings and partly returned to the atmosphere during respiration. The Planet Earth Organism also used photosynthesis to prevent its overheating due to the increased activity of the solar furnace, which has been occurring at the same time as the evolution of life on Earth. To do so, the greenhouse effect has been reduced, removing part of the carbon circulating between the atmosphere and the body of living beings. In this way, it accumulated energy and carbon in its entrails in organic matter that transformed into oil, coal and natural gas.

The goodness and intelligence manifested in nature is infinite. The Earth Planet Organism always works for the good living of all beings that form it. Therefore, working in the opposite direction of what nature does always has very bad consequences for all living things.

Through other natural processes, such as breathing of living things, fires or increased consumption in relation to food production, the Earth Planet Organism can return carbon accumulated by photosynthesis into the atmosphere. Controlling the atmospheric carbon content through photosynthesis is one of the ways that, like most other living organisms, the Earth Planet Organism controls its temperature, as long as it does not get in too much of its work.







From bottom to top, in the first graph, the almost vertical growth of carbon dioxide levels in the last hundred years in relation to the regularity of these levels in the last 400 thousand years, together with the second graph, which shows the great growth from almost zero emission of human emissions accompanied by the evolution of atmospheric levels in orange, leave no doubt that emissions have raised atmospheric levels. The third graph represents the average temperature in strong growth from 1910, coinciding with the increase of atmospheric carbon dioxide.

Due to its function in controlling the temperature of the Planet Earth Organism, carbon dioxide acts like a hormone. As in the case of other hormones that regulate vital processes within the organism of beings small changes in their content cause great changes in the individual.

As in the case of other hormones, the organism has, within certain limits, mechanisms of control over their content. Based on competition, exploration and domination instead of the natural behavior of organic and loving cooperation, human society has, even long before knowing them in depth, deregulated these control mechanisms, causing the overheating of the Earth Planet Organism , with disastrous consequences for all life and for human society.

As well as the undeniable numerical data, many images like these show global warming in a very impressive way.

5.4 - Oxygen and organic management of solar energy

Oxygen has the function of disrupting the union between the water molecules and carbon dioxide made during the process of photosynthesis, releasing the energy that kept these two molecules together and also the carbon dioxide back into the atmosphere. This process can happen inside living beings, in a controlled way, when it is called respiration, or in the open air, when it is called burning or combustion.

Through the burning of wood or oil the released solar energy can be used to carry out jobs such as moving vehicles, such as trains and automobiles, or being transformed into other forms of energy, such as electricity.

To provide the energy we need for the life of our bodies it is necessary to carry oxygen and finely divided foods by the process of digestion to each of the approximately 100 trillion cells of our body. In each cell, then, the dismantling of the mixture between water, solar energy and carbon dioxide that formed during photosynthesis, releases solar energy for use by every cell of our body during cellular respiration.

For cellular respiration to occur, the food is first pricked and pre-digested by the saliva in the mouth. In the stomach, acids are responsible for continuing to grind food, which when they reach the intestines are finely ground and dissolved. A portion of the food will be returned to the environment, where it will serve as food for a multitude of beings that promote soil fertility. Another part of the food will be used by a number of microbes much larger than the cells of our bodies, which inhabit our intestines and play a key role in maintaining our health. A third part of the food will enter our blood and will be carried to all the cells of our bodies.

To enable this absorption of food by the blood, the intestines are extensively irrigated by the bloodstream. On the other hand, our lungs are very specialized structures to enable the oxygen we breathe to enter the bloodstream and be delivered to the cells. In them, the oxygen will be used to extract the energy contained in the dissolved food through the cellular respiration. At the same time, in the lungs, carbon dioxide, produced in cells during cellular respiration and then returned to the blood, is discharged into the respiratory system, to be returned to the atmosphere every time we exhale.

The very thin arteries and veins of the lung allow the exchange of the carbon dioxide collected in the respiration of the cells by oxygen captured by the respiratory system. Food is stored in various forms by our bodies and for this we can survive several days without eating. But if there is no reason to stop breathing, in a few minutes oxygen will be lacking for the cellular respiration, and we will die because of the lack of energy necessary for the cells and organs to perform all the functions necessary for the life of the whole organism.

Like all other conditions appropriate to our lives, the oxygen content in the atmosphere of the Planet Earth Organism is also the result of the organic and coordinated action of living beings. Oxygen has accumulated in the atmosphere until it reaches the current 21%, because photosynthesis releases into the atmosphere two-thirds of the oxygen present in the molecules of water and carbon dioxide it uses, along with solar energy, to make food.

So that living things can use the solar energy, stored in the molecule resulting from the union of carbon dioxide with water, the union needs to be broken into the breath.

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The solar energy used was captured by plants or algae and was stored in food, in the case of people, in the wood for the steam locomotive and in oil or alcohol, or more recently in batteries, in the case of automobiles.

Breathing consumes the same amount of oxygen released by photosynthesis. Because of this, mature forests can cease to be oxygen producers when an amount equivalent to that produced by photosynthesis in the leaves of plants is consumed by the respiration of all living beings in the forest.

In the history of life on Earth, a portion of the food produced by photosynthesis remained undissolved through cellular respiration. This is part of the body of living beings, dead organic matter that is part of the soil or have been transformed into oil, coal and other products generated by life. Therefore, total photosynthesis was greater than total respiration. The other part of the balance of photosynthesis in relation to respiration gave rise to the 21% of oxygen present in the Earth's atmosphere and to oxygen that was added with other substances, such as iron, very present in the soil.

Oxygen has the function of releasing the solar energy retained in food, precisely because of its great ability to bond with other substances. Therefore, if the whole life of the Earth Planet Organism died suddenly, the free oxygen content in the atmosphere would reach

0%, relatively quickly. This would happen because the oxygen would join with the dead organic matter and with substances like the iron. A large portion of the soil iron is already attached to the oxygen generated by photosynthesis. However, the continuous action of bacteria, which disintegrates the union between iron and oxygen, still maintains a large stock of iron not combined with oxygen in the soils.

Without the action of these bacteria or the replacement of photosynthesis, the 21% of oxygen in the atmosphere would be consumed through its union with iron, other elements and organic matter, returning to the atmosphere carbon dioxide and water that had been united by photosynthesis.

Through the work done by all living beings in the Earth Biosphere, in different, incredibly coordinated ways, Earth Planet Organism maintains the exact content of 21% oxygen in the atmosphere. Just 1% would double the chances of a fire, and if the ratio was 25%, releasing the solar energy contained in food would be so easy that even the green leaves would ignite quickly. If this proportion were much lower, we would have much difficulty in obtaining from food the energy we need to live. With 15% oxygen in the atmosphere the fire would be impossible.

5.5 - The organic control of temperatures

In the universe, temperatures range from minus 273 degrees centigrade (absolute zero) to hundreds of billions of degrees. Many details in the organic evolution of the universe had to happen in an extremely precise and improbable way, so that life on Earth would become possible. Among them is the distance from Earth to the Sun. But beyond the precision of cosmic processes, it was the very coordinated and organic action of the individual beings of the planet that enabled and enabled their temperatures to be maintained within such a small and life-friendly range , unlike what occurs on planets in which life is not present.

The vast majority of living beings on Earth have a large percentage of the body composed of water and live in the temperature range that goes from 0 ° to 40 ° degrees. This is because below 0 ° degree the water freezes, preventing vital functions from occurring and, above 40 ° C, the proteins of living beings begin to be destroyed. Very few organisms can live in temperatures as high as 70 degrees.

Even between 0 ° and 40 ° C, each species adapts to a certain temperature range, where it lives and performs its functions more efficiently for the good of the whole Earth Planet Organism. When a living being is far from the conditions in which it can live and perform its functions efficiently, it is transformed into food for others. This happens through the action of several beings, who in agriculture are called plagues and diseases. In this way, they create the conditions for other beings better adapted to that place to perform work more efficiently, in favor of the common good. Because of this, it is very difficult to grow plants or raise animals in a climate that is not suitable for them.


The images show how the differences in climate and soil originate biomes with vegetation and animals as different as the Atlantic Forest, the Pantanal on the previous page and the Tundra above, in the polar regions.

5.6 - The function of water in refrigeration and temperature control

The vast majority of living things are water-cooled. We humans have sweat glands all over our bodies. When we sweat the water evaporates. Evaporating the water consumes heat. In order to get an idea of the amount of heat needed to evaporate one liter of water, we only remember the amount of fire needed to evaporate one liter of water in a kettle on the stove. During a single day of heat we can sweat more than 10 liters of water.

The water absorbs relatively large amount of heat to each degree that heats up, and returns the heat absorbed to each degree that cools. This process makes it difficult for environments with a lot of water to heat or cool, because as the water heats up, much of the heat is withdrawn from the environment, and as the water cools, the heat is returned to the environment. In this way, the greater the presence of water in the environment, the lower the temperature extremes.

In addition to temperature control, water has many other fundamental functions. The cells, which make up all living things, are filled with water. It is in the liquid medium, formed by water, that almost all vital processes happen. Channels that carry oxygen, nutrients, carbon dioxide, or any other substance into cells - be they veins, arteries, or plant pots - carry these dissolved substances into the water.

5.7 - The oceans and their role in refrigeration and temperature controls

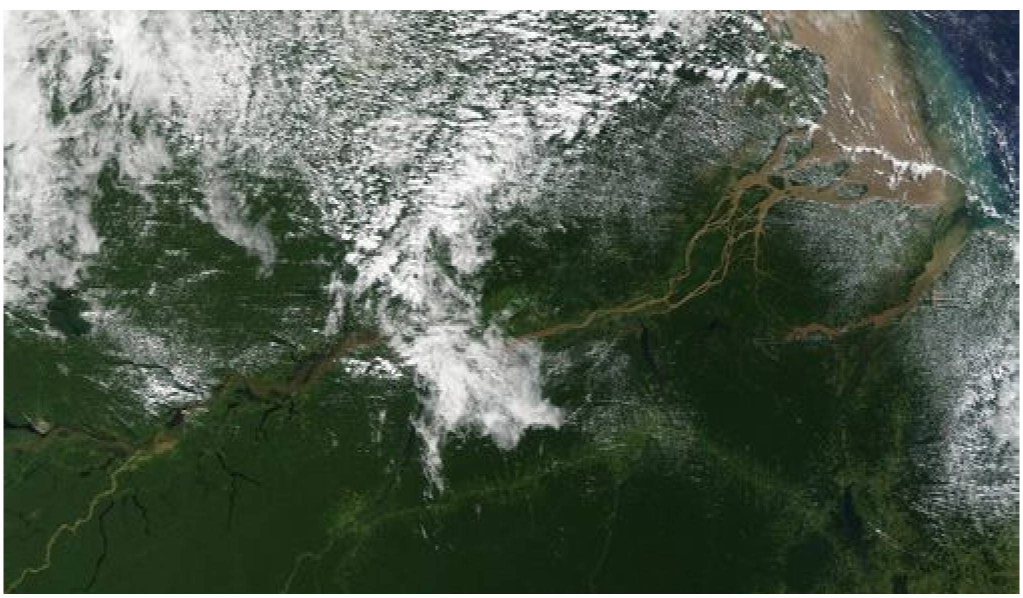
The Planet Earth Organism is also water cooled. The oceans are their biggest coolers. Every day, the ocean evaporates a volume many times higher than the volume that all the rivers of the world together pour into the sea. Evaporation of this immense amount of water draws huge amounts of heat from the surface of the sea, making it colder than the atmosphere. The heat always moves from the hottest to the coldest places, making the surface of the sea a great heat-eater. At the same time, this heat is carried by evaporated water vapor to higher regions, allowing the vital processes to take place there too. When it rains, the heat absorbed by the process of evaporation of water from the oceans and forests is returned at high altitudes of the atmosphere, which facilitates its irradiation out of the Earth's Organism in outer space.

Due to the water's ability to decrease large temperature variations, the oceans have this function in the Earth Planet Organism.

Clouds formed by the Amazon Rainforest in NASA photo

In this photo of NASA, part of the ocean covered by clouds that he himself formed. In the oceans occurs more than 97% of the sweating of the Earth. This physiological function of the planetary organism results in the transport of heat from the surface to high altitudes, from where it flows into sidereal space.

The amount of water on the planet is constant, that is, it does not increase or decrease. However, it is in constant movement, which we call the water cycle. It is the living beings that maintains the proper functioning of this cycle, in which the fundamental role of forests stands out in the continents.



5.8 - Forests and some of their functions in regulating the climate and maintaining the water cycle

Among other functions, forests have an action equivalent to the sweat glands of humans for ecosystems and continental biomes. Trees pump water from the depths of the Earth and place it on their leaves. All plants have openings in the leaf tissue that open and close to control processes such as the introduction of carbon dioxide and the outflow of water.

The volume of water evaporated through the forests is greater than the volume of all the rivers of the world combined, thus removing immense amounts of heat from the environment, being therefore large refrigerators of the ecosystems and continental biomes. In the farthest places of the sea, most of the falling rainfall is formed by this water pumped through the forests. Air cooling causes atmospheric pressure to fall, contributing decisively to pumping humid air from the surface of the ocean to the continents. In addition, the particles thrown into the air by the forests also favor the fall of the rains. Without the presence of the forests, much of the continental rains would disperse by the rise of hot air, falling into the oceans. In addition, the clouds formed by the forest help to reflect the sunlight back out of the Earth's Organism, making the climate even cooler.

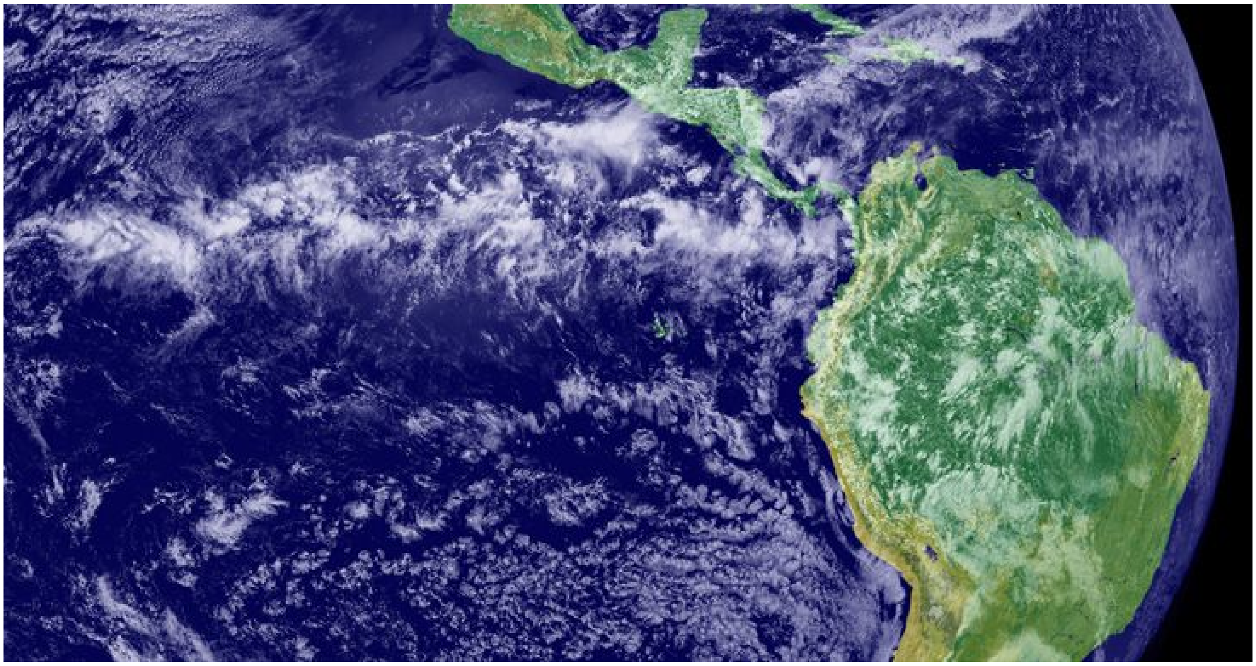
Due to the water's ability to reduce temperature extremes, the presence of forests softens the extremes of heat and cold on the continents, as well as the oceans (which cover about 70% of the Earth Planet Organism) in the context of the whole organism. This is because forests carry out essential functions in the water cycle, retaining water on the continents, and also because the living beings that form them have about 70% water in their composition. The absence of life and water makes the temperature variations, between days and nights, unbearable, as in the deserts.

The Amazon Rainforest pulls from the soil and evaporates in the leaves of the trees about twenty trillion pounds of water per day, almost 20% more than the amount of water that the Amazon River pours into the ocean daily. Evaporation of each kg of water removes 540 kcal or approximately 2,260 kg of heat from the environment. Therefore, the evaporation of the twenty trillion pounds of water withdrawn from the Amazon Forest requires about 45,200 trillion kJ per day. This amount is equivalent to 45,200 trillion x 0,000277kWh or approximately 12,500 billion kWh per day. The Itaipu plant, one of the world's leading energy producers, generates about 90 billion kWh of energy per year. Its annual production is about 140 times less than the heat needed to evaporate the amount of water the Forest and solar energy evaporate in a single day. To evaporate the twenty trillion pounds of water that the Amazon Rainforest evaporates in a day would be required 140 x 365 or approximately 50 thousand Itaipu mills running, with all of their turbines, all the time. Awareness of this function of forests is absolutely indispensable for the survival of human civilization. *

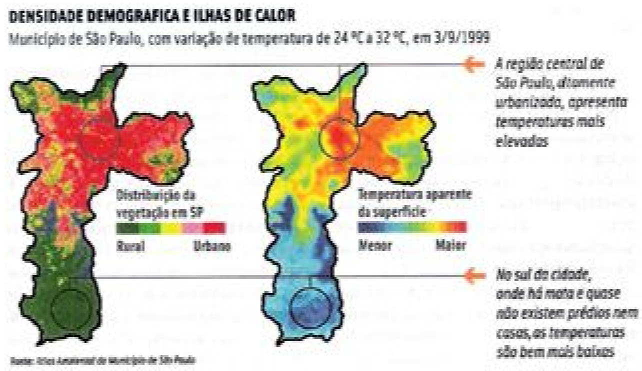
The Itaipu Plant has a market value estimated at approximately 60 billion dollars. We know that even if we had enough money, it would be environmentally unfeasible to build 50,000 Itaipu mills. In addition, as natural conditions such as volume and water fall would be worse from mill to mill, each mill would cost more than the former. Even so, let's assume it could be built at a price of $ 60 billion each. So the 50,000 mills would cost three quadrillion dollars. This figure is about two thousand times greater than Brazil's GDP and about forty times larger than world GDP, which is the sum of the value of all the material wealth in the world and currently is approximately 73 trillion dollars.

(* Read article by the great Brazilian scientist Antônio Nobre, in the page www.ccst.inpe.br/wp-content/uploa- ds / 2014/11 / Futuro-Climatico-da-Amazonia.pdf)

In the two previous paragraphs we count and value only the share of the work carried out by the Amazon Forest, equivalent to the evaporation of water, which, among other functions, cools and keeps the climate in the southern and southeastern regions of Brazil wet and not desertic. We do not count the work of pumping the water from the soil and taking it to the leaves, nor the maintenance of the giant Amazonian biodiversity, nor the maintenance of the fertile Amazonian soil, nor the many other functions known and unknown by humans, but equally essential to our lives and all other beings that are part of the Planet Earth Organism. The calculation shows how undervalued are the so-called environmental services of nature. It also demonstrates how absurd is the current common idea that it is possible to replace the work of God and Nature by artificial labor in the most diverse areas in which humans act such as agriculture, the environment and medicine.



Above and on the previous page, NASA photos show an essential part of the sweating of the South American continent. They occurred during the dry season, in which the Amazon practically does not receive moisture from the ocean, the clouds being totally formed by the forest. The south and southeast of Brazil will become desert without this organic function of the Amazon Forest.



Densidade demográfica e ilhas de calor

Thus, the immense growth of cities, in which artificial structures are present in much greater quantity than living beings, causes the heating of the environment and the increase of extremes of temperature. Even more serious, in this sense, is the artificialization of agriculture, which has driven nature and human beings from immense areas of the Earth Planet Organism.

5.9 - Control of the circulation of mineral nutrients

As the rocks decay through the rain, the sun, the wind, and the action of living beings, they become earth. The process of transformation is very time consuming and can take thousands of years. But when the rock becomes earth the mineral nutrients are being released and used in the functioning of living organisms. In warmer places and in stages where life is already very intense, the dissolution of ground rocks is relatively rapid and can be accelerated by a management that increases the uptake of energy for the work of soil life. When we burn a plant or a tree, the water evaporates, the organic matter is consumed by the fire and what is left in the form of ashes are the mineral nutrients. For this reason is that ash is a great fertilizer for plants.

Most of the minerals are in liquid form, at very high temperatures and at great depths, near the center of Planet Earth. Through volcanic activity, the minerals are spilled on the surface, forming the volcanic rocks. For this reason, in regions where volcanic eruptions are more recent or soil rock has not yet been greatly modified, mainly by washing the water that carries the minerals to the springs and then to the rivers and seas, the soils formed (basaltic) are very rich in minerals and, when conditions are adequate for the work of life, they become very fertile very quickly.

Sedimentary rocks were formed from earth, sand, organic matter or other sediments submitted to special conditions of temperature and pressure. The earth and sand that form the sedimentary rocks originated in volcanic rocks, but may have lost much of their minerals dissolved in water. Therefore, sedimentary rocks can give rise to soils with lower mineral content.

In the photos above the exuberance of the landscape near the volcanoes confirms the great and renowned mineral wealth and fertility of the volcanic soils of Costa Rica.

Even in soils with lower mineral content, the joint work of living beings can form large and abundant forests in food, as happens in the greater part of the Amazon Forest. In these cases, the need to recycle intensively the mineral nutrients that circulate intensely from the body of a living being to another, usually nor going through the soil, that can be minerally very poor. In these environments, as in the greater part of the Amazon, the withdrawal of forest life has even more damaging consequences. On the other hand, a management that maintains the forest structure and dynamics becomes even more important, keeping the environment fertile and productive.

The withdrawal of the structure and forest dynamics makes it impossible for the planetary organism to keep minerals in the life cycle, being part of the body of microbes, animals and plants or dead organic matter. So the ecosystem organism uses acidification of the soil to retain the minerals making them insoluble, stuck to the mineral part of the soil. In this way, the organism preserves some of the minerals, which can be reused if life is allowed to occupy that area again. If a process of forest regeneration occurs, several beings, such as earthworms, mycorrhizae, collo- buds, and so many will gradually correct the acidity of the soils.

Through a liming process, the soil acidity can be corrected chemically and the most nutrients can be released very quickly, and the crops will be grateful. But if it is not possible to simultaneously create conditions for released nutrients to remain part of the body of living things and organic matter, many of the remaining nutrients will be dissolved in the water and will stop at the springs, then the rivers, and finally the oceans, impoverishing for a very long time the soil of the place.

Due to the process of dissolution of rock and soil minerals, the waters of springs and rivers always have a small amount of mineral salts, unlike rainwater. The oceans are salty because they always receive water with a small amount of mineral salts and evaporate unsalted water, since the salts do not go to the gaseous state. A considerable part of the formed clouds falls on the continents and removes more salt from the rocks and solos. Sea water is rich in salts beneficial to the whole of life, including vegetation. However, there is a large excess of sodium chloride, which impairs the development of plants. If it were not for other control mechanisms, which maintains the sodium chloride content in the seas by approximately 3%, the water of the oceans would be even more salty, rendering them lifeless, as well as other serious consequences for the Planet Earth Organism.

5.10 - The control and functions of nitrogen

In the current atmosphere of the earth, every 100 liters of air contains 78 liters of nitrogen. There are about 5,000 times more nitrogen in the atmosphere than in the oceans and about 10 times more in the oceans than in the soils.

