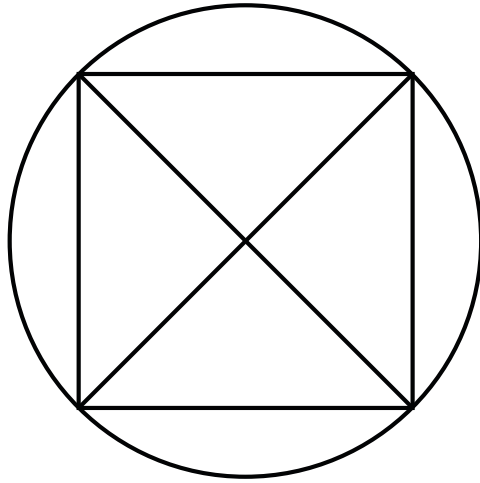


# **After school**

Integral Agriculture  
April 2021 - March 2022

Anshul Aggarwal



“Integrity is his destination; man is only a half-disclosed form of the Divine,  
that is why he is travelling towards the Divine integrity.  
In this human bud hides the fullness of the Divine lotus,  
and it is the endeavour of Nature to bring it into blossom gradually and slowly.”

- Sri Aurobindo (1955)

In loving memory of  
Sanjeev Aggarwal

What follows is a summary of the process of and the work done during the one-year course, from April 2021 to March 2022, in Integral Agriculture offered as part of the After School program for the youth of Auroville.

It has been a very enriching year for me as a mentor of this program and I am grateful to Dakshani, for her trust in this process and her persistence.

We both have learned a lot during this period and hope that more programs will emerge in the coming years to support learning *after school* in Auroville.

Our deepest gratitude to SAIER for their support in this project.

This report has three parts:

1. Philosophy of Integral agriculture and the need for a course on this subject

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2. The framework of the 'after school' program, course summary and reflections

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3. Project outcomes (Cartography and soil biology analysis at AuroOrchard)

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The philosophy of  
**Integral Agriculture**

Agriculture, like most human activities, is in a process of renewal of aspiration. However, the new aspiration that we seek does not limit itself to agriculture. What we are moving towards is a complete transformation of the human consciousness and agriculture with its far-reaching implications plays an important part in this journey. The following reflections are an attempt to synthesise my perspectives on the past, present and future of farming and *agri-culture* based on my experiences with the land and the people I have had the privilege to work with.

In the past decades, we have been fortunate to learn and be inspired by the likes of *Masanobu Fukuoka*, *Albert Howard*, *Bhaskar Save* and others about a new way of looking at agriculture. **Integral agriculture** does not exclude any of their findings or suggestions. Neither it is a new term or concept. It is simply an extension of the ideals of Sri Aurobindo's Integral Yoga and interpretation of what integrality means when working with the land, with each other and growing food as a service to humanity and all life.

What follows is not for people looking for any practical techniques. For this, there is plenty of experience within Auroville and across the world of tried and tested methods and inspiring innovations. In any case, any amount of reading cannot substitute for the knowledge a farmer develops walking and working on the land. At best, this text could be useful in exploring the philosophical foundations of a new way of looking at a farm, a community, and the people working on the land. And nothing mentioned here could be claimed to be absolute. The purpose of this text is to bring attention to this topic and encourage open discussions leading to more ideas being shared on how this philosophy can be realised. With this hope, I humbly offer this in service to new agriculture for a new humanity.

I am deeply grateful to all the farmers of the world for their perseverance and care and to all those who gave me their time and knowledge which has and continues to help my study immensely.

## Evolution and Yoga



*“Man is at the bottom, divine at the top.*

*The wavy line is the path of the ordinary life, the straight line the path of yoga.”*

- *The Mother*

There are many aspects and qualities that connect a human being to others of his kind and the vast web of life. But on the deepest and highest levels, he shares with the other