Unlike oxygen, it takes a lot of energy to bind nitrogen to other substances. This feature of nitrogen, as well as the opposite feature of oxygen, is complementary and essential to the life and process of breathing. It would be disastrous for the integrity of our bodies if, in addition to oxygen, another gas that was very easy to combine was part of the breath. The major role of nitrogen in breathing is to dilute oxygen. The presence of nitrogen is also important to keep atmospheric pressure at a level appropriate to living things.

However, being unreactive is one of the characteristics that enabled nitrogen to become essential for the life of all beings, because this characteristic allowed it to play key roles in the structure and self-regulation of the body of living beings, as well as in the process which transmits the hereditary characteristics from generation to generation. These nitrogen functions are exerted through their participation in the amino acid, protein, DNA and RNA molecules.

Due to its small reactivity, although immensely present, the availability of nitrogen to living beings is highly dependent on highly specialized organisms. For this reason, controlling nitrogen levels has become the main way in which Ecosystems Organisms control the activity of living beings, by dosing it to optimize their journey towards abundance and biodiversity.

The organization of society, based on the principle that each person should take care only of his own interests, in order to generate wealth, has led us to the breaking of all organic controls, based on the good of the whole organism and not on the wealth and power of individuals. The use of large artificial doses of nitrogen in agroecosystems has broken the mechanism by which ecosystem organisms carefully measure the activity of living beings.

In soils, the uncontrolled activity of life, through the use of large doses of nitrogen, has contributed decisively to the uncontrolled consumption of organic matter through respiration. Excessive consumption results in a sharp decrease in leaf litter and organic matter, which structure the soils, including humus. The results are the increasing desertification of soils across the planet, thus contributing, among other harms, to ruining its fertility and its capacity to store water and slowly supply it with springs and rivers. In this way, along with biodiversity, the vital structure that forest organisms have accumulated over generations that has been lost in the vastness of time has been rapidly mined.

"God has united us so closely to the world around us that the desertification of the soil is like an illness for each one of us" (Encyclical Praise Be, 2015, Pope Francisco)

Following the photos that begins on the previous page, the landscapes show the escalation of the loss of organic matter, making the soils desertic, that is, without life and without water. They start in the south, as the araucarias testify, they pass through the Midwest as shown by the surviving cerrado tree, they arrive in the Northeast and end up on the planet Mars, as an alert of where we will arrive if civilization does not learn to recognize and love the organism of which It is part.

Even worse, given in immensely excessive amounts, nitrogen, in addition to disrupting the life activity of the cells in our bodies, rendering the food carcinogenic, ends up being largely dissolved in the water and ending up in the springs, rivers and finally in the oceans. In rivers, lakes and oceans, as well as in soils, nitrogen uncontrollably accelerates the activity of living beings. Because oxygen has limited ability to dissolve in water, the very activated respiration of living things consumes all the dissolved oxygen in the water. Then all life dies from lack of energy due to lack of oxygen. This process, called eutrophication, already occurs in most of the planet's rivers and ponds and in vast, already "dead" regions in the oceans, making self-centered agriculture and livestock the biggest disaster ever, at 4.5 billion years of life history on this planet.

The nitrogen content in the atmosphere is also controlled in a complex way, in a process in which living beings have decisive importance, called the nitrogen cycle. In this process, which demands a lot of energy, a considerable amount of nitrogen is removed by electric discharges and incorporated into the seas and the soils. Another part is removed from the atmosphere by specialized bacteria, which put it in the soil in organic forms. Through diverse cycles, they are also living beings, who inhabit the oceans and the soils, that return it to the atmosphere.

The great proliferation of algae depletes oxygen and kills by asphyxiation almost all living beings and huge areas of the oceans and lakes. Above the large proliferation of red algae in China and Ceará beach and below green algae in the Baltic Sea and Lake Erie.

Were it not for the continuous activity of these living beings, in just a few million years, almost all the nitrogen in the atmosphere would be dissolved in the oceans, with dramatic consequences, among them the salinization of the oceans at intolerable levels for life.

The amount of nitrogen that is incorporated into the vegetation and food chains of soils, through living beings, is considerably greater than through rainfall. If the conditions for the proper functioning of these processes were maintained, it would be possible to make agroecosystems independent of the addition of nitrogen. Currently, the amount of nitrogen supplied through chemical fertilization in soils is tens of times greater than that which is naturally incorporated *.

* The booklet "Ecological Agriculture, Basic Principles" developed by the Ecological Center team and made available for downloand at http://www.centroecologico.org.br/Agricultura_Ecologica/Cartilha_Agricultura_Ecologica.pdf, in addition to many other contents of great importance for the practice of agriculture based on the functioning of nature, shows on page 21 that up to about 500 kg / ha of nitrogen could be supplied to crops through natural processes.

6 - Soils naturally fertile and productive

"We knew little, but I was sure the time was right for agroforestry to happen. I soon realized that it had a will of its own. And I was happy to be participating in the story. Despite all the difficulties, at no time did I think about giving up. I was convinced it was a time to learn a life. We would have to learn something we had already forgotten. I say in terms of humanity, because the world is no longer enduring all the aggressions that we humans have committed. "(Pedro, agroforestry farmer, Cooperafloresta)

So far, in this booklet, we seek to strengthen our faith in the infinite goodness, intelligence, and organicity present in all the processes of nature that take place in every inch of the Planet Earth Organism.

From now on, the idea is to focus on the processes that make soils fertile and productive. Thanks to the infinite intelligence present in all of nature, they also make the springs and rivers rise again and grow, that the Earth's climate will be more and more beneficial for humans and all other beings, for the birds to come back to sing and that the "springs never become silent."

Soils are formed by the work of all nature, which through life adds organic matter and transforms the rocks of a certain place. From this incredibly perfect work, rain, the sun and countless beings like plants, microbes, earthworms, ants, armadillos and birds participate.

The rocks are of different types and origins, and there are those that break down with greater or lesser ease, the richest and the poorest in nutrients. Depending on a great combination of things, such as rock type, climate, relief and the history of life in place, soils will naturally be more or less deep, fertile, dark and rich in organic matter.

Although there is an infinite diversity of soils of different origins, we can observe that, under similar conditions, the soil of a forest will always be immensely more fertile, aerated, soft, moist and productive. It will always be covered with lots of leaves and woods. Between the cover and the ground, we can see whitish fungi catching nitrogen from the air and a large amount of small beings and earthworms, airing and fertilizing the earth with their rounded feces.

If we were able to see through the earth, we would see that the depths reached by roots, organic matter and all the biodiversity beneath the soil are proportional to the biodiversity that is above the surface, being like the mirror image of vegetation and of the life that is above the earth. This makes us understand why a soil under a biodiverse forest organism is so much more alive and fertile than a soil with other vegetation cover.

Organic matter is formed by the remains of animals, plants and faeces, so it is usually dark. But the feces of some will be food for others. Therefore, organic matter is always food, the source of energy that enables the work of an infinity of beings, which together leave all the environment fertile and suitable to life.

In Brazil, it is common for forest soils to contain 5% to 6% of organic matter, whereas in the currently dominant artificial agriculture, soils have less than 1% organic matter. Because of this, our soils were naturally fertile, in this land everything was produced without much effort, but today we are the nation that uses the greatest quantity of agricultural poisons in the world.

Under naturally perfect conditions, the soil is moist, capable of storing and allowing the circulation of air and water, soft and with spaces that facilitate the penetration of the roots, rich in organic matter and in various nutrients and with great quantity and diversity of beings alive. A small part of the organic matter is composed of several foods indispensable for the perfect health of all vegetation. This great diversity of food is being released in correct doses and can only be produced by the very diversified life of the soil, which only exists in capoeiras and forests in advanced steps of the escalation of life. Another perfect condition is the climate generated by the vicinity of the forests and capoeiras, with temperatures that neither rise nor descend too much and without the excess of winds that dry the plants. It is this situation that we should seek in our agroforests.

The vigorous growth of SAF of Jorlene and Gilmar, soon after undergoing a strong renovation, in Barra do Turvo SP, at Cooperafloresta.

In these clearings, the short-lived and long-lived thickets, the fastest growing trees, and the trees grown in their shadow, grow together from the moment the clearing is formed. Growing together they have the exact amount of light and the company of the roots of the others, for joints to penetrate the soil and extract various nutrients. Each one has different abilities to seek in the depths of the soil the various nutrients necessary for the nutrition of all, sharing them with each other, by discarding their leaves, branches and roots. Together, they all have the perfect conditions to grow healthy. That is why, in Agroecological SAFs, we try to plant species that have complementary ecological vocations at the same time, allowing each function to be done by a specialist, as well as multi-storey canopy occupation and different soil depths at the roots.

In fact, in a forest organism it does not make much sense to think that each plant or tree has a root, because what you see is a collective web of roots, which together form the great root organ of that forest organism. This sustains and is sustained by the aerial part of the same forest organism.

In both forest organisms and SAFs, the vast majority of seedlings will not reach adulthood. They will soil the soil, dissolve nutrients adhered to the clays, feed the life of the soil and be transformed into organic matter and nutrients, thus completing its function in the forest organism. Only the best adapted to the place will be large and those that the seeds germinated in the most appropriate pieces of the land. As they are in great quantity, if any accident causes a molt to be lost, there will always be another to take its place.

The perfect occupation of the floors will guarantee the best use of the sunlight. This makes the production of food, which maintains the operation and the escalation of life, is carried out as far as possible. Thus, planting by seed, by nature, a large quantity of seedlings, is a fundamental step for the walk of life, becoming also an important foundation for the practice of Agroecological SAFs. In these, constant pruning helps to lead the treetops to the best possible position, according to the natural gait of each species to access sunlight, different floors, or strata.

As time passes, the clearing becomes more closed, leaving the seedlings to appear much later, with no light and no space to fully develop. Because of this, young trees and plants have a hard time growing up after the clearing has closed. Thus, if some kind of seedling is not present at the time of the formation of the clearing, so that it develops vigorously, it will be necessary that afterwards a new clearing will form. In agroforestry practice, this often justifies the renewal of SAFs.

Recognizing the main processes that make forest organisms perform their functions with increasing efficiency, it is important to reproduce them and even to potentiate them, harvesting food, medicines, fibers and other products in this way.

7- Natural Succession

In forest clearings, there is usually a lot of seed in the soil, because the strategy of plants is always to produce and spread an immense amount of seeds, from the most varied types of environment, which will germinate when there is opportunity. Thus, when a clearing forms, its soil brings the inheritance of the diversity of trees that were there before.

The colonizers, pioneers, secondary and climax tend to grow together, although at different speeds, so they are part of the same "Ecological System". The colonizers have very short lives and serve as a kind of protective placenta, because when the forest is reborn, the trees are still as fragile as babies. Under their protection, the pioneers grow faster than the secondary ones and these than the climatic ones. Among the secondary ones, there are the initial secondary ones, which grow faster and have a shorter life than the secondary secondary ones and these secondary ones that later. The placenta is creating the conditions that the pioneers need, the pioneers for the secondary ones and the climatic ones, which are the ones that grow more slowly and have a longer life. On each step of the path of natural succession, the forest as a whole also grows from the initial stage into the middle stages and then into the more advanced stage called the climax.

7.1 - The Everlasting Resurgence of Natural Succession

The little that we could understand of what Ernst Göstch lovingly and devotedly taught us and the subsequent agroforestry praxis brought us to the realization that another succession is also an essential part of the process of Planting Succession as a whole. This is the Succession of Ecological Systems. At the end of each cycle, when a new clearing is formed, all vegetation is succeeded by another one, more specialized in acting on the highest fertility step generated by the vegetation of the previous step. In each new fertility step, the succession of the colonizing placenta occurs again through the pioneer trees, the secondary ones and the climatic ones, as described in the previous section of this chapter.

By this we can describe the succession as a spiral path that passes several times through the same places, but at different levels of fertility. When the human being behaves as part of nature the direction is up. But when it yields to the forces that propagate the illusion that the world must be governed by competition and not by the love of pink cooperation, organic matter and forest structure are destroyed. So the path goes down, or there is a sudden fall. In these cases, unfortunately the most common ones today, the succession trek may have to start several more steps down.

On every floor of Planet Earth, all living beings work with infinite intelligence, by improving the living conditions of that place and the Earth Planet Organism as a whole. The eternal re-commencement of succession is part of a grand strategy by which all beings on Earth continually promote more favorable conditions for succeeding generations. Recognizing the existence of this process makes us realize the natural laws that govern it. Understanding these laws is of great importance for us to re-engage in an agriculture in which fertility is promoted by natural processes.

7.2. The succession of ecological systems within the Forest Organisms

The succeeding systems are different in each biome and each ecological niche, including particularities of climate, relief and soil. Even so, the succession has common features, which do not depend on the biomes in which it occurs.

Forests are actually a mixture of "ecological systems". In every small part of a forest, a different amount of renewals occurred. In each place the natural succession had different speeds of evolution, depending on several factors, like soil stains, microclimate, relief and other peculiarities.

Stimulating the digestion and breathing processes consumes organic matter. However, when the soil is sufficiently structured and with sufficient litter accumulation and organic matter, moderate increases in digestion and respiration may result in greater increases in photosynthesis. For this reason, the forest organisms, from the colonizing placenta to the pioneer, secondary and climactic ones, are beginning to produce, in the Ecological Systems that follow each renewal, organic matter with increasing levels of nitrogen and decreasing substances of difficult digestion, as the lignins.

Prioritizing the accumulation of organic matter and humus has an ecological cost, because for living conditions to improve organic matter also needs to be used as a source of nutrients for the vegetation and as an energy source, so that individual living beings can perform, with intensity, works like digging channels, withdrawing nitrogen from the atmosphere and extracting nutrients retained in the ground rocks of the soil. But, in the extreme lack of organic matter, it becomes essential for forest organisms to save it, keeping it in their physical structure.

Ernst gave the name of lignin systems to the systems composed of colonizers, pioneers, secondary and climactic who occur when the conditions are still very degraded or the spiral escalation of the vegetable succession towards the abundance and the biodiversity is very in its beginning. In these systems, nitrogen contents are minimal and those of substances of difficult decomposition like lignins are maximum.

In lignin systems, much of the organic matter produced by vegetation is accumulated in the form of various compounds, including humus. This, like other components of organic matter, has functions of great importance. They serve as a glue, which joins the grains of clay, sand and silt, forming earthenware and organic matter. The cookies are rounded, so they do not fit well, leaving voids inside the soil.

The voids add to the paths opened by the animals and roots, slowly turning the soil into a sponge, filled with spaces through which water and air are circulated and stored, which are available for microbes, animals and vegetation for many days after to rain. Organic matter sticks to the nutrients present in the soil, with a perfect intensity, retaining them with enough force for them, which are not washed by water and not so strongly glued, that the vegetation can not absorb them.

On the next page, from the top left: Guanxuma, Carqueja and Sape are typical placenta. Following: Assa-fish, Bracatinga and Embaúba-branca are pioneer trees. All of the above species are typical of systems relatively early in the spiral climbing of plant succession. Species of these systems vary greatly from biome to biome.

In the systems following lignin, the nitrogen and lignin levels in the vegetation are intermediate because life has already been structured enough that moderate increases in respiration result in even greater increases in photosynthesis, leading to maximum accumulation of organic matter. Ernst has given these intermediate systems the name of accumulation systems because they are specialized in accumulating organic matter and it is in them that the organic matter accumulates with greater speed.

Systems of abundance succeed the accumulation systems. The levels of nitrogen in the vegetation and also the speed of photosynthesis are close to the maximum possible. The places where systems of abundance predominate have come to this condition, in large part, because they have undergone many processes of renewal. There are places, usually on the banks of mountain-clad rivers, where the passing of occasional windstorms overthrows the old trees, which have already fulfilled their function, speeding up renewal processes. The woods are softer and break branches more easily, further favoring the occurrence of renovation events.

What we have said in the previous paragraphs shows how the infinite intelligence that governs forest organisms gives rise to the growth of the activity of living beings, controlling the levels of nitrogen in organic matter and consequently in soils. In the evolution of a forest organism, there is usually not only one system that dominates the whole region occupied by the forest, therefore there are sections where the lignin system predominates, others where the intermediate systems dominate and places where systems of abundance predominate.

Less washed rocks, with their richer mineral constitution and close to the magma coming from the center of the earth, make faster evolution to systems of abundance. In places where the rocks that gave rise to the soils have been washed more, being poorer, the initial use of volcanic rock powders, also called basaltic rocks, can contribute to minimize the initial disadvantage of the place. A flatter relief, mainly in the form of a basin, which facilitates the accumulation of soil and organic matter, facilitates evolution in relation to the hills, in which slope favors drainage, rather than accumulation.

Renewal processes that lead to the formation of abundance systems can be greatly enhanced through pruning, partial pruning and multi-pruning, as well as intensively managed SAFs, total pruning and cycling such as 5, 10, 20, 50 or 100 years. This principle, which is of fundamental importance for the practice of agroecological SAFs, has historically been used in traditional agroforestry-based agriculture practiced by quilombolas and other traditional populations, which is based on the rest of the land for the recomposition of fertility, the so-called coivara agriculture. This was also one of the techniques that indigenous peoples used in the generation of the so-called "Tierra Preta de Índio". These soils, in which organic matter predominates, in layers that reach depths greater than two meters, still exist throughout the Amazon. Archaeological and paleobotanical studies prove that these soils originated due to the action of indigenous peoples.

When the clearing of all the vegetation of a clearing takes place, a considerable part of the organic matter is consumed in the breathing of the alive beings. However, most often end up being stored in both the soil and dead wood, which lies on the ground and is digested very slowly. In addition, in the clearing, the process of succession, if not prevented, will resume at a fertility level much higher than the previous one.

Agroforestry management; In the previous page severe pruning in eucalyptus and in the photo above, renewal of an expanse of agroforest

The higher level of fertility allows the life of more demanding species, but more efficient in the production of organic matter, in all phases of the process of succession, from the placenta to the climatic trees. Therefore, the step of succession that will happen in the new clearing will accumulate more organic matter than the previous one. In addition, the inheritance of accumulated organic matter is added and not spent on the previous step.

The wise and moderate use of renewal processes enabled the peoples of America to leave behind a legacy of immensely fertile soils and SAFs of majestic biodiversity. These were so integrated with natural processes that the Portuguese could not understand that the "virgin forests" they saw all over the corner were in fact SAFs managed by the indigenous peoples. Already in the first document written in Brazil, Pero Vaz Caminha, when narrating that the natives did not cultivate the land, speaks "of that yam that is everywhere". The yam, however, is what cassava was called, a plant selected for generations that were lost in times by the natives, and which it would never produce without its care.

7.3 - Stratification on floors in the context of Natural Succession

Stratification is a process that takes place at the same time as the succession, in which the forest organisms are structured in stages, in each phase and in each step of the natural succession, to collectively capture the energy of the sun with greater perfection.

The stratum of a plant is the floor its crown occupies in the forest organism in which it originates, when the forest organism reaches the stage of the plant succession to which it belongs. For example, if a tree is of the upper stratum and the climax stage, it will occupy, in the forest organism from which it originates, the upper floor, when the forest succession reaches the climax stage. If the tree is a secondary of the middle stratum, it will occupy the middle floor when the forest organism reaches the secondary stage of natural succession.

The above paragraph gives us an indication, for example, that it is a step forward in the succession to favor, through pruning, that a tree from the middle stratum of the climax stage occupy the middle floor, formerly occupied by a secondary tree also of the medium stratum, removing the latter when the species of the climax stage is already occupying the middle floor, but below the secondary one that always grows faster.

We can observe that in forest organisms, the trees of the higher strata have their crowns much more distant than those of the strata below them. In this way, the higher the stratum, the more it allows the passage of light into the strata below it. Ernst Götsch, seeking to give us a quantitative idea for the application in the management of Agroecological SAFs, even made estimates. The emerging stratum allows the passage of approximately 80% of the light it receives, the upper stratum 60%, the medium stratum 40% and the low stratum 20%.

We understand that in all stages of succession, in the phase where the colonizing placenta dominates, in the phase in which the pioneer trees dominate, the early, middle and late secondary trees or the climatic trees, there are species with an ecological vocation to occupy the strata low, medium, high and emergent. This understanding may be somewhat different, or more detailed, from what gives rise to the successional classification traditionally adopted in the technical-scientific environment. These small differences in the way of conceptualizing should not be grounds for failing to take advantage of the great ecological knowledge cataloged in these classifications.

It is also important to consider that there are higher and lower ecosystems. This is due to the different restrictions on tree growth, mainly because of the climate and / or the soil from which they originate. It is natural for trees in the upper stratum of low forests to be lower than trees in lower strata, from very high forests. To give an example involving more known species, we can cite the case of acerola and avocado. The acerola is a tree of the upper stratum, because it occupies the upper stratum in its ecosystem of origin. The avocado is of the middle stratum, because it occupies the middle layer in its ecosystem of origin. However, usually the acerola foot grows less than the avocado. This is because all the forest in which the acerola originated grows less than all the forest in which the avocado tree originated. However, an acerola will never be productive if it is under trees of strata lower than hers, as in the case of the avocado.

7.4 - Lignin systems

When we let our bare, hard, dry and very impoverished lands rest in the arms of nature, first grow few types of grasses and herbs, which resist the worst conditions. Soon after, and still together with them, enjoying the organic matter and the shade they generate, they appear pioneering, secondary and climatic trees. All the vegetation produces hard and rough organic matter, due to having lower levels of nitrogen and higher contents of difficult-to-digest materials for soil organisms, such as lignins.

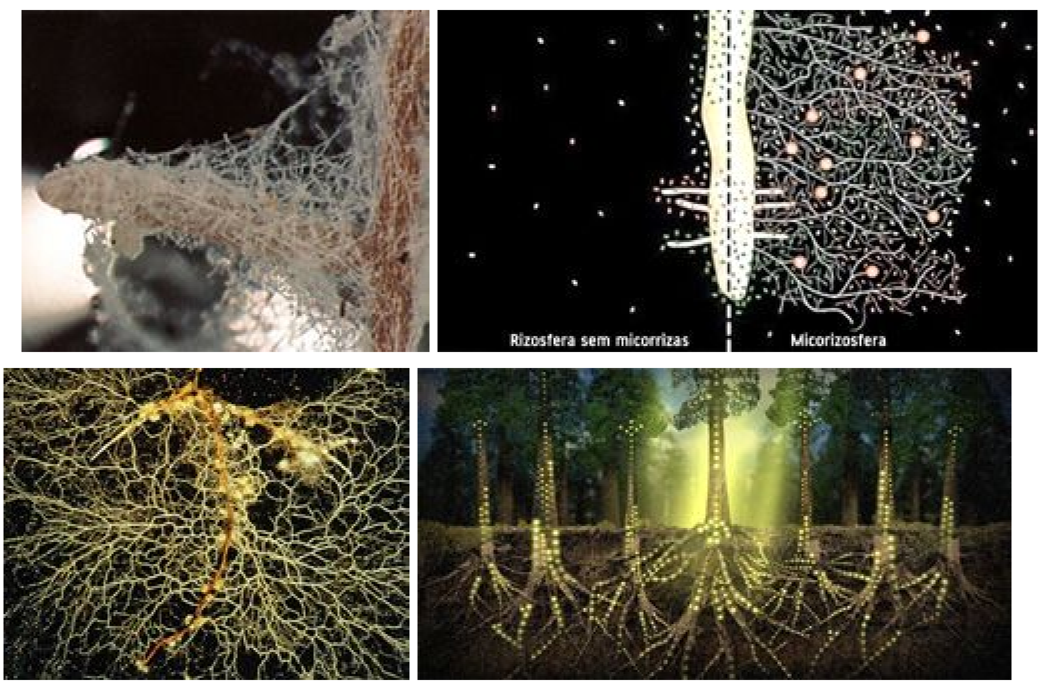
The lack of better conditions only allows the development of a still small and unequaled number of animals and microbes, which resist the worst conditions both above and within the soil. They only digest and take a small portion of the food they consume. Most of it is modified and disposed of like feces and other discarded droppings, which function as a growing pool of energy-rich food and also as a glue that sticks to the grains of soil in each other, structuring the soils.

7.5 - Aging Crises in the Forest Organism

Pioneer trees have a shorter life than those that need their shade and other favorable conditions they generate. The types of pioneer trees that live on very weakened lands have an even shorter life. As they age, their leaves turn yellow, losing the lime and green of chlorophyll, which made them able to use sunlight to produce food. Some time comes that they can no longer capture energy in the quantity necessary for the tasks indispensable to their life and the exercise of their functions for the entire forest organism, such as producing organic matter, pulling water and rendering soluble, capturing and making available nutrients present in the depths from soil.

In these times when trees that perform functions of great importance go into decay, the life of the place diminishes the vine. The general decay of the forest organism also occurs in these moments, because the roots of the trees are totally interconnected, exchanging nutrients and information that each one obtains, according to the different vocations of its species. They are therefore part of the gigantic "Root of the Forest" organism. In this way, both aging and renewal of one or more plants contributes to the aging or renewal of the entire forest organism. Of this great organism "Root of the Forest" also actively participate the beings that live in the ground. These considerations show the importance of pruning, harvesting and harvesting of old plants, always keeping young and green all the plants of an Agroecological SAF, as confirmed by the experience accumulated to us and constantly reported to us by many peasant families.

Secondary and climactic species also age, making partial renewal processes (when only one tree replaced) or totals (as described in the next section) fundamental in the path of succession.



Images related to mycorrhizae, fungi organically integrated with the roots of vegetation. Among other functions they multiply the volume of soil accessed by the vegetation; dissolve and collect nutrients and water and contribute to the exchange of nutrients and information among the plant community, as symbolized by the above illustration.

7.6 - Freeing space, nutrients and energy for the eternal rebirth of life

When a windstorm knocks down the old trees and drags other prey to them by vines, clearings are made. Some trees sprout and others do not. In the ones that do not regrow all the roots die together with the tree. Even the trees that sprout discard most of the finer roots that absorbed water and nutrients, because with few leaves they could not feed many active roots. This would also not be necessary because without the leaves the demand for water and nutrients is greatly reduced. In the clearings, therefore, a great amount of dead roots is formed.

Although it varies by species and terrain, the total weight of the roots of a tree tends to be proportional to the weight of the tree canopy. Therefore, in times of severe pruning, in addition to the large amount of food available on the ground, there is also a great availability of food inside the soil. As the life of the soil is feeding on the dead roots, tunnels are formed where air, water, animals, and roots of other plants enter.

The leaves and woods cover the earth, keeping the moisture and not letting the rain beat hard on the soil, preventing it from breaking up the bunches of soil and organic matter, which are built even faster with the life of the soil. In them, the grains of earth are very well glued, and in this way they hardly dissolve in the water. Organic matter lying on top of the soil does not allow water to flow with speed, even in very steep places. In this way, erosion practically does not happen, which in open and uncovered lands carries the most fertile part of the soils to the rivers.

In addition, in the clearing soil, the temperature increases a little, because of the sun's entrance, causing a large number of seeds to germinate, just waiting for the heat.

A small part of the organic matter will be reused in the form of organic compounds, which give great health to the vegetation and the life of the soil. A larger portion will be broken up during the processes of digestion and respiration of living beings, providing energy, minerals and carbon, essential for the growth of vegetation and the lives of other beings. In this process, many nutrients are released, which have been slowly extracted from the air and land and stored in the vegetation, with great participation of soil life.

A significant portion of the organic matter will become part of the organic matter of the soil, making it softer and porous and serving as a reserve of energy and nutrients, which will be slowly made available by living beings, so that all can perform their functions and provide nutrients for vegetation

But for all this work to happen at the speed necessary for vegetation to close quickly the open clearing, the beings that inhabit the soils need a lot of energy. For this reason, the Forest Organism produces, in the initial stages of resumption of succession, organic matter richer in nitrogen and poorer in materials in which chemical bonds make them difficult to digest, such as lignin. Having already remedied the need to release part of the energy and nutrients accumulated in the previous step of the succession, the forest organisms change their priority and begin to produce organic matter with lower levels of nitrogen and higher levels of lignin, such as wood. This organic matter will be largely accumulated to be then partially made available in the future, enabling the life of the forest organism to become increasingly active and abundant on the next rungs of the spiral path of succession.

In agroforestry management, soon after a pruning of renewal, the organic matter is consumed and transformed quickly. In order for the nature path to continue to advance, it is necessary that the excellent conditions generated be harnessed from the outset by the strong growth of new vegetation. This vegetation must be diversified and from the outset form several floors, resulting in a growing, larger and larger than the previous pruning of leaves, roots, branches and wood.

However, if for any reason the succession is prevented from proceeding further, the forest organism keeps digesting and breathing more than doing photosynthesis. In this way there is a growing loss of minerals and organic matter that structures the soils. Because of this, in view of the abortion of the succession escalation, forest organisms save resources for the possibility of being reborn in the future. For this, they make the soils acidic. The acidity so tightly clings the minerals in the clay of the soils, that they become not soluble in the water. Therefore, they can not be carried by the water to the springs and rivers, but are unavailable to most of the vegetation and beings that live and perform their functions in the soil.

7.7 The function of the "Renewing Beings"

Not all renewal promoted by nature is accomplished as completely as in the formation of clearings. Often, only the work done by the Renewing Beings is enough for nature to take the necessary step to follow her walk.

The Renewing Beings are the animals and microbes that have the function of removing everything that is not contributing in the best possible way so that the climb towards the abundance advances faster. In this way, they control and optimize natural processes. The function of the Renewing Beings has not been well understood. In this way, they, who have been called pest and disease, have been generally opposed.

When weeds, plants or trees do not have everything they need to live, they do not build their bodies with all the pieces perfectly glued together. That is, plants can not adequately synthesize their proteins. In this way the parts that constitute the proteins, the amino acids, along with excess sugars, are dissolved in their sap. Only in these cases do plants serve as food for the Renewing Beings. They do not even have the necessary "chemical sawdust" in their digestive tract, the specialized enzymes to cut the proteins in the parts that form them, the amino acids. Therefore, healthy plants do not even serve as food for the Renewing Beings. Renewing Beings need to find diseased plants with excess amino acids and sugars dissolved in their sap to be able to feed and reproduce, rather than being part of their body structure, as in healthy plants.

The organic function of the Renewing Beings is therefore to remove from the place the plants that are not in the proper conditions to develop in a healthy way and thus produce enough food for life to advance in their climb. For this, the ants can make great walks to cut the same species of plant, that sometimes they find next to where they live. Certainly, in these cases, the plants nearby are in the most adequate conditions and therefore have health and are not good food for the ants, one of nature's greatest renovators.

Depending on the type of situation, it may be important for the development of forest organisms that Renewing Beasts to remove whole trees or just a branch that is preventing the growth of species of phases or higher steps in the spiral rise of the plant succession. In these cases, pioneer trees are being pruned, to give passage to species that when young need their shade, but in the later stages they need sun to fully develop. In this way, the greater intelligence leads the forest organisms, acting through the ants or other renovating beings, like the beetle and the caterpillars.

7.8 - Accumulation Systems

It is in these steps that the forest organisms reach the maximum rate of growth of the organic matter of the soils and in the whole organism.

As a greater amount of life is structuring in place, the moderately increasing availability of energy and nutrients, which occurs through the production of organic matter with moderately increasing levels of nitrogen, results in increases in photosynthesis greater than those in respiration .

Thus, the growth of larger, more varied herbs and trees, which generate branches and leaves, are gradually becoming more tender and succulent. Thus, although on less organic matter per kilogram of digested material, organic matter accumulates with increasing velocity in soils.

On the contrary, if the soil conditions of life as a whole did not yet provide a sufficient response to compensate for the greater consumption of energy and nutrients, the production of organic matter richer in nitrogen would reduce, rather than increase, matter organic soil management. For this reason, we have already seen agricultural research that detected the organic matter decrease of the soils after the cultivation and incorporation of green fertilization with high levels of nitrogen. In these cases, if spiral climbing of the natural succession was better understood, preference would have been given to growing vegetation that would produce nitrogen-rich and carbon-rich organic matter, such as grasses. In addition, this green manure would be applied on top rather than inside the soil.

The better we understand these little details, the better we realize that naturally occurring species are always efficiently and carefully selected by forest organisms to increase the speed that they move towards fertility, abundance and diversity of life.

The types of trees and bushes that lived in the worst conditions were specialized for them and generally would not function on more advanced steps, disappearing on these steps. Eventually, one or another species may move to the next step. In these cases, due to several factors such as the greater availability of water and nitrogen, all of them, being colonizers, pioneers, secondary or climactic, are getting the leaves more and more soft, humid and with higher levels of nitrogen.

7.9 - Abundance system clearings: the perfect environment for our crops

In systems of abundance, life is already so abundant that the accumulation of organic matter is no longer a priority for forest organisms. In order to better fulfill its function in the Organism Planet Earth as a whole, these forest organisms even overflow, exporting organic matter to other places, as well as to other riverbanks, mangroves and even to the oceans.

On these natural succession steps, the herbs and the trees have very moist and soft leaves, producing a large quantity and variety of fruits, larger, more fragrant and more palatable. They create and attract a great quantity and diversity of animals that plant the seeds of the fruits with which they feed in the exact places where they will develop better and contribute more decisively with the escalation of life. Life inside and above the ground has reached a high degree of quantity and diversity.

It is in the clearings of these more advanced stages of natural succession that the naturally perfect conditions for the development of the great majority of our fields are found. They are the natural places where we find the vegetation that most resembles our crops. Thus, seeking to approximate the conditions of the crops to the condition of the best possible clearing is the basis for the preparation of the soil and the environment of the Agroecological SAFs.

8 - Returning to belong to the life of the Organism Planet Earth

"I soon realized that it seemed that the thing had a will of its own. And I felt happy to be participating in the story of that moment, despite all the difficulties, at no time did I think about giving up. I was convinced it was a time to learn a life. We would have to learn something we had already forgotten. When I tell you, I say in terms of humanity. That the world is no longer tolerating all the aggressions that we humans have committed. "(Pedro, agroforestry farmer, Cooperafloresta)

In today's world, the idea that to produce productive agriculture is necessary to remove the trees from the agricultural systems. In this context, just bringing the trees back to agriculture is already a major and indispensable step towards the sustainability of the Earth Planet Organism and agriculture. But in order to reach productive systems that can sustain themselves we will have to go much further. We will have to learn to recognize and cooperate with the natural processes that make and maintain fertile and productive soils.

For this reason, the main goal of this book to date has been to reinforce our faith in the importance of preserving and enhancing natural processes. He will already have fulfilled much of his function if it helps to arouse the curiosity and the reflection on the great subjects treated until this point.

From Chapter 8 onwards, we have tried to go further, presenting some techniques, strategies and pedagogical methodologies that have made the crossing, even of an artificial agriculture, made in semi-desert environments totally dependent on industry, socially, economically and environmentally viable. an agriculture that reproduces, potentiates, sustains and is sustained by natural processes.

We understand that for the proposed crossing in Chapter 8 to occur collectively and with the necessary speed, it is essential to exchange knowledge, experiences, strategies and methodologies among peasants and between processes and projects that, like the Agroforest Project, encourage and enable it be carried out collectively. However, it is not possible for this purpose to replace visits and exchanges of experiences in the very places where processes similar to those that we will deal with occur. One factor that has made it much easier for these to happen is the great organicity that exists between most settled families and their organizations. Another factor is their great awareness and commitment to the need and the planetary importance of sharing their experiences.

In a coherent way with what we wrote in the previous paragraphs, when we presented in a structured way some techniques and methodological steps, we tried to refer them to the collective processes in course in the Contestado Settlements in Lapa PR and Mario Lago in Ribeirão Preto SP. In this way, we hope to have incorporated a small part of its radiant vitality into the systematized contents. We also hope to provoke in readers, the desire for the irreplaceable experience of knowing personally the processes described or others of similar importance.

We also remember that nothing can substitute for praxis itself, when peasants and their organizations apply the knowledge and methodologies and from what they observe, reformulate them and apply them again and reformulate them again ... In stories that have no end.

9 - The Construction of the Agroforestry Praxis in settlements Mario Lago, in Ribeirão Preto / SP and Contestado, in Lapa / PR

"A large number of people signed our undersigned, marched along with us, sensitized the government, the judiciary, bet on this project. We were looking for another way. The Settlement is located in an area of recharge and outcrop of the Guarani Aquifer, so it requires even more special care, not to contaminate these precious reserves of pure water, of which Ribeirão Preto totally depends. The quality of life of those who live in cities depends on the field. Production of healthy food diversity, social relations that deny slave labor and deforestation. Without forests no project will save us from the lack of water in urban centers. "(Kelli, settled and multiplier agent)

9.1 - Context and challenges

Since the beginning of the Project, the great challenge of its actors has been to adapt, create and re-design SAF techniques, taking Cooperafloresta agroforestry experience and the agroecology history of the settlements as a base. Overcoming this challenge is fundamental for the irradiation of the agroecological agroforestry in different regions, biomes and socioeconomic contexts.

This challenge was assumed, in particular, by the farming families of the Contestado Settlements (Lapa / PR) and Mário Lago (Ribeirão Preto / SP).

Both settlements, since the struggle for land, were conceived and implemented by settled families and their organizations to serve as references in agroecology and agroforestry. The history of this struggle and of these conquests begins, therefore, long before the moments initially referred to in this book.

Also in both settlements, settled families and their organic network of national and international organizations have been building schools of agroecology and training people from many other places in Brazil and neighboring countries. In this context, the Latin American School of Agro-ogyology (ELLA), in the Contestado and the Dom Hélder Câmara Socio-Agricultural Training Center, in Mário Lago, stand out. In these schools, they study young people from all over Brazil and Latin America, especially children of peasants who are committed to peasant and agro-ecological organizations, who have trained as technologists in agroecology. Adding the praxis to the great educational processes, the path for the irradiation of agroforestry to various points of the continent is shortened.

"I assumed that I was going to study Agrarian Reform and would like to see an Agroforestry Agrarian Reform in practice" (Monica, doctorate in geography)

For the adaptation of agroforestry techniques in these settlements, it was important to identify three major differences between the Cooperafloresta region and the region of each one: ecological differences, differences in relief and differences in cultivation practices.

Regarding the ecological context, it is possible to highlight some important differences: the upper Vale do Ribeira is inserted in the Dense Ombrophylous Forest ecosystem of the Atlantic Forest biome, with warm temperatures, high rainfall, high relative humidity and a very diversified forest structure. In the Contest Settlement, inserted in the Araucaria Forest ecosystem (also of the Atlantic Forest biome), it rains less, it is much colder (frequent frosts occurring) and the forest structure is less stratified. The Mário Lago settlement is part of the Cerrado biome, with native vegetation very different from the Atlantic forest and a much drier climate. It brings as a heritage a soil that came from rocks with greater potential for natural fertility than in the Ribeira Valley, but strongly degraded by the intensive cultivation of sugar cane, implanted decades ago in the place, before the arrival of the settlers. Thus, the development and adaptation of agroforestry practices at the center of agribusiness in São Paulo represents a path both for the adequacy of agriculture as a productive process and for the recovery of the Cerrado.

Regarding the relief, it is remarkable the presence of the hills in the upper Vale do Ribeira. There, it is very rare to walk a few tens of meters in a straight line, in a flat relief. The variations of altitude are very large in relatively small spaces, having a great amount of rivers and streams cutting the hills. Both in the Contesting Settlement and in the Mário Lago Settlement, the relief is much flatter, with slight undulations, with rare exceptions. In addition, both are on plateaus and farther from the sea than the upper Vale do Ribeira.

The ecological and salient differences obviously reflect differences in cultivation practices, which are also influenced by the cultural and social context of different groups of farmers.

In the upper Vale do Ribeira, mechanization is much less intense. There, it is more complicated to handle machines and tractors in minimally large areas to justify investment in them. On the other hand, the use of capoeiras and their regeneration process is historical, with capoeiras available, with soils covered and without beginnings, that favor the productivity of the systems without the need of contributions of inputs and mechanical loosening of the soils. Under these conditions, it becomes more feasible to produce independently of the initial use of machines. Already in the settlements, the use of tractors and machines is traditional and has been part of the culture of agriculture for a long time. Moreover, the soils on which the agroforestry was established were no longer covered by forest, and therefore had no natural conditions favorable to crops. In this situation, it is necessary to provide these conditions through liming, fertilization and soil preparation, using machines, in a way adapted to agroforestry principles. Another aspect that has become especially important in the context of the Mário Lago settlement is that because of the dry climate, farming without having an irrigation system (albeit simple), is to assume greater limitations and risks than in the other two regions .

It was with all this variation and diversity of conditions that the Agroflorestar Project assumed its objective, seeking to radiate and adapt agro-agroforestry. In the following, agroforestry principles are brought together with reports of this construction.

The Contest Settlement is located between 900 and 1100 m of sea level, in the Araucaria Forest ecosystem in the Environmental Protection Area (APA) of the Devonian Escarpment. In Lapa, it is in the region of climate classified as Cfb (classification of Koeppen), that is, temperate climate, with mild summer, rains uniformly distributed, without dry season; the average temperature of the hottest month does not reach 22 ° C. Precipitation from 1,100 to 2,000 mm. Severe and frequent frosts, in an average period of occurrence of ten to 25 days annually. The climate is relatively humid and there are often many cloudy and light rainy days.

Even so, organic farmers never grow leafy vegetables without irrigation. Thus, there is usually the fear of doing this even in well-covered plots, but there are already success stories in agroforestry beds.

The climate is suitable for temperate fruit trees such as blackberry, fig, peach, plum, pecan, nectarine, pear and even for apples of less demanding cold varieties. The vegetation cover of the areas where the agroforestry was started was generally composed of grasses such as papuã, mattress, donkey's tail, iguaçu, taquara and braquiária, besides shrubs, among which the presence of vassourinhas with between 1 and 4 years old.

The Mário Lago settlement is located at an approximate altitude of 550m, in the municipality of Ribeirão Preto, northwest of the state of São Paulo, in a transition ecosystem between the Cerrado and the Mata Atlantica. In Ribeirão Preto the minimum monthly average temperature is 18.4 ° C and the average monthly maximum temperature is 23.9 °. The climate is tropical semi-humid, with rainy season subject to delay for autumn and dry season in winter and rainfall index of about 1500 mm concentrated between October and April. During the dry season it is common for air humidity to drop below 20%.

Comparing the landscape and socioeconomic contexts in the two settlements, it is easy to perceive the climatic and soil fertility difference that the vegetation cover indicates. In Ribeirão Preto, mainly because of the basaltic rock that gives rise to the soils and also because of the warmer, although drier climate, living beings can release nutrients, generate organic matter and recover a high level of fertility at a much higher speed. However, for this to occur in an environment in which air humidity is generally very low, soil cover and tree and vegetation functions related to wind decay, bring water from the soil depth and keep it in the farming environment.

The Contestado Settlement is about 60 km from Curitiba PR, which makes the production of fruits and vegetables feasible for commercialization for natural consumption. In the Mário Lago settlement, this type of commercialization is still much more feasible, because the Settlement borders the 90 91 urban areas and there is a great demand for agroecological products. It is worth remembering that in Ribeirão Preto, about 95% of the food is imported from outside the municipality, due to the almost absolute predominance of sugar cane monoculture. It is important to note that in the Mário Lago settlement, in addition to the legal reserve of 20% of the total area and regeneration of permanent preservation areas, settled families and their organizations committed themselves to a collective reserve of 15% of the total area, destined to practice of agroforestry systems.

In the Contestado, the lots have about 10 ha, being about 6 times larger than the lots in the Mário Lago Settlement. For very intensive operations, such as agroforestry gardens, lots of Mário Lago are more than enough size. Due to the exceptional quality of the soil mother rock and the close proximity of urban centers, the olericultura is a great vocation of the settlement. In the Contested Settlement, planning should take into account the need for areas with less management intensity, such as SAFs directed to the direct sowing of cereals, planted and harvested with machines.

9.2 - From machete to tractor, generating Agroforestry Praxis

"Each person will have a way of doing and even if it is in the same direction, nobody will do the same. The agroforestry of each will be a personal brand. "(Pedro, Cooperafloresta)

In agroforestry logic, cabbage, radish, banana, jaboticabeira, corn, cassava and all other cultivated plants are forest plants, adapted to different soil and light conditions. In the conditions of clearings of undisturbed forests the crops find the fertility they need for their full development, including moisture, nutrients, vitamins and life.

Thus, to implement an agro-agro-agroforestry system in a place where the life of the Forest and the conditions naturally created by it already cease to exist, it mainly involves potentiating the natural processes that recreate the forest conditions.

"We can get a healthy plant from the natural one. We make a mini-forest and self-regulate the system, without so much disease, without damage to the environment. "(Jesuit, settled and multiplier agent)

By favoring the processes of life towards the generation of naturally occurring conditions in a clearing in a fertile forest, living beings capture solar energy and use it to perform all the work that makes the organism fertile and productive. A work of unparalleled perfection is accomplished by "divine grace." The environmental and economic results arrive much faster than we usually imagine. A demonstration of great convincing power is realized by observing how the soil quickly becomes soft, moist and full of life, soon after being well covered with organic matter, resulting in increased production and great reduction of work and costs , such as weeding, irrigation, disease control and fertilization.

"We were surprised by the agroforestry system. The soil has changed a lot, it did not have life today, it has a lot of life. If you find out here, you have earthworm. They produce a lot of coconut-cola, it's a blessing for the soil. "(Célia and Claiton, seated)

It would be perfectly possible that all the work of recovering the fertility and productivity of the Organism Farming would be carried out by the body itself, powered by solar energy. However, in places that have long been deprived of life and the perfect work carried out by forest organisms, so that from the beginning the SAFs allow the well-being of the families that manage them, it has been decisive to use energy, work, techniques and resources at the same time developed in the field of artificial agriculture, at the beginning of the system. These include fertilization in the molds commonly used in organic agriculture, techniques of soil preparation and in some cases irrigation.

If you do not have the necessary organic matter in your site, we must first produce it or carry it from another place, or at least concentrate it on the planting strips. In any of these solutions, considerable "external work and energy" is required, which is not realized nor circulates in the agroecosystem itself. With the proper use of machines we can add "work and external energy" in a generally more efficient and fast way.

In this sense, it is important to follow the technical guidelines regarding the preparation of soil and fertilization or the experience of people experienced in using these practices, where we are working. In the meantime, we can dedicate ourselves so that our SAF has the plants and the management that guarantee its capacity to go replacing the artificial work by the organically realized by the life and intensified by the handling.

"I do not even know the garden. Then they insisted and resolved. It has been without exaggeration some 2,000 kg of this small piece, it is cabbage, jiló, beetroot, broccoli, everything. Always leaving fertilizer. This is going to be a paradise here. I do not think there is a better way. With this little piece of land, you do not have to hit a card for any citizen. "(John, seated)

In the present context, the use of techniques developed in artificial agriculture should be seen as a form of homeopathy, contributing to cure the evils that this same system created, by expelling people and the nature of the field, never as a purpose in itself. It is essential to follow a route that ensures that, every day, the work is carried out by the very life of the farming organism and the discernment of human beings. It is important to keep the vision of the paths that we intend to follow, although we are continually open to modify them in our agroforestry praxis.

"This system is improving the soil more and more. In the future it will be possible to get a good production that is very diversified without needing anything out. " (Vandeí, settled and multiplying agent)

In this way, it is fundamental to adapt equipment or to use them of different form to facilitate the good handling of the organic matter. Another aspect is that, in order to avoid environmental damage, such as compaction of soils, or to re-integrate human beings into natural processes, even in this transition strategy it is important to maintain the most humane and sensitive scale possible in the mechanization process, opting by lighter machines and by the human presence in the processes.

Pruning systems with a much greater intensity than naturally occurring ones, including the supply of wood and the use of typical plants of the abundance system, such as banana trees, make a decisive contribution to the natural processes that promote abundance. even when we start from inadequate conditions for cultivating crops.

Consortia based on stratification and natural succession optimize the occupation of ecological niches, producing diverse food for the life of the soil. They also make it possible for the fertilizers we bring from outside to escape the cycle of life, as in monocultures. In addition, they greatly increase the return with the beds, because fertilizing only according to the needs of the most demanding crop, all will enjoy the better environment. If every plant is in its function in succession and stratification, what exists is cooperation and organicity, not competition.

We can begin with small beds, to experience the fundamentals of agro-ecological SAFs, keeping them well covered with matter from outside, preferably from nearby areas.

According to the considerations of the previous paragraphs, we will discuss ways that have been totally or partially tracked and debated, already in more or less advanced phases of the implantation of agroforestry systems as a productive matrix within the ambit of the settlements Mario Lago and Contestado and within the scope of Agroforestry Network that already congregates more than one thousand settled families and peasants in the states of São Paulo and Paraná.

Our goal will not be to analyze and reconstruct in detail the history or the exact form as agroforestry techniques were used, although we recognize the importance that a work that did this could have, this type of approach is out our possibilities at this time.

Within the collective agroforestry praxis we experience. this is for us a moment of synthesis of what we have learned in this collective process. Not always all the steps are described in the exact form as they were given, as they often appear the way we would and will do today.

In this way, the book also reflects what happens in the day to day of those who dedicate themselves to the praxis of the continuous dialogue with nature and agroforestry organisms. Each day, according to our experiences, we change at least a little bit what we believe and the way we deal with our agro-ecological SAFs.

The above considerations further reinforce our understanding that, based on the principles of life functioning, a myriad of other solutions will still be creatively developed.

9.3 - A school on the doorstep

In the Mário Lago settlement, one of the works initially aimed at training and living with the agroforestry principles was the planting of irrigated agroforestry gardens of about 500 m², with the soil prepared and fertilized according to the indications used locally in organic agriculture. For the planting of most of these agroforestry gardens, initially only demonstrative, the organic matter in the area was cleared, removed to the margins of the area and later replaced in cover. If it were mixed with the soil, in order to feed on it, the microorganisms would consume part of the nitrogen available to the plants. On the contrary, placed on top of the beds, besides protecting and keeping the soil moist, it attracts and multiplies microorganisms, which to feed on organic matter poor in nitrogen, remove it from the air, eventually incorporating it to the soil, enriching them rather than impoverish them from this nutrient.

Usually a larger section was scrubbed or organic matter was brought with low cost of outside of the settlement, obtained in prunings of parks and other green areas of the city.

In these gardens, usually in every four flowerbeds, were planted, together with the vegetables, fertilizer trees and banana trees to produce organic matter. After the mowing, the limestone was released to be mixed to the soil during the following operations.

Whenever possible, in the beds where trees would be planted, the soil preparation began with the passage of a subsoiler with only one or two stems and then was followed by the passage of a mower.

An important aspect is to avoid that the beds are high, especially in places where the soils are not permanently humid, because raising the beds facilitates that they dry up. In addition, high beds require the application of large amounts of organic matter in between the lines, to protect the changes of the resecting winds.

Vegetable consortia were planted on the beds, based on the principles of stratification and natural succession. These gardens produced a great amount of diversified food, being decisive for many settled families to be enthusiastic about agroforestry praxis. Among the most important learnings are:

• consortium based on stratification and succession;

• the use of trees and banana trees for the production of organic matter;

• learning the importance of covering the soil with organic matter, keeping the soil moist, generating life and fertility, saving on the cleaning of the food, since it is already picked clean, ready to be consumed or marketed.

From learning about the importance of organic matter, in many settled families the recognition of the importance of adopting practices to obtain it more easily at all stages of the development of SAFs has been aroused. Those who made the experience of the 500 m² with great success and then other experiments in which grass beds were reserved for the production of cover for the beds, evaluated that the second way makes work much more economical and feasible.

"We planted arugula, lettuce, chicory, almeirão, cabbage, eucalyptus, banana, gliricidia, cassava, yams. It is done a planting that you have to consorciar the life time of each plant. Saves on the ground, in the water, in the input. I picked the first crop and then the second one is the cabbage, the yucca, the yam, the garlic, and I'm going to have the bananas and the trees, which will help me with soil cover and climate. "(Jesuit, seated and multiplier agent)

9.4- Keep the soil covered, the best start

The technique that brought greater and almost immediate results was to cover the soil. This also happened with many families who did not want to participate in the Agroforestry Project, but, seeing the results obtained by the participants, began to cover the soil. However, at the beginning of the agroforestry praxis, the difficulty of obtaining enough organic matter, the lack of examples and the still nascent understanding of the great response to a more perfect coverage of the ground makes the first and great step, usually achieved, be cover over the flowerbeds and sometimes only slightly in the space between the beds.

In the photos, well covered beds and between beds lightly covered.

The agroforestry praxis is a continuous learning with nature. Wisdom manifested in nature is infinite and the forms it adopts are always very important. The animals make nests to protect their young. They teach us that the way we shape organic matter by applying it to the beds is important. The ideal is to place organic matter always higher on the edges of the beds than at its center, making the beds suitable for the young seedlings. If we have beds next to each other to form nests, we must place a higher layer of organic matter in the space between the beds, than in the beds. The nest form brings rainwater and nutrients dissolved in it into the beds and not out of them and protects the seedlings and the soil from the beds of the drying winds.

On the previous page, small demonstration bed in the shape of a nest. Above, one can see the nest shape with the edges higher than the center of the plot where one can see gliricidia for fertilization, manioc and yam.

One of the reasons to raise the beds is to accumulate the most fertile land of the surface and to be able, more easily, that at least 40 cm of the depth of the bed is very soft and airy. However, it is possible to achieve the equivalent result by increasing the fertilization and the preparation of the soil. In very humid places it is important to raise the beds precisely to drain excess moisture. However, very high beds generate the need for huge amounts of organic matter to reach the nest shape, which is very important to keep moisture essential to the growth of crops. In this sense, it is good to remember that irrigation is generally expensive, limited and its overuse can lead to disease.

In the photos above several materials are placed between the lines in the search for the ideal format in which organic matter between the lines is higher than the beds themselves.

When we accumulate organic matter around a tree seedling, which is not in a bed, we should also make a nest with the highest organic matter at the edges at the foot of the seedling. If we simply pull the organic matter to the foot of the seedling, it stands higher up near the trunk, leans against it, and causes disease. In addition, the rainwater, with the nutrients dissolved in it, flows out of reach of the seedling.

The height of the layers of organic matter must be sufficient to avoid weeding. Hardly anyone will be able to hit the ideal amount from the start, but the need to weed and harden the beds should be understood as a lack of organic matter.

It is much easier to cover the beds first and then to open the hedge to plant the seedlings, which in this way are at the bottom of a nest protected from the winds that would dry these very fragile little plants. Thus, seedlings, even in the midst of considerable amount of organic matter, find the way to break the cover and grow with the soil around them completely protected. It is also important, after the seedlings grow a little, to make a revision, completing with a little more organic matter in the rarer areas.

"The more you cover, the better it is for land, for the animals of the earth. At the time you are going to plant, open a space and try not to leave the seed too covered. And then he organizes so that the plant is well protected. If near the lettuce is showing up a bit the soil, you will cover and she will thank you very much. "(Paraguay, seated and multiplier agent)

The farmer opens a space to plant small vegetables in well-covered flower beds

Seated and Seated have developed very ingenious methodologies to plant with covered beds. An example is the planting of the carrot, in which they place bamboo along the lines where the carrot will be sowed, by hand or with a manual planter for a line, put the organic matter in the beds and then remove the bamboo. In this way, only a small slit is discovered where the carrot is sown.

We insist that agroforestry praxis is not and will never be a finished technology, ready to only be adopted. It will always be possible to do better. But at this point in history, it is absolutely fundamental for human civilization and for the independence of farming families that many contribute their creativity and personal and collective effort so that it can be massively adopted. And one of the tasks of fundamental importance is to develop, with much passion and art, methods to keep the soil always covered while we cultivate our crops.

Nest-shaped hedges, the space between the beds with organic matter higher than in the beds, favoring the draining of water and nutrients to the seedlings and protecting them from the drying winds.

9.5 - Serrapilheira, the first step

Serrapilheira is the name given to the leaves and branches that fall on the soil of a forest, covering its surface and serving as food for its organisms.

We must intensely experience the importance of litter for the natural productivity of SAFs, for the infiltration and storage of rainwater, for soil life activity and for natural erosion control. To cover a hectare of soil, only once, with only 10 cm of litter - which is relatively little - would require 10,000 m^2 (1 ha) x 0.1 m = 1,000 m3 of leaves or branches / ha, that is, 100 trucks of 10 m^3 of litter! The account leaves no doubt that, except in very rare conditions, bringing in organic matter from outside to cover the soil is generally not feasible.

Thus, it is very important to form litter, even in deforested areas. In these areas, on hot, dry days, the wind dries the leaves, making it necessary for plants to absorb a lot of water from the soil so they do not wilt. But because of lack of organic matter, soils do not have the capacity to store much water. So the plants almost need to close their pores, stopping to make photosynthesis.

Under these conditions, the grasses evolved to function efficiently, because even with the semi-closed pores they can capture enough carbon dioxide to efficiently perform photosynthesis, concentrating the carbon dioxide in a structure specially developed for this purpose, called the leaf sheath. Another specialization, aiming to fulfill its function in deforested areas, is to produce organic matter with relatively low levels of nitrogen and high levels of low digestible substances. Therefore, in the absence of wood, grasses, especially when well managed, can contribute to the accumulation of litter and organic matter for the soil structure.

It may be important to use complementary legumes, balancing the relationship between carbon and nitrogen contents, to favor the processes that promote the availability of nutrients to the plants along with the processes that favor the accumulation of carbon, litter, organic matter and humus not alone.

"All the organic matter that I have here, eucalyptus, pigeon peas, banana, blackberry, gliricidia, is to give me conditions to cover the beds. Every 2 flowerbeds in between, there is a bed of trees. "(Seated Zacchaeus and multiplier agent)

"Here I plant every 4 meters a line of trees, vegetables and leaves all together and in the interweaving I leave the grass to make the handling and go replacing the cover of the beds" (Vandeí, settled and multiplying agent)

9.6 - Sizing to produce the required organic matter

Before beginning any planting of SAFs it is fundamental to have a well-designed plan of how organic matter will be obtained and managed, so that from the beginning the soil where we will grow trees and crops will be permanently covered.

In order to keep soils well covered in the early years of the SAFs, it has greatly facilitated the work of the settled families and reduced production costs, leaving spaces between the beds to produce grasses and green manure for easy litter production. beds or strips for the production of crops.

The width of the bands intended for the production of green manure and fertilizer should be sufficient to enable no weeding to be required, with about half of the organic matter being left to keep the organic matter strips themselves reasonably well covered. These should also be kept fertile, receiving, if necessary, liming and fertilization with rock powders and manures. The costs of planting and fertilizing the strips planted with grasses can be paid for, or at least minimized, through the planting consorted with crops.

It is important to evaluate if there is sufficient organic matter in the area to begin planting with the beds covered in the same year. In this case, so that there is no lack of organic matter, usually the most feasible is to start planting beds twice as long as the next year, joining the organic matter of the entire area to cover these more distant beds. Then, we planted grass between the lines and when it is producing, we planted another plot in the middle of the space between each plot. Thus, if we project that the distance of 6.4 meters from the center of a plot to the center of the next plot will be sufficient to guarantee the production of cover when the planted grass is well developed, we can start planting a plot every 12.8 meters.

When we have a very productive grass, well planted and with good conditions to

develop, we generally need the range for grass production to be 3 to 4 times larger than the area we will cover, but this should be seen only as an initial reference. It is indispensable to continue the praxis, aiming at its improvement.

Loading grass from outside SAFs is much more expensive and less efficient than producing it at SAF itself. Thus, as people gain experience in agroforestry practice, they recognize that it is better to exaggerate the bandwidth to produce grass and green manure than to plant it narrower than necessary.

If we let the grass pass from the point and start to grow old, the production of cover decreases a great deal, which leads us to believe that we have to increase the distance between the beds. However, we should never let the grass pass from the point, because if this happens, the crops will also have their development greatly impaired, because of the information to yellow and age rather than greening and growing.

Passing from the point, organic matter also becomes difficult to digest and releases very slowly the energy used by microorganisms in their function of keeping the soil cool, moist and nutrients available for our crops.

Increasing the grass ranges increases the distance between the beds and between the trees and banana trees, which in the future will produce most of the organic matter in the SAF Organism. It also increases the work with the cutting of the grass, without ever letting it pass the point. Finding the point of balance will always be a personal and collective challenge in each context.

9.7 - Selecting the grass to produce soil cover

In the settlement Mário Lago, we found a lot of grass growing spontaneously. It is very productive, has good regrowth and can be used with some efficiency for the production of cover for the beds. It only appears spontaneously on relatively fertile soils. However, when we replace the colonization by mombaça grass, planted densely according to the technical recommendations for pasture planting, the production by area generally almost doubles, reducing in half the width of the bands that we need to leave for the production of organic matter. This has a number of advantages and among them is the reduction of handling costs. Even so, using spontaneous colonization proved to be an excellent option in the first year and at least viable in the years to follow. It is also important to remember that the Mombasa is a very demanding fertility grass. In conditions of lower fertility, other grasses, such as napier, should produce more abundantly.

We used grass colonião and mombaça with good results between the lines in Ribeirão Preto and Cooperafloresta, but we were afraid of not adapting well in the much cooler climate of the Contestado. However, we learned that in an experiment conducted by IAPAR (Paraná Agronomy Institute) in the city of Lapa, among several tested grasses, the most productive was the Mombasa. We had already used the napier, however, to obtain a large amount of napier seedlings would be expensive and difficult, being much more feasible to plant the 35 hectares, to plant the mombaça by seeds with the tractor planter. On the other hand, if the napier goes from the cut-off point, the consequences are worse and include it pick up at the flowerbed. However, there is no absolute consensus on the choice of one or the other grass, because they are managed at the right time, both work well. The use of equipment, such as the grasshopper that bites the grass, helps to avoid the napier's glue.

In the colder climate of the Contesting Settlement, we also feel the need to plant green winter fertilization. This planting was carried out successfully, sowing the vetch and then grazing the Mombasa with tractor trimmer. As the secular vetch was left, it was also born spontaneously in the following years. In this way, the vetch produces organic matter at a time when the mombaça paralyzes its growth. In addition, it protects the Mombasa from frost, improving its regrowth in the spring. At the beginning of spring, both are covered covering the beds and the mombaça regrows vigorously.

Bedbeds being prepared in an area with mombaça grass covered by vetch in the winter. Part of the vetch will be used to cover the beds and the unpeeled mombaça will re-sprout vigorously, having been protected from frost and fertilized by the vetch in the winter.

9.8 - The use of the banana tree for the formation of Serrapilheira

The banana tree is perhaps the most typical plant of abundance systems. In places like the mountain-shored riverbanks, where the passage of winds causes relatively constant renewals in the vegetation, the production of organic matter is potentiated. As a result, it increases the activity of the beings that generate the fertility of the soils and the natural development of systems of abundance. In these places the banana tree spontaneously reproduces with its seedlings being carried by periodic floods.

Its "stem" is formed by the base of its leaves, being rich in nitrogen, minerals and water. It is immensely gratifying to learn how bananas and especially their stems contribute to our crops producing abundantly. When we begin a new planting cycle of annual crops, it is usually important to remove all the stalks from banana clumps, sacrificing banana production to crops, and leaving only two or three of the best horned offspring.

However, if the stems are placed whole on the ground, they become nests for the drills known as the banana grub, its most feared plague. On the other hand, cracked in half in all their extension and with the cracked part lying on the ground, are digested quickly by the life of the soil. In this way they serve as traps for the brat because the brat lays eggs that see larvae, but it does not give the larvae time to turn beetles and thus they end up dying.

Another great advantage is that, in contact with the soil, produce fertilizer of much better quality, it keeps the soil part where they are wet and also end up leaving the soil free of grasses and grasses. The leaves should also be cut and chopped to cover the soils, because whole ones end up functioning as an unwanted umbrella, leaving a considerable portion of relatively dry soil.


From top to bottom in the first photo, part of the stem of the banana tree being cut in half in length so that it is well bedded on the ground. In the following photos, applied in different ways, to cover and protect the soil from crops, vegetables and orchards.

9.9 - Renovando e promovendo o viço do verde

It is essential to learn the importance of keeping SAFs to the maximum with all their evergreen plants, always green, always far from entering the aging phase, always transmitting to the other beings of the SAF Organism the message of vitality and growth.

It is easy to verify the negative effect of letting the grass go past the point. When this happens, it seems that the whole system evolves more slowly. On the other hand, it is gratifying to check the positive response of our annual crops and crops, when we cut the grass at the point before it would begin to age and put it on the ground in the vegetable beds or in the strips of the annual plants.

"In addition to the banana tree, gliricidia and eucalyptus, because they produce a lot of organic matter. Leaves, wood that on top of the earth produces nitrogen and this has given a great advance in the system of organic fertilization. It has been very gratifying to work with the earth. "(Clailton, seated)

"It is important to manage the whole system so that everything begins to sprout together, in order not to have influence from the old grass that is ripe in the development of the plants. I prune the eucalyptus 3 to 4 times a year, I cut his head always at the same height and with leaves and branches covered the beds, in this way, among many other plants, unlike in monoculture, he is a comrade who will bring enough water for my system. "(Paraguay, seated and multiplying agent)


All the plants that are in the foreground are young and green. Keeping all plants lush, renewing through pruning or withdrawing from the system those entering the aging phase is fundamental for the good development of the other plants of the SAF

9.10 - Why keep trees ever pruned?

There are several important reasons for pruning trees, such as:

1. So that trees are always sprouting vigorously, because it is perceived, in practice, that information to grow vigorously is transmitted to the whole environment, including annual crops and fruit trees;
2. To increase the production of organic matter by trees of good regrowth;

3. To allow light to enter;
4. So that low branches do not grow, outside the stratum of the trees that we use for the pruning, that generally belong to the high and emergent strata. The growth of low branches is harmful because it occupies the space that should be occupied by the crops, be they annual or fruit trees. It is said to "suspend the skirt of the tree" for this type of pruning;
5. To limit the height of the tree, when we can your "head", which is also called "apical pruning". This pruning is fundamental for the safety of the pruning machine and also of the tree itself, because if it grows freely and without the protection of the other strata as it does in the forests, the windows can break it, causing disasters and the loss of the value of the wood. On the other hand, apical pruning causes the trees to thicken more, increasing the commercial value of each m³ of wood produced;
6. To keep the consortium properly stratified;
7. In the case of fruit trees, the pruning is quite different and carried out for several other reasons such as: maintaining the proper shape of the trees, stimulating fruiting, increasing fruit size, removing unproductive branches, keeping the consortium correctly stratified, etc.

In the photo above is the moment of the realization of apical pruning in a guapuruvú, a tree of good growth and that regrows well after apical pruning. In the photo just above, we see gliricidia and eucalyptus lines receiving apical prunings in an area being prepared for a new annual crop

9.11 - Making economic the planting of the grass

The costs of planting grasses can be paid in the first year. In this direction, an experiment that worked well in the Contested Settlement was the planting of the tuiuiú variety beans. This variety, like other improved ones to avoid the mela of the bean, grows with the leaves going upwards and not to the sides, producing the pods also in the stop. These characteristics facilitate their intercropping with the mombaça, as they allow more light for photosynthesis and less moisture for the maturing of the pods. We have not had the same success with corn and rice. In the case of rice, we evaluated that the biggest problem was the lack of specific disk for the planting of this grain, which caused that it ended up being planted in excessive depth. In the case of corn, perhaps the biggest problem was the lack of correct variety selection, whose main characteristic should be the highest possible vertical growth speed.

The beans were placed in the planter's seed box, pulled by a tractor and the mombaça seeds mixed with granulated bird fertilizer, in the fertilizer compartment of the planter. In this way the mombaça and the bean were born together, in lines distanced of 40 cm. This would allow a weeding with the tractor. Due to the lack of adequate implements, some weeding was carried out with animal traction and others with a hoe. Either way, planting on the same line greatly facilitates the possibility of weeding. The weeding was necessary due to the faster exit of the grasses that already vegetated in the area, like the papuã, mattress and the foot of chicken. In this way, the beans produced well and the Mombasa was well planted. Another way some think could be tested would be to plant the single bean and then weed it with the implement to weed, either with animal traction or to the tractor. Then sow the Mombasa manually or with a sower to a line. It is important to note that the mombaça is best born when it is not buried, or is buried with a maximum of 1 cm depth, or covered with a thin layer of well-ground organic matter.



From top to bottom sequence of photos of the steps of establishing the "infrastructure" to produce the ground cover and the beds. Further up the beans and mombaça planted at the same time, with the beans growing initially faster. In the middle photos, at the time of the bean harvest, the Mombasa is already higher. In the photos below, the beans were already harvested and the area is dominated by the Mombasa, and beds were opened for the planting of fertilizer, fruit, banana and other crops.

To make this planting it was important to make liming, always in moderation to avoid release of nutrients at a greater speed than the vegetation can assimilate, causing them to be lost dissolved in the water that goes to the springs. Also important was a good soil preparation, as well as fertilization with rock powders and manure, at the recommended doses in organic agriculture. Another important aspect was to make a good leveling of the terrain, which greatly facilitated the cutting of the grasses. As already discussed, the well-made use of the techniques developed in artificial agriculture and the recommended fertilization in organic agriculture is fundamental when the SAF Organism is not yet ready to make, through the living beings that are part of it, the preparation and fertilization of the soils.

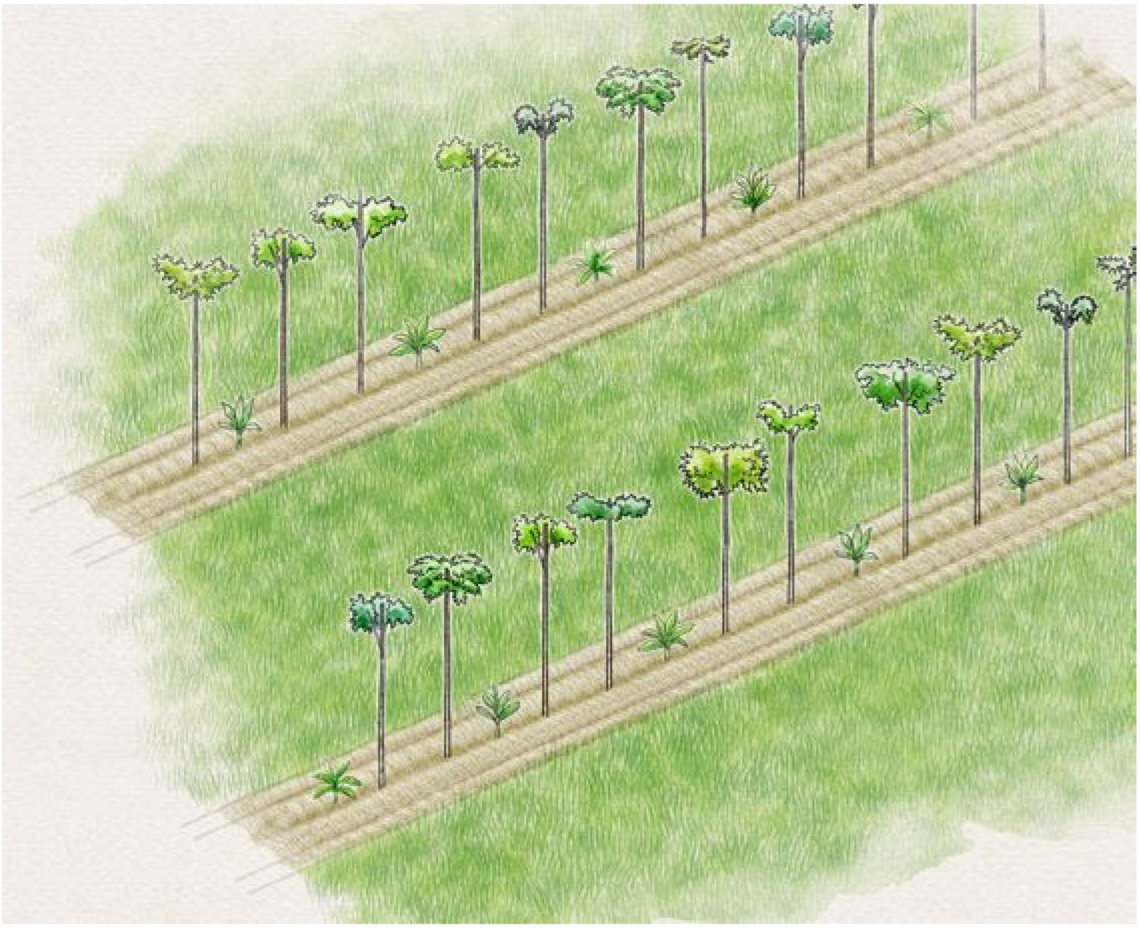
9.12 - Dimensioning to enable the use of equipment in handling

In order to use mechanization, it is important to select the width of beds, tillage ranges and ranges for the production of organic matter, to also allow a good use of equipment. Let's take an example: in the Contestado Settlement, equipment was acquired that cuts, chops and throws the chopped grass up to a maximum distance of 6 meters for each side. This equipment greatly facilitates the management of the grass, reducing the cost and allowing the increase of the areas worked, aiming at the production of fruits, grains or vegetables.

However, the equipment cuts a strip of 1.20 meters each time, and is pulled to its side by a tractor that is 2.10 m wide. In handling it is important that the tractor go and return by cutting grass and passing with the wheels just above grass. Let's imagine the range planted by grass divided in length into 2 parts. When the equipment is cutting the part on the right side, the tractor has to fit whole on the left side. Each side must be at least 2.10 wide to fit the tractor. It is also important that the equipment cuts a full 1.20 m strip at each pass. For this, each side must have at least 2 bands of 1.20 m. That is, the width of the grass strips should be equal to 4x1,20 m or 5 x 1,20 m or 6 x 1,20 m, etc.

Assuming that the grass ranges will be 4 x 1.20 = 4.8 m and we estimate that they should be 3 times larger than the area covered, we could cover 1.60 m with 4.80 m bands, with the beds with trees and banana every 6.4 meters. Within this proposal we could have the following options:

a) Vegetable beds or crops with 1 m wide, trees and banana trees in its center, 30 cm on each side without planting grass, only to accumulate enough organic matter, ensuring the nest shape. This would take us to flowerbeds every 4.80 m + 1 + 0.3 + 0.3 m = 6.4 m;



b) Trees and banana trees every 6.40 m, as in option a, but only 60 cm wide or a central line with trees and banana trees and crops or vegetables only in this line and 30 cm on each side where organic matter accumulates, the edges being much more covered than the center. In this case, on the side that gets more sun, especially the morning sun (that is, the north side and / or more to the east), make a bed of 80 cm wide, leaving next to this another 20 cm only for the placement of very high organic matter. In this way, we formed 2 beds in the form of a nest and as in item a) we reserve 4.80 m for the planting of the grass.

c) Make the first planting with the format a), but with the trees and banana trees instead of in the center, 30 cm away from the edge that less gets the sun from the flowerbed. In the following plantations adopt the format b) .30 cm1 m30 cm4,8 m20 cm4,8 m60 cm80 cm

d) We could also choose to make the lines between 5x 1.20 meters = 6 meters. This would give us the opportunity to place 2 50 cm side of the center of the trees with 60cm, leaving 20cm on each side of these 2 lateral beds without planting grass, to put organic matter. In this case, we would have to cover 0.60 cm of the central bed + 1 meter of the lateral beds + 40 cm next to the lateral beds = 2 meters or 3 less than the grass area, as would be recommended.

Proposals "b" and "c" seem to us to improve proposal "a", however they need to be better tested. They have emerged and have begun to be used successfully in the Contested Settlement, due to the fact that trees and banana trees make it difficult to continue mechanically loosening the central bed after the first plantings, so that we can continue to grow vegetables. Adopting this design may allow the use of cultivators and is important mainly for the planting of vegetables which require extremely loose soil, such as carrots. We believe also that it will facilitate the maintenance of nests of organic matter, even more perfect for the trees and banana trees.

It also seems important to us, for those who are developing praxis agroforestry, to reflect and evaluate the extent to which the need to mechanically loosen the beds is happening because we let the grass pass from the point and in this way we make it difficult for the beds to be always covered, hardening them, as well as hampering the development of crops, trees and banana trees.

9.13 - Loosening the soil without inverting its layers

It is important to try to avoid inverting the layers of the soil, because living things that maintain their fertility are very specialized and do not always survive when we do this. With this in mind, and also in the ease of operation, settled and settled Contestado have successfully used forks that make it possible to loosen the beds without inverting the layers of the ground and without cutting important beings like earthworms. Below, we put photos of a very well designed model for this use, which can be made to order, in a locksmith.

In the first photo, fork to loosen the soil without inverting its layers, in the following photos, the fork being used.

9.14 - Importance of planning

"In this framework for the ease of water and being very close to home I will continue with vegetable garden in the agroforestry system. In the future we will have wood, to finish my house, make a new shed, finish my fence, a lot of things. "(Jesuit, settled and multiplier agent)

"If I do it from here to here it will shade my beds. From here to there I will have sun. I'm going to do this because of this too." (Zacchaeus, settled and multiplier agent)

Even if we use very similar designs for the implementation of SAFs for different purposes, it is important to keep in mind where one intends to arrive by planning the agroforestry production unit in stands for each purpose.

For example, if we start investing in relatively expensive fruit tree seedlings in SAFs near our home, it will be unreasonable to cut them even before they come into production. This way, soon our garden will be moving away from home. Since we will need to go to every place in the garden, this is probably not the best way to make our work more efficient and enjoyable.

In addition, while it is important to keep an eye on the necessary changes in management as the SAF evolves, it is very important to carefully and carefully plan all steps, always evaluating the organic matter available and that can be generated, indispensable for the beings to keep the SAF Body healthy and promoting its own sustainability.

"If I plant an orange or avocado, I will not prune it on the trunk to make a vegetable garden! So we have this planning. "(Paraguay, seated and multiplier agent)

9.15 - SAFs with a focus on fruit

"This is a vegetable garden, it has an older area that has more fruits and one with more wood. We have several models, so we can take care of 1 ha. But in 0.5 ha, the income is very good and you can have a lot of diversity and food. "(Vandeí, settled and multiplying agent)

The different socioenvironmental contexts in which the practice of SAFs are developing in Cooperafloresta and settlements generate important differences in the definition of the designs and selection of suitable strategies for agroforestry practice.

In the page next to and on top of this, SAFs in Cooperafloresta, in mountainous conditions and of vicinity of fragments of the Atlantic Forest determining less aligned designs and less continuous interference in both time and space. In the photo just above, Cooperaflo-sub's visit to agroforests in the semi-arid, with the strong presence of cactaceae and jurema, species very well adapted to form serigraphy in semi-arid climate conditions..

Recognizing that many other paths are possible and even indispensable, we have chosen to exemplify the principles that we have used, starting from relatively similar formats to the most commonly encountered orchards today, seeking to add priority elements to them to become naturally self-sustaining organisms.

It is relatively common for orchards to be organized in rows with only one type of fruit tree, spaced apart by spacings that vary depending on the final size of the trees to be managed. It is also common for fruit tree lines to end up on wider streets through which production flows.

By opting to maintain the general structure of an orchard to transform it into an SAF with a focus on fruit production, it is necessary to add some fundamental elements to make them self-sustaining organisms. Among the aspects of great importance in this direction we highlight:

a) Since the implantation of the SAFs, use plants, trees and managements that favor abundant litter, especially in the bands where the trees and crops will grow;

b) That the SAFs have the vegetation, including trees, with natural vocation for the generation of organic matter, always renewed by the pruning and, thus, producing litter and diverse foods for the life of the soils;

c) That all trees and plants are within environments for which they are ecologically specialized, considering soil, climate, strata and natural succession;

d) That the trees for fruit production be pruned always aiming at their health and productivity.

9.16 - Enabling and making sustainable the cultivation of fruits

It is possible to focus SAFs on fruit production, but bringing along the annual crops and vegetables as well.

One of the great advantages of these combinations is that from very early the implantation and management costs can be paid with the commercialization of these crops and vegetables. This fact also makes it possible for the fruits to develop in a better care environment.

In general, we can plan a SAF of this type in the following way: we plant the fruit trees in the center of beds or strips of about one meter wide, along with annual crops and trees for organic matter production.

Between the beds or ranges with trees and crops it is important to design strips of sufficient width for the production of grasses and other green manures in sufficient quantity so that the beds are covered all the time, and at the same time so as not to have to weed and do not take away so much organic matter to the point of impoverishing the lines.

Planting a line of tree fertilizers and banana trees, between a line of fruit trees and another, facilitates the management and production of organic matter. This intermediate line, because it is intensively pruned, does not hamper the development of the grasses of the strips between the tree lines, making possible its long stay in the SAF. It is also important to take advantage of each pruning of these lines for the production of annual crops, which can be decisive to economically make possible the planting and management of these bands and the whole SAF. In these lines, in which we will not plant fruit, it is generally useful to include some species of the accumulation systems, in order to favor the processes of accumulation of structuring organic matter in soils.

In case we have chosen to plant the intermediate line of trees and bananas for the production of organic matter, we can still plant trees with rapid growth and excellent regrowth, as well as bananas, only in the early years, to help create the fruits until they start producing.

When the fruits begin to produce, we take the pruning trees and the banana trees of these flowerbeds and we leave in them only the fruit trees and emergent trees of excellent wood, but which can only have their crowns cut once a year, as for example: andiroba, araribá, true rosemary, Brazil nut, yellow cedar, pink cedar and purple, jatobá, jequitibá, african mahogany and pink peroba.

In the photo on the previous page, peach trees in a field with eucalyptus trees where they have already been planted and harvested annual crops. In this same photo on the left side you can see only a garden with fertilizer trees and greenery. In the photo above, eucalyptus and banana trees growing together with yam at the end of the cycle, since other annual crops have already been harvested. On the right, one can see that in the interweave the vetch begins to cover the grass and the ground, bringing nitrogen from the air and protecting the mombaça from possible frost.

Everything we have said in this section shows that the SAF focus on fruit production, have their sustainability stemming from the same that the SAF bodies with a focus on the production of vegetables or other annual crops.

9.17 - Direct planting of grain straw and annual crops in SAFs

This praxis is just beginning, not having the same experience accumulated with the vegetables. So the approach that follows must be understood as experiences with great potential to be developed and modified with constant practice.

The grass-cutter equipment cuts grass and other vegetation, such as brooms found in the Contesting Settlement, when they are not too thick, up to 6 meters for each side. This allows the organic matter to be chopped and accumulated every 12 meters by one pass of the equipment throughout the area. Before doing this, it is important to submerge and prepare seedbeds with 12 meters from center to center, accumulating the organic matter on top of the beds. In the first year, depending on the time of year, crops or vegetables can be grown on top of the beds, along with the planting of tree fertilizers and banana trees, aiming at the production of organic matter. In the following year, these beds will be left with only 25 cm of each side.

Then the 11 meters between rows are prepared, discounting 1 meter of bed.

If the planting begins in the spring, the grass colonium or mombaça, as already discussed, is planted. If planting is done in the fall, instead of beans or corn, we can start by making a green winter fertilization, such as vetch, white and blue lupine, flaxseed, black oats or grains such as rye, wheat and peas. that their seeds be pelletized, to be consorted, like what happened like beans in the spring. If the mombaça seeds are not pelleted, they will probably all be consumed by the birds during this period.

Even if several of the crops mentioned in the previous paragraph are planted in a consortium, they can be harvested at the same time with a harvester, and then separated with sieves of adequate size. By living seated and settled, the mombaça seeds will be stored in the soil and, in the spring, will germinate with force under the cover left after the harvest of the green manures and / or winter grains.

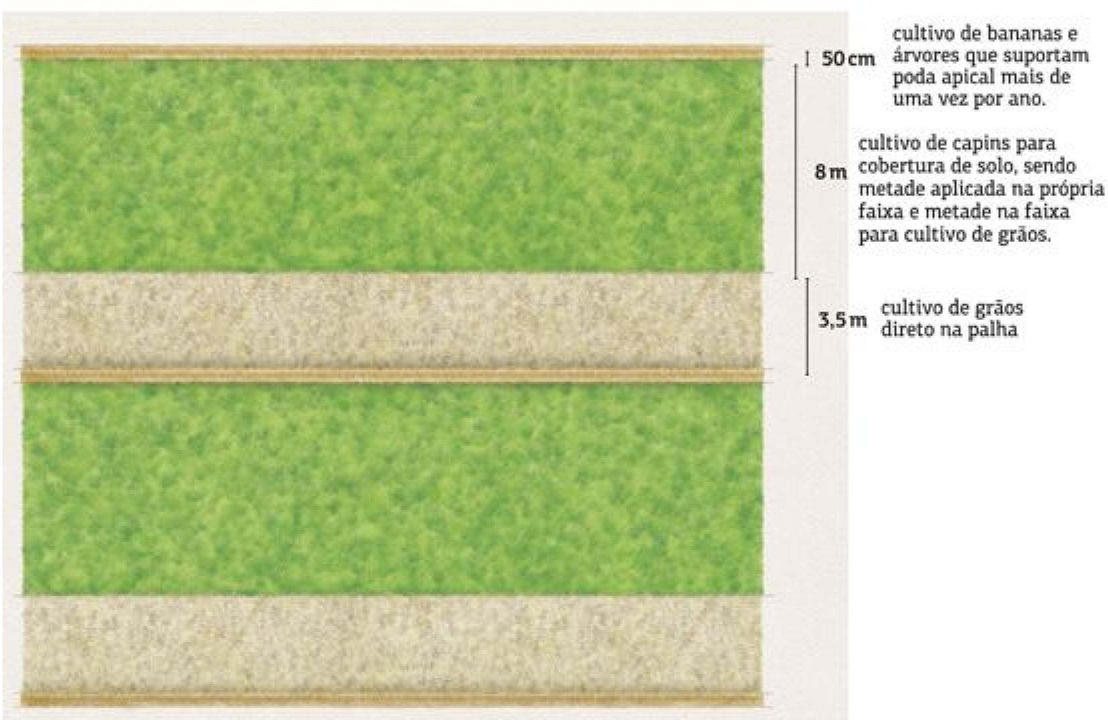
For the cultivation of vegetables, it has been evaluated that the part that will produce grass for cover must be 3 to 4 times greater than the part that will be covered. However, besides the cover made with grass, the plants normally used to generate coverage by those who practice no-tillage will also be used. In addition, in the first year, we will accumulate organic matter by planting a larger range of grasses and, from the second year, we will start counting on the pruning material of banana trees and trees. Therefore, in this case, the material obtained with grass will be greatly complemented and it is reasonable to use about 2 times the area to be covered, rather than 3 to 4 times. The beds with trees can, when we begin the grain plantations, be reduced to about 50 cm, with 25 cm of organic matter on each side, forming a nest for the banana trees and crops planted in the tree line. There will therefore be 11.5 meters of interlining, for the grassy tracks and for the bands with grains.

If we scale the range for grain production with a planter (in the case of Contest Settlement, in a 3.5 meter wide band), there will be a band of 8 meters wide to keep permanently with mombaça or napier - exactly twice the range which we must cover by adding the beds and the range for grain production.

According to this design, when the grass is very productive, one can select the side of greater sun exposure when the trees and banana trees grow to plant the grain band, giving preference to the morning sun, that is, the side to the north and / or east of the beds. However, it is good to remember that every time we grow grains or other crops, we prune all or almost all of the tree canopy and all the banana stems, leaving only 2 or 3 horns, and therefore the shade on the crops will be very small.

In order to prepare a range for planting grains in the implanted grass, we can go through the grass harvest by cutting the grass of the strip that we want to plant grains, chopping and piling the grass next to the tree stand. Next, the soil is prepared in a conventional way, starting the Mombasa and leveling the soil well. After preparing and fertilizing the soil, the grass tasting is passed in the range for organic matter production, throwing it in a width of 6 meters, in the bands for the production of grains and the other 2 more distant next to the next flowerbed . Finally, it is evaluated the need to, even manually, return with part of the grass removed from the grain band, to further improve its coverage. Next, with the planter for no-till, the grains are planted, initiating the practice of no-till logic in the straw, with reinforced cover, so that there is no need to weed.

One of the main difficulties that can arise is that with repetition of the cuts, the grasses worsen their regrowth, due to both the cut and the tractor to cut them. In this sense, important to be perfected and constantly monitored: the use of lightest possible equipment; the demand or development by equipment whose cutting promotes a good regrowth of the grasses and the demand for grasses that adapt better to the continuous cut by the equipments. Another factor, which may be important, is to alternate a cut with the equipment and a cut with a costal brush, in this case leaving the grass in the same range where it was cut. In this context, elephant grass may be better suited to proposed that the Mombasa grass, being cut into small pieces by the grasshopper loses its ability to sprout in the beds that was problematic for manual labor.



9.18 - SAFs with focus on animal husbandry

"In this area there is plenty of fruit, we are picking vegetables, but the idea here is an area of 2 thousand m² that allows to raise animals, chickens, ducks in a way very quiet, with plenty of food and shade, a cool environment for them. "(Paraguay, seated and multiplier agent)

"I'm going to prepare the chicken coop as if it were a normal agroforestry garden, wood, banana, but I will plant a number of plants including fruit which the chickens like. "(Zacchaeus, settled and multiplier agent)

Generally the animals were raised in areas where they naturally there were forests. Soils of the Forest Organisms were maintained by the coordinated and cooperative work of the beings who lived in it with 5 to 6% of organic matter and always well covered with litter. Without the dynamics of forests, soils have been impoverished or with high investments, through techniques artificial agriculture. Their organic matter content decreased 5 or even 10 times. Among the disasters are the small availability of nutrients and the loss of structure that makes soils capable of storing water and slowly supply it to the vegetation and to the springs and rivers. In Brazil the areas with pastures are gigantic, also generating impacts gigantic.

By integrating animals with SAFs, it is possible to recover, if not fully, at least in part, the operation of the Pasture Organism, whose natural vocation is forestry. This action is key to regaining your fertility, families that raise livestock independent of inputs and energy to keep the body functioning. It is, above all, indispensable for the proper functioning of the Planetary Organism and for the living of human beings and other beings on Earth.

The working principles of nature are the same, whether we dedicate ourselves to agriculture as to animal husbandry. Within the framework of the Agroforestry and Flora, some families have made progress in of this praxis. We recognize, however, that animal production was not the focus of the Agroforest Project. For this reason, although we are aware of its enormous importance and potential, we are not the subject with the depth it deserves. Even so, we to share some indications and initial ideas that may arouse the interest of people who are already engaged in animal husbandry or who dedicate themselves to the practice of SAFs for animal husbandry.

Among the fundamental principles is the importance of the presence of trees, performing various functions such as bringing water and nutrients from the depths of the earth and reducing the drying winds. It is also essential to keep the soils well covered, in the limit of not hindering the regrowth of the grasses. Trees for the supply of wood to the soils should preferably be selected from those which may have their crown partially or partially pruned 2 or 3 times a year. In this way, pastures, as well as crops, will also produce wood, because the trees of good regrowth, kept on constant pruning, thicken much faster than those that are not pruned.

One possible design is to alternate lines of trees and banana trees for pruning and lines of trees and shrubs to complete the cattle diet.

Being pruned two to three times a year, or at least once a year, the trees and banana trees do not overshadow the pastures. Their level of shade is always beneficial, both for livestock and pasture. For this, designs with lines of trees closer, as 10 meters or even less and intensely pruned generate more branches, woods, roots and all the dynamics that will sustain the Pasture Organism. When tree lines are placed on pastures not integrated with SAFs, lines are often planted far apart from one another because trees are not pruned continuously.

The ideal is to first form the SAFs and then receive the cattle. If this is the case, the techniques used for the formation and establishment of SAFs with other foci may be employed. Among them, we highlight the techniques used for the formation of SAFs with focus on grains, which have a very easily adaptable structure that would be suitable for pastures.

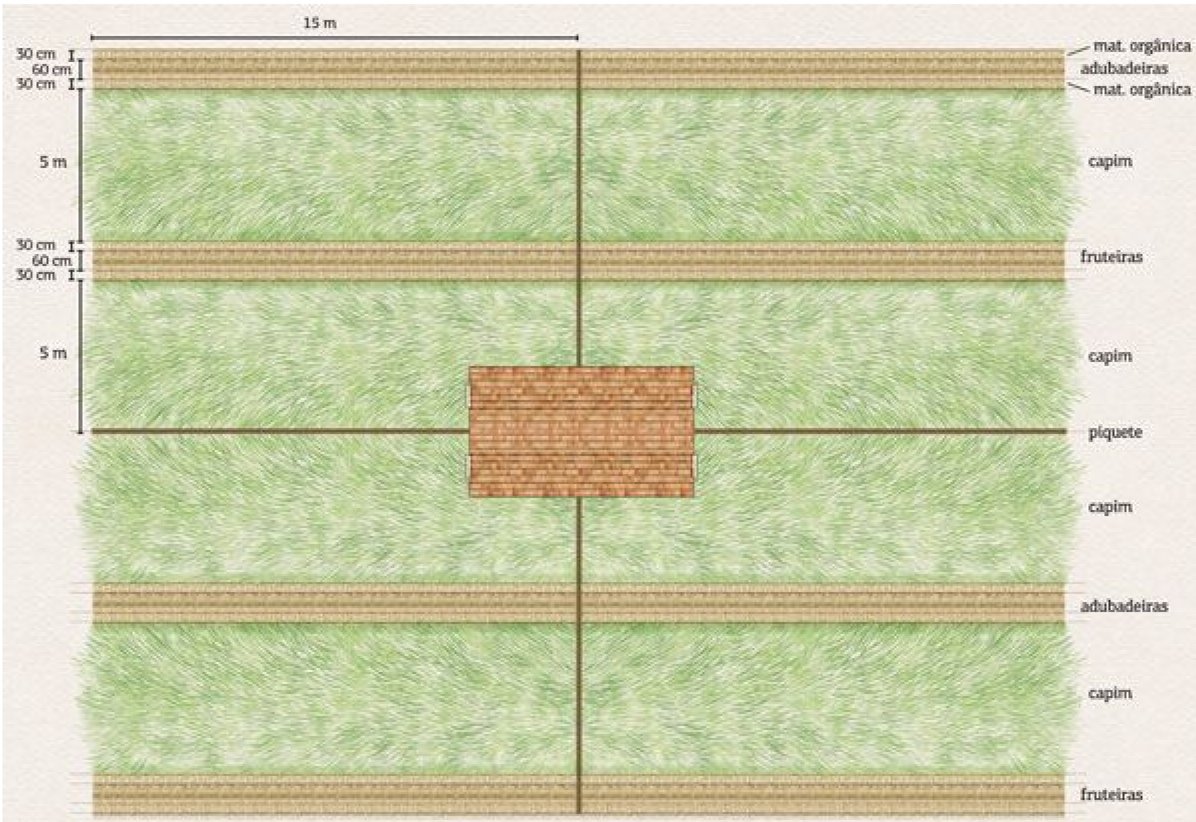
If we have to establish SAFs on pastures that already have cattle, one idea could be to isolate blocks within the pastures and to form gradually, because in this way, each block formed, mainly when breaking the winds, would bring benefits to the others.

Everything we have discussed should ideally be thought of in the context of rotational grazing methodologies, which we are not able to present at this time, but which have a lot of practical experience among settled families and in the scope of family and agroecological agriculture, as well as great technical progress and conceptual.

The foundations that have been approached with respect to pastures directed to the cattle raising, also are valid for the creation of small animals like chickens, ducks, pigs, etc.

At the Mário Lago settlement, some plots were started by the production of vegetables but aimed at their future structuring for raising chickens. The plan consists in the planting of lines with tree fertilizers and banana trees interspersed with bands of grasses and lines with fruit trees that can be more or less intensely pruned. In the future, the area for chicken production will be divided into at least 4 pickets. It is designed the construction of central chicken coops with independent exits for pickets. Management should be based on experiences that deal with rotational grazing even without the tree component.

The fundamental difference in the SAF proposal is the planting of trees and banana trees to be pruned at least 3 times a year, to provide soil cover, boosting the life of the soil and in this way providing both chicken feed and fertility for the growth of grasses and fruit trees.



9.19 - Planning of the Lot Organism

"By planning production in the short, medium and long term, you can have an income all year round. We have trees that will give economic return in 30 years until radish and arugula that produce with 25 days. "(Paraguay, settled and multiplier agent)

Before starting to plan SAFs it is important to reflect a lot on the socio-environmental vocation. Many factors should be considered such as climate, soil, availability of organic matter, availability of water for irrigation, distance to the likely final consumers, lot size, people we count on to do the jobs, people who will feed on the products and their tastes and many others, including the taste of the farming family for possible productive activities.

In both settlements, it is also important and feasible to plan SAFs for the planting of fruits, vegetables and also for other important annual crops to feed families, including grains.

The production of large quantities and diversity of vegetables is well advanced both in the Mário Lago settlement and in the Contestado Settlement. Fruit production comes next. Some grains and crops (such as cassava) have also been produced, but producing most of the grains they need, at least for their food, is still a great challenge for families settled in both treated cases.

The lots of Mário Lago has 1.7 ha, that is, 17.000sqm. In just 500 m², many families were able to obtain adequate food and income from SAFs. However, in these 500 m 2 areas were not counted for production of organic matter. If we consider 4 times more area for the local production of organic matter we reach 2,500sqm. These areas, while generating good incomes, also require considerable manpower. Considering that the production of vegetables is a great vocation in the context of the Mário Lago Settlement, it would be balanced to consider areas of 4 thousand m² destined to the production of vegetables. Fields of the same size, intended for the production of grains and other large annual crops such as manioc, would be enough to feed the families, also generating surpluses for commercialization. The same can be said about fruit production. For the creation of small animals, perhaps they are even too large. However, these considerations and the perceptions we have gathered from settled families give us the assurance that batch planning can meet all the needs of households and families. The production of vegetables, followed by the production of fruits, is the great vocation for the generation of income. The production of small animals, grains and crops is very important for the production of high quality food for families, and has the potential to generate some surpluses for commercialization.

In the Contestado Settlement, the lots are at least six times larger than in Mário Lago. The production of vegetables has been the one that generates more income for the families. However, under local conditions, the production of species of temperate or subtropical climate - apple, pear, peach, quince, fig, plum, nectarine, pecan, Portuguese chestnut, citrus, mulberry, pitanga, cherry of rio grande, guabiroba, guabiju , guava, uvaia, araçás, jaboticaba, pinhão, mate, espinheira santa, cinnamon sassafras, cinnamon and many others - can, in the medium term or in some cases in the short term, give a calmer return to the families, than keep focus on vegetables. After the production of fruits, SAFs with focus on grain production also seems to us a great vocation in the context of the Contested Settlement.

In the case of the Mário Lago settlement, most families understand that the size of 1.7 hectares of the plot is too small for livestock. In the Contestado, lots of more than 10 ha allow livestock to be raised, even if it is not the most profitable option, provided that the quantity created is limited by the possibility of producing the feed for livestock and pastures in the SAF itself and the creation is preferably initiated after the establishment of a self-sustaining SAF for this purpose.

Already the creation of small animals, such as chickens and pigs, especially when made to produce quality food for the families themselves, seems to us a great vocation in both cases. In this case, it is important to consider not only the market price, but, above all, that food of animal origin inhumanely produced by artificial farming is very harmful to human health. Also, it does not seem impossible to us the extra effort to meet the consumption needs of this type of production, when they come from consumers committed to the Agrarian and Agroecological Popular Agrarian Reform Project.

In both cases, the planning for the deployment of the SAFs with the foci already discussed for a long term of the unit as a whole is of fundamental importance.

10 - References based on Agroforestry Praxis for vegetation uses in SAFs

"A plant with good soil, suitable location, in conditions minimally similar to its origin, suitable consortium, will not be so attacked. Sometimes a pest cuts a plant that is in inadequate conditions. If you want to produce tomatoes in the summer gets tough! You can not go planting everything together without reaching and understanding the forest! Get in there and observe the floors, the life time of each plant! In a forest you see only one type of tree? Do you see everything the same size? See the floor uncovered? There are plants near the ground, the trees are medium, tall and emergent! In agriculture it must be the same thing, you have to put the plants in a way that one collaborates with the other, in the way that nature does. The papaya foot is emergent stratus and soon leaves, so it is along with the mango foot. I've been harvesting a lot of papaya and have not messed up the manga. "

(Paraguay, settled and multiplying agent)

If we stayed only in grand foundations and concepts by adding few illustrative examples we would run the risk of making mistakes. However, in the agroforestry praxis, one deals with the selection of plants for several functions. It is also true that concepts and principles can be more easily understood and tested when we talk about their applications.

Our concepts, as well as those of every person engaged in agroforestry praxis, change over time with praxis. However, the plants we indicate for this or that use change much more quickly. Therefore, although all references in this chapter and in this book have been based on experience and practice, they should be looked upon only as a possible starting point and never as a final word.

Nor can it be forgotten that the greatest foundation for agroforestry praxis is the organicity of life on every piece of Planet Earth. Therefore it is fundamental that the organ executing the function is perfectly adapted to its function in the context that will execute it. So before using any of the plants that we put in the tables and examples, the first question is whether the plant fits well in the condition of climate, soil, slope, sun exposure and other characteristics of the environment.

Everything can vary widely, depending on environmental situations and even personal management. When references are used, they should be tested and improved by people and collective processes, aiming the development of agroforestry praxis. In the context of these considerations, we have chosen to publish the following references.

10.1 - Use of succession and stratification in consortia between crops, including vegetables

"In a module of 500 m² the person takes 20, 30 species of products and sees production of trees in 7, 10 and 40 years. One foot of mahogany, of cedar, people begin to have another vision. "(Zacchaeus, settled and multiplying agent)

The suggested consortia suggestions are based on concrete experiences and also in the experience with the application of the concepts of succession and stratification for the preparation of consortia. It is never too much to remember that spacing and plant cycles change with soil, climate and season.

Sometimes the behavior of a species changes differently than the other when we go from one environmental context to another. So still that we have had success in a place and climate, the same may not occur in another location and climate. This applies to the consortia themselves, but above all, for the spacings and numbers of possible lines, in a same bed.

In a more fertile soil, in a favorable climate and with good condition of humidity, plants are larger and should be planted with greater distance another. The opposite occurs under less favorable conditions, in which it is important to plants, both to better cover the soil, and to maintain productivity per area at more satisfactory levels. Even so, we chose for suggesting spacings based on real contexts, so that the suggestions are more easily understood and not abstract. However, these should be adapted, as well as the time limits for harvesting, in accordance with seasons, soil fertility and accumulated each person or group.

The only certainty we have is that we consorciate on the basis of stratification and succession it is worth, even requiring a great personal effort, to understand how to apply the logic of succession and stratification under the conditions in which each person works. We believe that this commitment brings many results: improvement feeding families, generating income, recovering and conserving the soil. Like this, the effort and possible initial failures will be greatly rewarded, for those who persist in the reconstruction and improvement of this application stratification and succession concepts.

"There is a table to be able to be setting up the consortium, the ones that will leave with 30 days, 60 days, 90 days. "(Clailton, Seated)

----- GENERAL TABLE ------

GENERAL FRAMEWORK WITH SUGGESTIONS CONCERNING STRATEGY AND POSITION IN SUCCESSION OF SOME OF THE MAIN AND GREENERY							
STRATA	**Occupation**	**Succession Groups**					
		Até 45 dias	**Up to 90 days**	**Up to 120 days**	**Up to 6 months**	**Up to 12 months**	**Up to 18 months**
Emergent	20%	Crotalaria Juncea	Sunflower	Corn	Okra	Castor	
			Green Corn	Sesame			
High	40%		Cauliflower	Tomato	Mucuna	Manioc	Guandu
			Broccoli	Pea Pie	Eggplant	Guandu	Fedegozão
			Millet	Chive	Basil	Yacon	Cotton

			Sorghum	Cabbage	Chilli pepper	Basil	
			Bean Rope	Wheat	Pepper finger	Alfavaca	
			Creeper Pod	Pepper			
				Vinagreira			
				Jiló			
				Cabbage			
Medium	60%	Curly lettuce	American lettuce	Potato	Onion	Yam	Blackberry of thorn
		Purple lettuce	3 month rice	Purple Almeirão	Chilli pepper	chilli pepper	
		Radish	Chicory	Linseed	Mangarito	Small strawberry	
		Arugula	Almeirão Pão de Açúcar	Leek	Rice	Parsley sauce	
		Coriander	Fodder turnip	Carrot	Fava Bean	Garlic	
			Chard	Beet		Helicônia	
			Turnip	Salsão		Burdock	
				rice		Mangarito	
				Trunk zucchini			
Low	80%		Black bean	Pork Beans	Peanut	Ginger	Pineapple
			Water Cress	Watermelon	Salsinha	Nirá	Saffron
			Pinto beans	Sweet potato	Mint	Orégano	
			Cucumber	Melon	Pumpkin	Poejo	
			Maxixe	Spinach		Arrowroot	
			Ground pod	Soy		Marjoram	
				Adzuki beans		Lírio do brejo	
						Taioba	

We will try to explain the ideas contained in the General Table through various examples of consortia based on succession and stratification. One of the most important practices for succession-based consortia to function is to harvest the plants before they begin to age. It is observed in practice that when plants begin to age, it occurs as a transmission of the aging information to the other plants, which tend to yellow. Contrary to what happens when the plants are green, healthy and vigorous, when it seems that the whole system is driven to greener vigorously.

"It's beautiful, I like to spend time here, I like what gives us back. I do not understood the consortium. We learned in the collective. "(Clailton, seated)

---- CONSORTIUMS FOR RENEWAL WITH 45 DAYS ----

Table 2

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Crotalaria Juncea	45	20cm x20cm	20cmx1m	20%
Medum	60%	Curly lettuce or purple lettuce	45	20-35cmx25-35cm	Same as monoculture	100%
Medium	60%	Radish or Arugula (by seedlings) or Coriander (for seedlings)	25-30	20cmx 5-15cm	Same as monoculture, between lettuce lines	80%
					Approximate total of beds grown at the same time on a single plot	200% = 2 Beds
NOTE: This proposal is optimized for lettuce. Crotalaria for green manure, harvested with 45 days, as it is emerging, occupying only 20% of its stratum is beneficial to the lower strata. The conceptual basis for its inclusion was stratification. The inclusion of the radish or arugula or coriander or alternating lines, one with each, was based on the succession, because at 30 days when harvested, lettuce is still far from having fully developed. But they need to be harvested at 30 days, with root and all, as soon as they are on point, if they do not get in the way of the lettuce, because of the shade and the information of aging that they transmit.						

---- CONSORTIUMS FOR 90 DAY RENEWAL ----

Table 3

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Green Corn or Sunflower	90	8 plants / m2 (densified) (corn bunch), sunflower may be, but varies cf size of the cultivar	center line at each m, with 2 seeds per pit, if sunflower variety peq planting more pits / meter	25%
High	40%	Cabbage	65-90	50cm x 1m	60cm x 90cm(duas carreiras nas laterais dos canteiros)	92%
Medium	60%	Lettuce or Chicory or Almeirão Sugar Loaf or Chard or Turnip	45-60	20 a 35cm x 25-5cm; chard 40cmx40cm	The same as in monoculture. On the lines with cabbage, one between each cabbage. Chard between cabbages and center line every 40cm	80% chard 77%
Medum	60%	Radish or Arugula or Coriander (the last 2, in this case only by seedlings)	25-30	20cmx5-15cm	The same as in monoculture (between lettuce or other lines)	80%
Approximate total of beds grown at the same time on a single plot						277% = 2.77
OBS: This proposal is almost optimized for Lettuce or Chicory or Almeirão Pão de Açúcar or Chard or Turnip. In monoculture there could be up to 5 lines or 3 lines in the case of the chard of only one of them. In two of the 5 lines we opted for the planting of half of the plants for this 80%. In the case of lettuce, chicory, chard or turnip could even be alternating between them in the 5 rows. Corn and sunflower for fertilization (for seeds would take about 100 days) entered occupying 25% of its stratum, because as it is emerging in this level of occupation is beneficial to the lower strata. By stratification we could only put a central street of cabbage every 60cm. But as the cabbage only reaches full development after a time of harvesting all other vegetables, due to the succession, we place it very close to its spacing in the monoculture, occupying about 92% of its stratum. Radish or arugula or coriander were included due to						

succession, because at 30 days, when harvested, the other vegetables are far from having fully developed. But they need to be harvested with roots and everything at 30 days, if they do not disturb the others, because of the shade and the information of aging.

Table 4

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Green Corn or mature, increasing harvest time.	90	8 plants / m2 (densified)	1.20m x 1m with 2 seeds per pit (2Pl per 1.2m2)	20%
High	40%	String beans or pod	90	1.0m x 0.6 (w / 2 seeds)	1.20m x 1m in the same line, in corn pits with 2 seeds	50%
Medium	60%	3 month rice	90	30x30cm	2 lines between corn and bean or pod lines	50%
Low	80%	Bean starter (bush) or ground pod	60 to 90	30x30cm	The same as in monoculture, preferably without	100%
Planted area approximately multiplied by						220% =2.2
NOTE: Optimized for beans or underbrush, the other plants enter due to stratification, for which they are approximately in the ideal limit.						

Table 5

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Green corn	90	8 plants / m2 (densified)	1.20m x 1m, with 2 seeds per pit, (2Pl per 1.2m2)	20%

High	40%	String beans or pods	90	1.0m x 0.6m (w / 2 seeds)	1.20mx1m in the same line, between the feet of corn (in a stake, that can be of cassava of about 60cm, buried 20cm)	50%
Medium	60%	3 month rice	90	30cmx30cm c/	2 rows between rows of corn	50%
Low	80%	Cucumber or Watermelon	40 to 90	Cucumber 120x30cm; Watermelon = 3x3m	Cucumber = 60cm x1,20, in the corn line between a foot of corn and a foot of pod or string beans; Watermelon = 3x4m between rows of corn	50%
Planted area approximately multiplied by						170% = 1.7 or 190% = 1.9
NOTE: Maize, beans and rice enter because of the stratification for which they are approximately in the ideal limit of density. The cucumber, because it is a low stratum, would enter into the spacing of the monoculture, but because it covers the other plants a lot, it has 50% of the density and the watermelon, for the same reason, a little less accentuated with 75%, so as not to disturb the other crops. The consortium can last 90 days with 3-month rice and the okra is harvested for up to 3 months, but can last up to 5 months, with another variety of rice and in situations more favorable to okra.						

----CONSORTIUMS FOR 120 DAY RENEWAL----

Table 6

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Corn or Green Corn or okra or Sesame	90 to 120	8 plants / m2 (densified)	Center line each m with 2 seeds per pit, if sesame, with 10 seeds / pit	25%
High	40%	Broccoli, Cabbage or Cauliflower	90 to 120	1.00 x0.5m	Two streets near the edges w / 1 plant each meter	50%

Medium	60%	Lettuce or Chicory or Almeirão or Almeirão Sugar Loaf or Turnip	45 to 60	20 to 35cm x 25 to 35cm;	The same as in monoculture. On the lines with cabbage, one between each cabbage.	80%
Medium	60%	Radish or Arugula or Coriander (the last 2, in this case only by seedlings)	25 to 30	20cmx5 to 15cm	The same as in monoculture (between lettuce or other lines)	80%
Total de canteiros cultivados ao mesmo tempo em um único canteiro						235%=2.35
OBS: Esta proposta está quase otimizada para Alface ou Chicória ou Almeirão Pão de Açúcar ou Acelga ou Nabo. Na monocultura poderia haver até 5 linhas ou 3 linhas no caso da acelga. Em duas das 5 linhas optamos pelo plantio de metade das plantas por isto 80%.						

The photos illustrate the consortium of Table 6, the photo of the left at 50 days, the one on the right near of 60 days. The Arugula was harvested with root and everything at 30 days, the Almeirão is beginning to be taken in the photo on the right. After the harvest of the Almeirão will be a central street of Quiabo and two Side streets with Broccoli. In the photo on the left, one sees Okina with the leaves confusing one little with those of the eucalyptus. On the right, there is clearly an okra on each side of the eucalyptus





The photos above are from the same area. Banana trees at 1 year old were fully pruned for a next cycle, leaving only 2 to 3 horns, to produce organic matter and release the seedbed for the next crop. The eucalyptus had her skirt gently pruned and then to reach about 4 meters in height had about 90% of its pruned crown (apical pruning) as in the middle photo above, to produce organic matter and open up light, whenever a new cycle of vegetables is planted. In the topmost photo on the right, the area being prepared for a new cycle, which is shown in the photos below shortly after and about 25 days after its planting.

CONSORTIUMS FOR 120 DAY RENEWAL - CONTINUED

Table 7

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Corn or Green Corn or okra or Sesame	90 to 120	8 plants / m2 (densified)	Center line each m with 2 seeds per pit, if sesame, with 10 seeds / pit	25%
High	40%	Broccoli, Cabbage or Cauliflower	90 to 120	1.00 x0.5m	Two streets near the edges w / 1 plant each meter	50%
Medium	60%	Carrot or beet	90 to 120	Carrot 20x10cm Beet 25 x10cm	Same as monoculture	100%
Low	80%	Radish	25	20cmx5 to 15cm	(same line as carrot or beet, as in monoculture)	100% if carrot, 80% if beet
Total of beds grown at the same time on a single plot						275% or 255% if beet
OBS: Consortium optimized for carrot or beet, radish enters due to succession, without worrying about the carrot or beet, and even the seeds fall together, the other plants enter based on the stratification.						

Table 8

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Corn or Green Corn or Sesame or Okra	90 to 120	8 plants / m2 (densified)	Center line each m with 2 seeds per hole	25%

High	40%	Tomato or (pod or corn)	120	"100 x 50 cm (2 lines per plot)"	Every 1 meter between the corns (in cassava maniva of about 60 cm planted standing, with 20 cm buried)	25%
Medium	60%	Curly or purple lettuce	40	20cm 25cm x30cm	4 rows with plants every 20 cm, 2 in the edges and 2 in each 30 cm	100%
Medium	60%	Radish or Arugula or coriander (the last 2, only by seedlings)	25 to 30	20cm x 5 to 15cm	30cm x 20cm (1 between the lettuces and 2 between the sweet potatoes)	70%
Low	80%	Sweet potato	90 to 120	30cm x 40cm	3 rows between lettuce lines with plants every 40 cm	100%
Total of beds grown at the same time on a single plot						320% = 3.2
Note: This consortium is optimized for lettuce and sweet potatoes. This is possible because at 40 days when we will harvest the lettuce, the sweet potato is only beginning to close the bed, having given time for the lettuce to leave. It also favors a bit, the lettuce being of stratus superior to the potato. The radish or arugula or coriander were possible because they will be harvested before lettuce and long before the sweet potatoes cover the soil and produce. The principle of these two first consortia is succession. The other plants were placed due to stratification, being in the limit possible. In the case of tomatoes, which closed a lot, it was necessary to decrease from 40% to 25% in relation to monoculture. Another advantage of this consortium is that the tomato, being much less densely planted than in monocultures and in the context of a more complete organism, has a lower chance of becoming ill.						

Table 9

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Corn or Green Corn or Sesame or Okra	80 to 120	8 plants / m2 (densified)	Center line each m with 2 seeds per hole	20%
High	40%	Broccoli, Cabbage or Cauliflower	90 to 120	1.00 x 0.5cm	Two streets near the edges w / 1 plant each meter	50%

Medium	60%	English potato	90	50cmx30cm	50x30	100%
Planted area approximately multiplied by						1.7
The consortium is optimized for potatoes. The other plants were placed on the basis of stratification, because at this level the occupation of the strata is beneficial for the potato.						

Table 10

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Corn or okra or sesame	80 to 120	8 plants / m2 (densified) Sesame 40pl / m2	Center line each m with 2 seeds per pit, if sesame, with 10 seeds / pit	20%
High	40%	Cabbage or Eggplant or Jiló or Broccoli or Cauliflower or Cabbage or Chilli pepper	80 to 120	Eggplant and Jiló = 120x80cm Cabbage, Cabbage, Broccoli, Cauliflower = 80x50 cambuci = 150x50cm	Same as monoculture, in the case of Cabbage, Broccoli or Cabbage Flower and Cabbage 2 streets per plot, the others a street per plot.	100%
Medium	60%	Lettuce, if above is cabbage the curly to form faster	40 to 45	25 to 30cmx30cm	3 lines every 30 cm, one of the lines between the two of cabbage and two at the edges. On cabbage lines between cabbages, every 40cm	80%
Medium	60%	Radish or arugula or coriander	25 to 30	25x10	4 lines every 10 or 15	80%
Total of beds grown at the same time on a single plot						280% = 2.8
OBS: The consortium is optimized for lettuce. The inclusion of radish, arugula or coriander or alternating lines, one with each, was based on succession, because at 30 days, when harvested, the other crops are still far from having fully developed. However, they need to be harvested with root and all at 30 days, as soon as they are at the point, if they do not get in the way, because of the shade and the information						

of aging. Corn or okra or sesame seeds enter with reduced density due to stratification, because at this level of occupation of the stratum the other crops benefit. The other crops of the high stratum enter by succession because those of the middle stratum will have already left and by stratification with respect to maize or okra or sesame.


Consortium of the above table, in two different areas and shapes. In the photo of the left with 27 days, still with portion of radish, lettuce, eggplant and green corn. In the photo on the right with 30 days, the radish has already been harvested and you see lettuce, broccoli and corn.

CONSORTIUMS FOR 180 DAY RENEWAL

Table 11

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Corn or okra or sesame	80 to 180	8 plants / m2 (thickened), Sesame 40pl / m2	120x100cm with 2 seeds per pit, if sesame, with 10 seeds / pit	20%
High	40%	Eggplant or Jiló or Cabbage or Pepper cambuci or finger	90 to 180	Eggplant or Jiló = 120cm x 80cm Cabbage = 80x50cm Pepper = 80x50cm	Between the streets of corn or okra Eggplant or Jiló = 120x160cm; Cabbage = 120x65cm Peppers = 100x80cm	50%
Medium	60%	4 month rice	90 to 180	Lines every 30 cm with	Single line between each line	60%

				40 seed / m	double of beans	
Low	80%	Ground pod or seed bean	90	30x30 cm	Double lines 20x30cm each double line 40cm from the other	100%
Planted area approximately multiplied by						230%=2.3
NOTE: The consortium is optimized for ground pods or starter beans. The other plants were placed on the basis of stratification, because at this level the occupation of strata is beneficial to the main crop. In order to realize the field planting, without beds, it is suggested that the pits be individually fertilized.						

CONSORTIUMS FOR 1 YEAR RENEWAL

"We have been able to show in practice that the production of agroforestry is diverse, abundant, it lavishes food for the family, but also for commercialization. And who does agroforestry account for others. This is forming a much larger chain, also for other settlements and social movements throughout Brazil. This kind of consciousness needs to grow. It is a project for all Brazilian society. "(Keli, settled)

Table 12

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Corn, okra or sunflower	80 to 120	8 plants / m2 (densified)	1 center row, every 120cm, with 2 seeds per hole	20%
High	40%	Eggplant or Jiló or Cabbage	90 to 120	120cmx80cm Cabbage = 80x50cm	Center line every 1m, manioc planted standing, with 60cm manta, buried 10cm to grow vigorously in the correct stratum	50%
High	40%	Yucca or Yacon	180 to 360	100x80cm	Center line every 1m	40%
Medium	60%	Carrot or beet	70 to 120	Carrot 20x10cm Beet	The same as monoculture	100%

				25x10cm		
Medium	60%	Radish or Arugula or coriander (by seedlings)	25 to 30	20cmx5 to 15cm	The same as monoculture	80%
Low	80%	Ginger	360	60x50cm	in the line of the eggplant, every 50cm, without matching it	100%
Planted area approximately multiplied by						390% = 3.9
OBS: Based on succession, the consortium was designed to harvest 3 production cycles. The first one ends at 30 days with the harvest of radish or arugula or coriander. The second cycle is optimized for carrot and beet, where they were placed, based on stratification of eggplant, jiló or cabbage, in the high stratum and corn or okra or sunflower in the emergent stratum, with densities adequate to avoid harming the development of plants of the same cycle . The third cycle begins at 120 days, when the harvest of the second cycle should be closed, so as not to harm those of the 3rd cycle, which is optimized for ginger and has cassava or yacon with 40% of the density of monoculture, because this level of occupation favors ginger.						

Table 13

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Corn, okra or sunflower	80 to 120	8 plants / m2 (densified)	1 center row, every 120cm, with 2 seeds per hole	20%
High	40%	Cassava	180 to 360	1.0 x 0.80 m, planted standing with 60 cm roots, buried 10 cm to grow vigorously in the correct stratum	Center line every 120cm between corns, in total 120x150cm	44%

Medium	60%	Yam or Mandioquinha Salsa or Onion or Garlic or Garlic Porró	240	Yam or Mandioquinha 2 lines at the edges, every 0.5m; the other 4 lines; onion each 0.15, garlic each 0,10 and porró each 0.40	Same as Monoculture	100%
Medium	60%	Lettuce or Chicory or Almeirão Sugar Loaf or Chard or Turnip	45 to 60	20 to 35cm x 25 to 35cm; chard 40cmx40cm	Same as Monoculture	100%
Medium	60%	Radish or Arugula or coriander (for seedlings)	25 to 30	20cmx5 to 15cm	The same as in monoculture (between lettuce lines)	80%
					Planted area approximately multiplied by	344%=3.44

OBS: This consortium is optimized for 3 groups of the same stratum, but dominant at different times. For harvesting at 30 days you can choose between radish, arugula or coriander or even the 3 at the same time, since taking turns in different rows. For picking between 45 and 60 days, you can choose between the 5 species (Lettuce, Chicory, Almeirão Pão de Açúcar, Chard and Turnip) or also by a relay between them, except for the chard, which is planted more spaced. For harvesting around the 240 days we can choose between Yams, Mandioquinha Salsa, Onion, Garlic or Garlic Porró. Simultaneous planting of a plant from each of the 3 groups in the same spacings as would be planted in monoculture is feasible and advisable due to succession. The stratification makes it feasible and advisable to plant cassava and maize at the indicated densities.

Table 14

STRATA	IDEAL OCCUPATION	PLANTS	DAYS TO HARVEST	SPACING ON MONOCULTURE	SPACING IN THIS CONSORTIUM	PERCENTAGE OF PLANTING
Emergent	20%	Corn or M. Green or Sesame or	90 to 120	8 plants / m2 (densified)	1,00m x 1,20m with 2 seeds per pit	20%

		Okra				
High	40%	Broccoli, Cabbage or Cauliflower	90 to 120	1.00 x0.5m	Every meter, between the streets of corn	40%
High	40%	Cassava	180 to 360	1.0 x 0.80 m, planted standing with 60 cm roots, buried 10 cm to grow vigorously in the correct stratum	In the same line between the corns every 1.50m	44%
Medium	60%	English potato	90	80 to 90cmx30 to 40cm...	Between the streets of corn every 30cm	100%
Low	80%	Ginger or Baroa or Saffron Potato	360	100x30 for ginger and baroa, for saffron 50x5a10cm	Ginger and baroa, between each potato, saffron lines between corn and potato, every 5 to 10cm	100%
Planted area approximately multiplied by						304%=3.04
Note: Between 90 and 120 days, the consortium optimized for potatoes with broccoli, cabbage or cauliflower in the high stratum and corn or sesame or okra in the emergent stratum is harvested. Both the high and the emergent strata are occupied in planting density that favors the development of the lower strata. On the basis of the succession, at the same time a consortium is developed optimized for the low stratum, where they can be alone or in alternating lines or blocks: ginger, baroa or saffron						

CONSORTIUMS FOR RENOVATION WITH 1.5 YEARS

"At SAF I burst my quota, it was a blessing, it was potato, pumpkin, green corn, banana, pigeon peas." (Alzira)

Table 15

STRATA	IDEAL OCCUPAT ION	PLANTS	DAYS TO HARVE	SPACING ON MONOCU	SPACING IN THIS CONSORTIUM	PERCENT AGE OF PLANTIN

			ST	LTURE		G
Emergent	20%	Green Corn or Sesame	90 to 120	8 plants / m2 corn and okra and 40pl / m2 when sesame	1.50m x 0.75 with 2 seeds per pit for corn or okra and with 10 seeds when sesame	22%
High	40%	Eggplant or Jiló or Pimenta cambuci or finger	90 to 120	120cmx80cm Peppers = 100x50 "	Between the streets of corn or okra 1,50mx1,20m; Peppers = 1.50x60	50%
High	40%	Cassava ou Guandu	180 to 540	Cassava = 1.0 x 0.80m, planted standing, with roots of 60cm, buried 10cm to grow vigorously in the correct stratum Guandu = 100x40cm	In the streets of corn between the feet of corn every 1.5, if cassava, if guandu each 0.75	41%
Medium	60%	chilli pepper	540	1.00x0.5m	In the streets of Eggplant 1.5 x0.6	50%
Low	80%	Pineapple	540	1.5 x0.40m	In the streets of cassava each 0.40	100%
Low	80%	Bean	100	30x30cm	37.5x30cm two streets between the streets of corn and eggplant	80%
Planted area approximately multiplied by						343% = 3.43

Between 90 and 120 days based on the stratification, the optimized consortium for starter bean is harvested, with Eggplant or Jiló or Pimenta be Cambuci or Finger of Maiden in the high stratum and Corn Green or Sesame in the emergent, occupied in planting density that favors the development of the lower strata. Based on the succession, a consortium is planted at the same time, which will be dominant from the harvest of the previous one around 120 days, starting to be harvested from 180 days, optimized for the pineapple. For the strata superior to the pineapple, a level of occupation was proposed within which it will benefit to him. If the option is to keep the pigeon and pineapple longer in the area, the pigeon pea may be useful for feeding and for the production of organic matter, if pruned, it may contribute to induce the more uniform flowering of the pineapple. fields.

10.2 - Some Uses of Trees in Systems Agroforestry Agroecological

10.2.1 - Árvores para produção de matéria orgânica em conjunto com lavouras anuais

In order to obtain abundant production, since the beginning of SAFs, we are obliged to artificially reduce the difference between the conditions of the soils we are using and those that would be natural to our crops. Therefore, we use techniques such as soil preparation, fertilization, liming, irrigation and others. Even so, it is usually important to include trees from the accumulation system, to contribute to its more lasting regeneration. However, when we use trees belonging to the systems of accumulation it is important to choose species with characteristics not so far from the systems of abundance, so as not to be companions extremely unnatural to our crops, which usually originate from systems of abundance.

Severe prunings, followed by a strong regrowth, have the effect of bringing the vegetation characteristics closer to those of the abundance systems, making the use of species of the accumulation system less unnatural. with abundance system crops. One of the reasons why this happens is because pruning favors the production of organic matter more digestive and rich in nitrogen and also the information to grow and greenish, typical of systems of abundance.

Next, we gathered in a table some trees with capacity to generate litter and to accumulate organic matter, when cultivated together with the crops and under continuous pruning. These trees sprout well when we can the head (apical pruning) removing much of their crowns up to 2 or 3 times a year and produce a lot of organic matter.

It is always important to test new species in different climate, soil and management conditions.

Table 16

Trees	Stratum	System	Value Madeira	Group Successive	% of cup to be pruned	Age for apical pruning (years)	Wooden spoon (years)
Blackberry (silkworm)	Medium	Accumulation	Only M.O	Secondary initial	100%	1	Only M.O
Aroeira Verdadeira	High	Accumulation	Great	Climax	100%	10	30
Babosa	High	Accumulation	Only M.O	Secondary Middle	100%	2	Only M.O
Cajá-Mirim	Emergent	Abundance	Medium	Transit between Initial Sect and Climax	100%	3	15
Cinnamon	Emergent	Accumulation	Good	Secondary Middle	100%	2	12
Eucalyptus	Emergent	Accumulation	Medium	Transit between Initial	90%	1.5	Firewood 3, Tora 15

				Sect and Climax			
Gliricedia	High	Accumulation	Serves for live mourão	Secondary Middle	100%	1 to plant by stake	Only M.O
Jamelão	High	Abundance	Only M.O and if not pruning 1 year, fruit	Secondary Middle	100%	2	Only M.O
Mutamba	High	Accumulation	Only M.O	Secondary Middle	100%	2	Only M.O
Cow foot	High	Accumulation	Only M.O	Secondary Middle	100%	2	Only M.O
Podocarpos (cold regions)	High	Accumulation	Only M.O	Secondary Middle	100%	3	Only M.O
Mexican Sombreiro	High	Accumulation	Only M.O	Secondary Middle	100%	2	Only M.O
Uva do Japão	High	Accumulation	Good	Secondary Middle	100%	2	12

10.2.2 - Succession of trees for litter and wood in annual crops

Generally it is useful to use trees that will succeed in the production of organic matter. First, most of the organic matter will be supplied by pioneer species. Then by secondary or by species that are not secondary, but grow as fast as they, such as eucalyptus and cajá-mirim. One can use climax species with a good regrowth, like the real aroeira, but they will only be able to produce great amount of organic matter years after planted. The removal of the trees from each successional stage should occur when the successor of the same stratum is able to replace the removed species in the function of producing organic matter. If this does not happen, it is also possible to choose the timber harvest and start a new cycle of planting trees at a higher fertility level. "It is not reforestation with a tree every 3 meters. I plant one on top of the other, then I see which ones are better and complete the system better, the rest I cut and benefit the soil. I have no misery to plant trees! Horizontal production, but also vertical. "(Zacchaeus, settled and multiplying agent)

It is important to have references and few experiences about the ability of each species to regrow when submitted to apical pruning, cutting all or almost all of their crowns 2 to 3 times a year. We also need to know the species' ability to produce organic matter at the time we plan.

Table 17

Species	Stratum	Pruning height (m)	Succession	Management Suggestion	Be removed from the system
Banana Nanica (grows between 2 and 5 m cf. soil, climate and variety)	High	Do not prune yourself	Pioneer	Each planting crop and whenever the shade hurt, take out all the stems or stems and use them as cover, leaving only 2 or 3 of the best horn sons. The crowns of pruning trees should be at least one meter above the top of banana trees. This is why using varieties that are too high can make handling difficult.	As the entire system will be continuously pruned, it will not be necessary.
Bananas Silver, Bread, Tropical Apple (grows between 2 and 6m cf soil climate and variety)	Medium	Do not prune yourself	Middle secondary		
Gliridia or	High	5m	Secondary initial	Planting every 1.5 meters. Gradually suspend the skirt. When the trees are well developed, prune the head, cutting 100% of the crown, at each annual planting (Gliricidia and Sombreiro, planted by cutting from 1.5 years.) Gliricídia, Sombreiro, Jamelão and Mutamba by seed, from 2 years. Pata de Vaca from 3 years.	When there is a successor next to them, with capacity to produce the organic matter in the high stratum, like the Grape of Japan, the Jamelão and the True Aroeira. Probably from 3 years old.
Jamelão (Many M.O and when it stays 1 year pruning, produces fruit) or	High	5m	Middle secondary		
Mutamba or	High	5m	Middle secondary		
Pata de Vaca	High	5m	Middle secondary		
Sombreiro mexicano ou	High	5m	Middle secondary		
Uva do Japão (madeira)	High	5m	Middle secondary	It can be planted by seeds or seedlings, including bare root easily found under arrays, resulting in one seedling every 4.5m. Gradually suspend the skirt. When the trees are well developed, probably from 4 years on, cut off the head by withdrawing 100% of the crown at each	When there is a next successor with the capacity to produce organic matter in the high stratum, as the true aroeira, probably from 10 years.

				annual planting.	
Aroeira Verdadeira	High	5m	Climax	It can be planted by seeds or seedlings, resulting in one seedling every 4.5m. Gradually suspend the skirt. When the trees are well developed, probably from 10 years on, cut off the head by withdrawing 100% of the crown at each annual planting.	From the age of 30, harvesting the wood and restarting the system at another fertility level
Cajá Mirim (M.O, wood and fruit) and / or	Emerge nt	7m	Late secondary	Cinnamon and Cajá-Mirim can be planted by seeds, so that it results in a change of one of the 3 to every 1,5 m. Gradually suspend the skirt. When trees are well developed, prune the head, cutting 90% if eucalyptus and 100% of the canopy, at each annual planting (usually Eucalyptus after 1.5 years, Cinnamon 2 years and Cajá-Mirim 3 years).	At the age of 8, harvesting a third of the trees, with 12 years the second third and together with Aroeira the third third. If the 3 species are planted, first harvest Eucalyptus, then the Cinnamon and finally the Cajá-Mirim
Cinnamon (MO and better wood) and / or	Emerge nt	7m	Late secondary		
Eucalyptus (plus M.O and wood)	Emerge nt	7m	Transition from pioneer to climax		

10.2.3 - Trees for the production of suitable shade, wood and organic matter in the same line as the fruit trees

The planting of ranges of grasses and green manures between the tree lines is of extreme importance to guarantee the necessary production of organic matter. In addition, practice has led us to believe that it is a good idea to leave a line of trees and banana trees between one line of fruit trees and the other one that we use for the production of organic matter in crops and vegetables. This strategy facilitates the management and enables the production of bananas for fruit. This intermediate line, because it is intensively pruned, does not hinder the development of the grasses of the strips between the tree lines, making possible its long stay in SAFs. Each pruning of these lines can be used for the production of annual crops, which can be decisive to economically make possible the planting and management of these bands and of the entire SAF. In this way, the trees that will remain for a long time on the fruit trees may have their crowns almost entirely pruned only once a year, as this is enough for the message that there is possibility of reproduction and thus the fruit produce many fruits annually. There are several difficulties in pruning several times a year the trees that have the crown above the fruit crown, such as access to the pruning site and the fall of branches on top of the fruit trees, and damage them. Pruning only annually enables the use of other species of good wood, such as Australian cedar and African mahogany. When planted in the same line of fruit trees it becomes more important to use species of abundance systems or at least with characteristics very close to them. Even so, it is also important to plant banana trees and fast-growing trees and excellent production of organic matter in the same line of fruit trees, because when well managed, these species quickly provide shade in the quantity and quality necessary for the initial development of the fruit. In this case, it facilitates management to remove these species before the fruit enters in full production, leaving the successors of slower growth, who produce good wood and need to be pruned only once a year, to encourage fruiting, to remain. However, as long as they remain in the same line as the fruit trees, it is essential to keep them intensively pruned.

Looking to synthesize what we said above, we include the following table with suggestions of trees and their use for the production of organic matter and wood in the lines where fruit trees will be planted.

In the photo beside, from the left side you can see the trunk of Eucalyptus with some leaves and on the right side, you can see the trunk of a mahogany behind the handle of the tool in the hand of Namastê, technical advisor of the Agroforest Project.

Table 18

Trees for Production of Organic Matter in the same line of fruit	Stratum	Usage phase	Value Madeira	Succes sion Group	% of crown to be pruned	Age to prune head (years)	Harvesti ng the wood (years)
Andiroba	Emergent	Staying longer	Great	Climax	80%	4	20
Araribá	High	Staying longer	Great	Climax	80%	8	15
Aroeira Verdadeira	High	Staying longer	Great	Clímax	100%	10	30
Babosa	High	First years	Only M.O	Sec. Média	100%	2	Only M.O
Barú	High	Staying longer	Great	Climax	80%	10	25
Castanha do Pará	Emergent	Staying	Great	Climax	80%	10	30

		longer					
Cedro Australiano	Emergent	Staying longer	Very good	Secundaria tardia	90%	4	12
Cinamomo	Emergent	First years	Good	Sec. Média	100%	2	8
Eucalipto	Emergent	First years	Medium	Transit from Initial to Climax	90%	1,5	For firewood 4 years
Gliricídia	High	First years	Serves for live mourão	Sec. Média	100%	1 if you plant a stake	Live Mourão
Ipê Amarelo	Emergent	Staying longer	Great	Climax	80%	8	25
Ipê Rosa	Emergent	Staying longer	Great	Climax	80%	6	18
Ipê Roxo	Emergent	Staying longer	Great	Climax	80%	6	18
Jamelão	High	First years	Only M.O	Late secondary	100%	2	12
Jatobá	Emergent	Staying longer	Great	Climax	80%	8	20
Jequitibá	Emergent	Staying longer	Great	Climax	80%	10	20
Mogno Africano	Emergent	Staying longer	Great	Climax	90%	4	20
Mutamba	High	First years	Only M.O	Sec. Média	100%	2	Only M.O
Pata de Vaca	High	First years	Only M.O	Sec. Média	100%	2	Only M.O
Peroba Rosa	Emergent	Staying longer	Great	Climax	80%	10	Only M.O
Pinheiro bravo (podocarpos)/clima frio	High	First years	Only M.O	Sec. Média	100%	3	Only M.O
Sombreiro Mexicano	High	First years	Only M.O	Sec. Média	100%	2	Only M.O
Uva do Japão	High	Can stay longer	Good	Sec. Média	100%	2	10

10.2.4 - References for a consortium of fruit trees

TABLE 19	
Emerging Stratum	**Produces between (years)**
Araucária	15 to 30+
Cajá Mirim	3 to 30+
Chestnut	12 to 30+
Coco da Bahia	5 to 30+
Breadfruit	5 to 30+
Jatobá	10 to 30+
Papaya	1 and 4
Pecan nut	10 to 30+

TABLE 20	
Stratum High / Emergent	**Produces between (years)**
Bacuri	10 to 30+
Buriti	15 to 30+
Chichá	6 to 30+
Copaíba	10 to 30+
Pequi	6 to 30+
Pear	6 to 30+
Tamarind	8 to 30+

TABLE 21	
High Stratum	**Produces between (years)**
Açaí	6 to 30+
Acerola	3 and 15
Araçá Piranga	10 to 30+
Babuçu	10 and 30
Banana da Terra	1 and 3
Banana Nanica	1.5 and 3
Caqui	3 and 30
Cereja do Rio Grande	10 to 30+
Fig	2 and 30
Guava	3 and 30
Guaraná	6 and 15
Ingá	3 and 15
Jaca	6 to 30+
Jambo	7 and 30
Jambo amarelo	10 to 30+
Jambolão	3 and 15
Jerivá	10 and 30
Juçara	6 to 30+
Lychee	5 to 30+
Apple	3 to 30+
Manga	3 to 30+
Marã	10 to 30+

TABLE 22	
Stratum Medium / High	**Produces between (years)**
Avocado	6 and 30
Abiu Roxo	15 to 30+
Araçá	8 to 30+
Purple Banana	2 and 15
Banana S. Tomé	2 and 15
Biribá	4 and 15
Cagaita	10 to 30+
Cambucá	10 to 30+
Cupuaçu	6 to 30+
Erva Mate	3 to 30+
Graviola	5 and 15
Guabioroba	10 to 30+
Jaboticaba da Mata Atlântica	15 to 30+
Jambo	8 and 30
Macadâmia	10 and 30
Nespera	5 and 15
Pineapple	4 and 15
Pitomba	10 and 30
Sapoti	10 and 30

Passionfruit	0.5 and 3
Oliveira	5 to 30+
Pitaia	2 and 15
Pupunha	5 and 30
Rambotão	6 and 15
Pomegranate	5 and 15
Rubber Tree	10 to 30+
Videira	3 to 30+

TABLE 23

Stratum Medium/Low	Produces between (years)
Cacao	3 to 30+
Jabuticaba Sab	10 to 30+
Lima da Pérsia	3 and 15
Limão Thaiti	3 and 15
Marmelo Português	5 and 30

TABLE 24

Stratum Low	Produces between (years)
Pineapple	1.5 and 3
Bacupari Miúdo	10 and 30
Cabeludinha	6 and 30
Coffee	2 to 30+
Limão cravo	3 and 10

TABLE 25

Stratum Medium	Produces between (years)
Abiu	10 and 30
Japanese Plum	3 and 30
Blackberry	1.5 and 3
Bacupari-açú	10 to 30+
Banana Apple	1.5 and 30
Banana Gold	1.5 and 30
Banana Bread	1.5 and 30
Silver Banana	1.5 and 30
Caferana	5 and 15
Cambuci	10 to 30+
Canela de Cheiro	15 and 30
Starfruit	3 and 30
Coité	3 and 15
Goiaba serrana	6 and 15
Groselha	6 and 15
Grumixama	10 and 30
Orange	3 and 15
Longan	5 and 15
Louro	3 and 20

			Mangosteen	15 to 30+
			Mangostão Amarelo	15 to 30+
			Marmelada de Cachorro	6 and 15
			Murici	6 and 30
			Nectarine	3 and 15
			Pataste	8 and 30
			Peach	3 and 30
			Pitanga	6 to 30+
			Pokãn	3 and 15
			Urucum	2 and 3
			Uvaia	6 to 30+

10.3 - Examples of consortia for lines with fruit trees

The tables we present help guide the development of fruit consortia based on stratification and natural succession. It is important to select and then prune the trees so that their canopies only occupy their strata. For example, coffee is of the low stratum and should receive apical pruning to occupy only the low stratum, otherwise it would occupy the upper strata disrupting the trees of these strata.

There are species, as in the case of citrus, which can not receive apical pruning, but within certain limits may have the height of their canopy limited.

Another practical recommendation is to leave one to two meters between strata and another when the trees are planted close together.

If we planted trees of all strata in the same line and close together, the recommendations in the previous paragraph would lead to very high SAFs and therefore difficult to handle. Mainly for ease of management, it is advisable that trees that are very close have a vacant stratum between their crowns. For example, Coffee, Clove Lemon, Cabeludinha and Bacupari Tiny are of the low stratum, being suitable to be under Hoses or Jacks that are of the high stratum, with the middle stratum unoccupied. However it is not advisable to stay under Cocoa, Orange or Carambola that are of the middle layer.

Next, we gather the information in tables 4 to 10 and the guidelines that follow with other experiences and learnings acquired from different people, but especially in the practice and observation of SAFs, to suggest examples of efficient consortia to be used in the same line of fruit trees and within the context of the other considerations in this book. It is possible to switch lines with different consortia, such as a line planted with consortia of table 26 with a line planted with consortia of table 30.

TABLE 26		
Stratum Low (one among the below)	**Keep cup between (meters)**	**Spacing**
Coffee or	Below 1.5	1,5
Lemon Carnation or Little Dumpling or Bacupari	Below 2	2,5
Medium Stratum High (one among the below)		
Avocado or Sapoti or Jambo Rosa or Cambuca or Pitomba or Araçá Vermelho or	2.5 to 3 and 5.5 to 6	10
Purple Banana	Can not prune	5
Cupuaçu or Macadamia or Graviola or Népera or Biribá or Gabiroba or Cagaita or	2.5 to 3 and 5.5 to 6	5
Erva Mate ou	2.5 to 3 and 5.5 to 6	2,5
Emergent or High / Emergent Stratus (one among the below)		
Emergent = Walnut Pecan or Araucaria or Fruit Bread or Chestnut of Pará or Jatobá or Alto / Emergente = Pequi or Tamarindo or Bacuri or Chichá	Greater than 7	10


In the left-hand photo Cabeludinha in the lower stratum and Biribá in the middle / upper stratum, as in example 25, were planted by seeds in the cradle of a nanica banana and are being created by it, which belongs to the placenta that protects them when they are very new ones. In the photo on the right, in the left corner appears Pitanga, about 5 m on your right we see Orange beginning to produce and more to your right Araçá. All 3 are of the medium / medium stratum and to live must be distant from each other, with spacings equivalent to those used if they were of the same species, which is approximately occurring. Above them grow 3 araucarias that still have to be thinned leaving only one. The consortiums between Araucária and Pitanga or Laranja or Araçá are among the examples in table 26

TABLE 27		
Middle / Medium Stratum (one among the below)	**Keep cup (meters)**	**Spacing**
Blond, Orange, Pokémon, Carambola, Peach, Japanese Plum, Serrana Guava, Nectarine, Gooseberry, Caferana, Longan, Puppy Marmalade, Murici, Pitanga. Araçá, Abiu, Grumixama, Cambuci, Bacupari Açu, Pataste, Cinnamon Scent, Mangosteen, Uvaia, Yellow Mangosteen	Below 4	4
Emerging or High / Emerging Stratum (one among the below)		
Emergent = Walnut Pecan or Araucaria or Fruit Bread or Chestnut of Pará or Jatobá or Alto / Emergente = Pequi or Tamarindo or Bacuri or Chichá	Greater than 6	10

TABLE 28		
Stratum Low (one among the below)	**Keep cup between (meters)**	**Spacing**
Coffee or	Below 1.5	1.5
Lemon Carnation or Little Dumpling or Bacupari	Below 2	2.5
Emerging or High / Emerging Stratum (one among the below)		
Emergent = Walnut Pecan or Araucaria or Fruit Bread or Chestnut of Pará or Jatobá or Alto / Emergente = Pequi or Tamarindo or Bacuri or Chichá	Above 3.5	10

TABLE 29		
Stratum Low (one among the below)	**Keep cup (meters)**	**Spacing**
Coffee	Below 1.5	1.5
Lemon Carnation or Little Dumpling or Bacupari	Below 2	2.5
High Stratum (one among the below)		
Apple or Manga or Rambotão or Araçá Piranga or Ingá or Jambolão	3 and 6	5
Jaca or Cherry of Rio Grande or Yellow Jambo or Rubber or Marã	3 and 6	10
Juçara or Acai or Pupunha or Babassu or Jerivá (all for fruit)	Palm tree does not accept pruning	10

Emerging or High / Emerging Stratum (one among the below)		
Cajá Mirim or Noz Pecã or Araucária or Fruit Bread or Chestnut of Pará or Jatobá or Chichá...	Above 7	10

TABLE 31		
High Stratum (one among the below)	**Keep cup (meters)**	**Spacing**
Guava or Acerola	Below 4	2.5
Lychee or Persimmon	Below 4	5
Emergent or High / Emergent Stratus (one among the below)		
Cajá Mirim or Noz Pecã or Araucária or Fruit Bread or Chestnut of Pará or Jatobá or Chichá	Above 5	10

TABLE 32		
High Stratum (one among the below)	**Keep cup (meters)**	**Spacing**
Apple	Below 5	2.5
Manga or Rambotão or Cherry of Rio Grande or Jaca or Marã or Araçá Piranga	Below 5	5
Emergent or High / Emergent Stratus (one among the below)		
Cajá Mirim ou Noz Pecã ou Araucária ou Fruta Pão ou Castanha do Pará ou Jatobá ou Chichá	Above 6	10

All the examples presented in chapter 10 came from agroforestry practices in different places. More than following them "to the letter", it is fundamental to practice, if you live and generate references in each place. It is in the practice of SAFs that we perceive the infinite intelligence present in natural processes and we consciously become integral parts of the path of nature towards abundance and solidarity.

In the photo above, banana lines and trees interspersed with bands of mombaça grass, forming a living infrastructure for the production of soil cover, which can be managed for various purposes such as the production of vegetables, grains, animals or fruit growing. In the photos just above, file of the Persia in the middle stratum and Judge in the upper stratum

11- Monitoring how SAFs contribute to soil fertility, the removal of carbon from the atmosphere and the dynamics of nature

With the first agroforestry experiments in the Mário Lago and Contestado Settlements, research actions were also initiated to understand what happens to the production of vegetal matter, soil fertility and the dynamics of cycles and ecological processes along the growth of agroforestry. These activities were planned and discussed among farmers and technicians of the settlements, Cooperafloresta technicians and researchers from the Federal University of Paraná, Embrapa-Florestas and the Chico Mendes Institute for Biodiversity Conservation (ICMBio).

To do the research, some areas were selected in the settlements: in some of these areas, agroforestry was implemented, based on the knowledge accumulated by Cooperafloresta farmers and settlements; in other areas, the cover was maintained with grass or brachiaria (as it was already); and other areas were selected among legal reserve areas, which also did not receive any form of management.

In the selected areas, soil and vegetation samples were collected periodically. In the laboratory, these samples have been analyzed, characterizing the vegetal matter produced both above and below (roots) of the soil, the chemical fertility of the soil, the soil density and the amount of roots in the soil. In this way, it is possible to follow these characteristics over time, as a "movie" telling the story of the same in each area.

Although the short period of follow-up (a little more than two years at the time of this booklet), and considering that some of this data is still being analyzed, it is possible to identify some interesting results.

11.1 - Beginning to answer some questions

Since the beginning of agroforestry, great care has been taken to produce organic matter in the agroforestry space itself, which is done by planting grass (usually, mombaça grass), eventually consorted with legumes. An important question in this research process was: how much of organic matter, in the form of vegetal matter, has been produced and made available as fertilization in this way?

To answer this question, several samples of the vegetation were collected each semester in the selected areas. To do this, a standard 0.5 x 0.5 m wood frame was used, placed randomly in the area and from which all the vegetal matter was collected on the soil (litter and cut of live plants the ground). The collected material was dried in an oven and then weighed and its biomass dried.

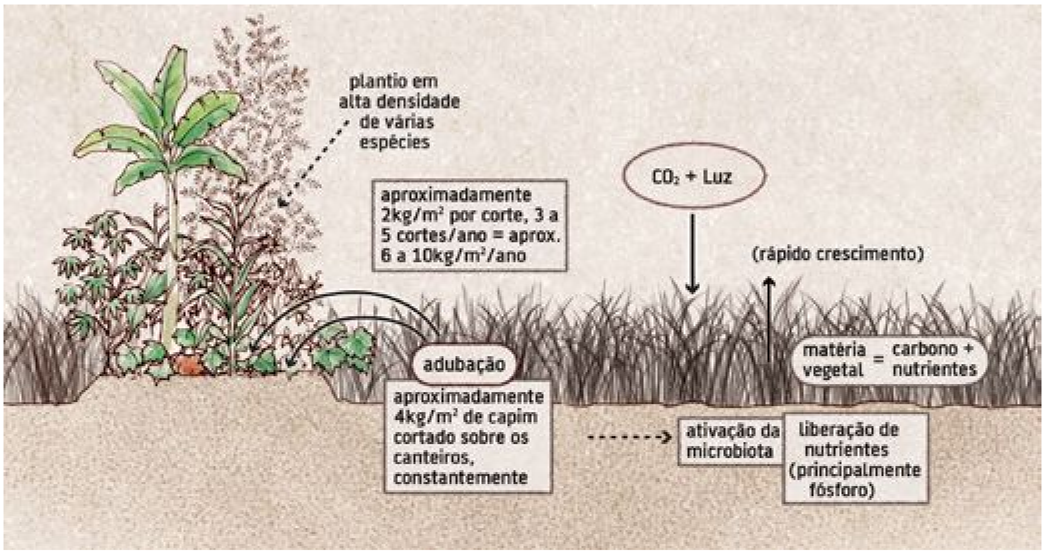
In areas where agroforestry was established, this was done in agroforestry beds and between the lines (grass / legume production sites). Thus, in the beds, this vegetal matter is represented, almost entirely, by the leaves of grass cut from the interlining areas and deposited there; and, between the lines, the aerial part of the grass and the legumes.

After two years of follow-up, it was observed that, on average, the average amount of dry biomass on the beds was 4 kg per square meter, which is constantly being decomposed and replaced (from the vegetation between the lines). Between the lines, the amount of dry biomass was just over 2 kg per square meter. Considering that the grass has been receiving 3 to 5 cuts per year and that almost all the analyzed biomass constitutes the aerial part of the grass and / or the legumes available for cutting at the moments of collection of the vegetal matter for the research, it can be estimated between 6 and 10 kg of dry biomass per square meter per year (figure below).

In areas where there was no management, that is, successive cuts, there was no regrowth of brachiaria grass and colonization. The increase of vegetal matter in these areas was limited to the natural growth of the grass.

It is important to emphasize that the local production of this vegetal matter, between the lines of the beds, is fundamental for the management. If this plant material were to come from other places, keeping the beds covered and fertilized would require a transport of 60 to 100 tonnes of dry vegetable matter per year (or 300 to 500 tonnes of green vegetable matter), which would certainly be economically and ecologically unviable .

Another question that we intend to answer with the research is: how does agroforestry management (which includes grass management) reflect on soil fertility?



Vegetable material produced and deposited on the beds.

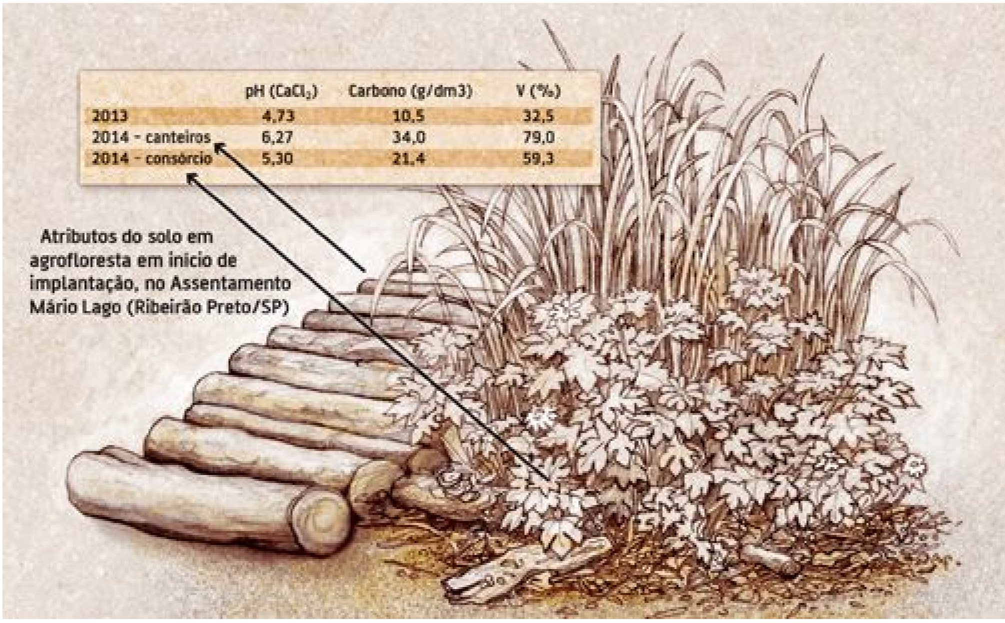
To try to help answer this question, some analyzes have been done, among them the pH, whose increase means that the acidity is decreasing and therefore the nutrients becoming more available to the plants; the concentration of carbon, which shows the growth of organic matter, which among many other benefits makes the soil more porous, humid and fertile; the concentration of nutrients such as calcium, magnesium and phosphorus in the soil and the saturation by bases, which shows the percentage of soil occupation by nutrients favorable to the development of plants.

In general, in all agroforestry areas analyzed, there was a reduction of acidity, increase of carbon (and organic matter) and increase of soil fertility over time. In the areas that were not managed, there were practically no changes in soil chemical characteristics during the two years of analysis.

Comparing only two areas to each other, in the Mario Lago Settlement, it is easy to perceive this difference. One of these areas was covered with brachiaria grass (and was not disturbed) and in the other one was settled by the settled Paraguay an agroforest, in a place that also was covered with brachiaria

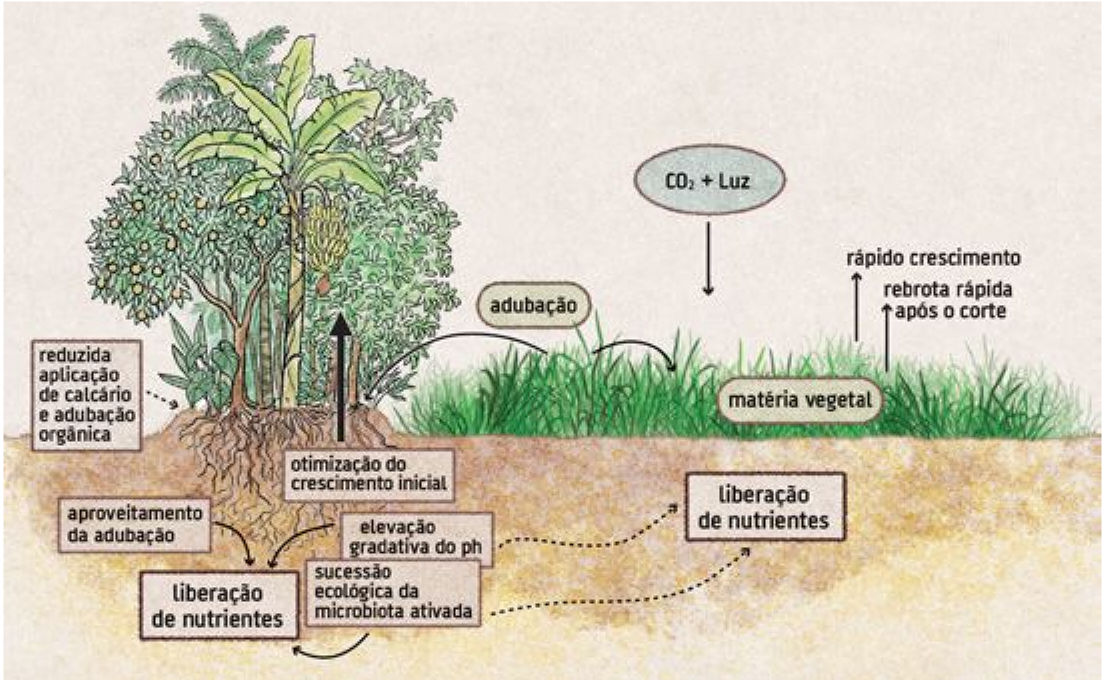
In the brachiaria area, there was practically no change in soil fertility, one year after the first analysis. The pH was 5.74 to 5.77; the carbon concentration was from 18.1 to 17.9 and the saturation by bases was from 78 to 76%, remaining practically constant. In the agroforestry area, this change was very large, both in the agroforestry beds and in the lines between grasses with legumes, as shown in figure 3. Over a period of one year, the pH ranged from 4.73 to 5.30 between the lines and to 6.27 in the beds; the carbon concentration was from 10.5 to 21.4 g /

dm 3 between the rows and to 34.0 g / dm 3 in the beds, and the base saturation was from 32.5 to 59.3% and to 79.0% between the lines and on the beds, respectively.



Vegetable material produced and deposited on the beds.

It is important to note that in agroforestry this evolution was obtained from the management of the grass and the high density and diversity of planting, associated to a low initial fertilization (1,000 kg of organic fertilizer per hectare) and a reduced application of limestone (0, 8 tonnes per hectare). Management was undoubtedly fundamental for the evolution of soil fertility attributes.



Dynamics of production and utilization of fertilization in agroforestry at an early stage of production.

Soil Carbon, a management indicator

Producing large amounts of vegetable matter, pruning and placing this plant matter on the ground means removing carbon dioxide from the atmosphere, transforming it into vegetable matter, and increasing the amount of organic matter - and carbon - in the soil. This is what agroforests have been doing.

The figure on page 171 has already shown the carbon evolution in the Paraguayan agroforestry soil (Mário Lago Settlement), in just one year of implementation. In the Contested Settlement areas, this trend is repeated. In the Cesar agroforestry, for example, the soil carbon content was 22.2 g / dm3 for 36.33 g / dm3 (in agroforestry beds) and 35.80 g / dm3 (between the lines), one year after the implementation of agroforestry.

Soil carbon represents the main source of energy for microorganisms. The more organic matter (and carbon) in the soil, the more reserves for the soil microbiota. These microorganisms, living and working, help release nutrients and increase the structuring of the soil, increasing its fertility. It is therefore essential to ensure the constant renewal of this reserve. If there is a lack of plant material to prune and place on the soil, the microorganisms, to live, will consume the carbon of the soil at a speed greater than its addition, reducing its content in the soil.

This was observed in two agroforests analyzed in the Project. In one, the initial amount of Carbon was 20.5 g / dm3, before the implantation of the agroforestry. Six months after implantation, although this rate rose to 32.9 g / dm3 in agroforestry beds, between the lines this value decreased slightly, to 17.5 g / dm3. During this period, grass and corn were planted between the lines, but a great dry season did not allow the production of corn, and the grass *grew very little. In the beds, a great amount of organic matter was placed that, when decomposing, even in this period of drought, allowed the increase of carbon in the soil. Between the lines, however, it is very likely that the microorganisms came to consume more carbon than could be replenished.*

In another area, after a large increase in carbon content in the first year of implementation, in the second year these values decreased by almost half the increase achieved in the first period. Due to the drought of this period, the farmer reduced the management in this area, directing the care to areas closer to the house, where he could carry irrigation. In addition, there was shading of the grass, which reduced its productivity and density; without addition of organic matter, the reserves obtained in the first year began to be consumed by the microorganisms.

Therefore, as well as a saving, it is necessary to guarantee the constant replacement of organic matter in the soil, to avoid its impoverishment.

The evolution of phosphorus levels in soil, an important result

Phosphorus (P) is a chemical element of great importance for soil and plants. However, much of the P content in Brazilian soils is immobilized, linked to other substances. Their release occurs generally associated with the reduction of acidity, the higher content of organic matter and the greater microbial activity in the soils. In the researches carried out, it is notable the increase of P levels in the soil of agroforestry, which indicates, among other aspects, this evolution.

To illustrate this situation, it is interesting to bring some data from the agroforestry analyzed in the Contestado Settlement, in Lapa / PR. At the moment of agroforestry implantation, in the area of Mário, soil P content was 6.45 mg / dm3. In the beds, this value rose to 10.00 mg / dm3, one year later, and to 30.17 mg / dm3, after one year and a half. Between the lines, this value also increased, a year and a half after the implantation, reaching 10.67 mg / dm3. In the Edson area, the evolution of P contents is also remarkable. In only 6 months, the P content was 3.8 mg / dm3 to 9.3 mg / dm3, between the lines, and from 11.8 mg / dm3 to 63.73 mg / dm3, in the beds.

In the Cesar area, soil P content was 2.2 mg / dm3 at the time of agroforestry implantation. A year and a half later, this value increased to 8.17 mg / dm3, between the lines, and to 16.30 mg / dm3, in the beds.

12 - Our last chance …

From the beginning of the evolution of life on Earth, each generation of living beings left an environment more suited to the diversity of life. Inheriting this environment, the following generations could be even more efficient in making living conditions even better. The evolution toward better conditions, greater quantity and greater diversity of life was continuous during the evolution of life on Earth. This same path that occurs in the planetary organism as a whole also happens on every inch of land and was the main theme of this book.

However, science records the occurrence of periods in which some kind of catastrophe caused discontinuity along this path, such as a meteor crash, for example. In these periods, large numbers of species were extinct in relatively short periods of time. There are evidences of five such occurrences occurring in about 4 billion years of the history of life on Earth. The last of them happened 65 million years ago, about 500 times longer than the existence of the human being on the planet.

By measuring the speed with which species are extinguishing, several scientists have discovered that we are living the sixth and most widespread extinction of species that has ever occurred on Earth. This should include human beings and, unlike the others, this time we will be the responsible catastrophe

by extinction.

In the vastness of time, every moment has been unique and sacred in the history of Earth's life. We humans directly participate in only 0.005% of the time in this story. Even so, these about a hundred to two hundred thousand years, around ten thousand human generations, seem to each one of us an infinite amount of time.

But why, in ten thousand generations, has the final struggle for the life of all beings on Earth remained for us? This is a huge sacred mystery, just like our own lives! Indispensable is to live it in praxis, day by day, with all the fervor of our souls.

Many religions and mythologies tell us about a first mistake, a primordial sin that gives rise to all others and that only the human being can commit. It is about seeing and acting as if each of us were a being separate from the universe. It leads us to selfishness. This primordial error, repeated every day, has caused us great sufferings for centuries, millennia and perhaps thousands of millennia, generating wars, slavery, destruction of nature and enormous social inequalities.

In the last century, more and more intensely, selfishness has shown its most extreme face. Some corporations have concentrated power and wealth on a never-before-imagined scale, carelessly with nature and with people. As a result, the soils, the rivers, the seas and the atmosphere were and continue being poisoned at enormous speed. Forests have been replaced by artificial environments. The rivers and springs are drying up and the weather becoming unsuitable for our lives. Populations and nature were driven out of the fields.

Step by step, large and few corporations have been adducing more and more of the land, seeds, genes and regulation of the use and distribution of food and medicine. They control institutions and mechanisms of national states that should discipline them and curb greed. To dominate the world, they use the most refined strategies of marketing and control of the media, institutions and opinion-makers. Eventually, they became self-sufficient in relation to their owners or creators. They have increasingly come to be governed by laws, codes of conduct, and councils that prioritize profit on ethics or the needs of all beings on Earth, even though it is increasingly evident that very rich and powerful people will also end up perish with the rest of humanity and countless species.

This is a technical book and grounded in the most qualified agronomic science. But today, there is no possibility to speak about any sector of human activity without making primary ethical choices. The apology of the neutrality of science and technology meets the immense corporate interests and, precisely for this reason, is promoted in the most different ways. Omitting this aspect would already be to choose a path.

When we tried to describe the foundations and the agroforestry technique, we did so conscientiously, in a way that has been passionately pursued in the praxis of more than one thousand peasant families and their organizations, among quilombolas and settlers. It has many other elements, such as a participatory and horizontal vision of education, through the construction of relationships of cooperation, solidarity, organicity and love of human beings between themselves and with nature. Our commitments and hopes are linked with this path. This path also connects organically to more than half a million other families, who also connect through of bonds and webs of solidarity and for the proposal of building a society based on love and the awareness that we belong to the same sacred organism. For this reason, his option for a project for the good of the whole society, for an inclusive and popular agrarian reform, which has agroecology as one of its pillars and fundamental commitments.

Our choice is also for all the traditional peoples, their cultures and their values, for the excluded people, for the workers and workers and for the webs of popular organizations that defend the life of all beings on Earth. For a life closer to divine wisdom, to the wisdom of nature. For a world without borders. For a world where lands, seeds and nature belong to all living beings on Earth, and therefore also to those who deal with them. For a more natural life, without an endless infinity of things we do not need and that end up enslaving us. For good living, fraternally and organically with all other beings on the planet. For recognizing and loving the organicity of life of the Planet Earth Organism. By placing science and all human knowledge for the life of all people and all beings on Earth, within the limits of humility, responsibility and ethics. For the liberation of people and nature from all the modern and ancient forms of slavery. And also for the sake of this country Brazil, and to all the countries of the world. That is our choice, with steadfastness and unyielding love.

May our hearts and minds be strengthened by faith in love manifested in the universe and in every inch of the world, creating the strength to triumph over the empire of selfishness that will inevitably lead us to the collective death of humanity and much of the infinity of species that, together with us, form the sacred body of the Planet Earth Organism.

PROJETO
AGROFLORESTAR

Realização

COOPERAFLORESTA
União de Gentes e Natureza

Patrocínio

BR
PETROBRAS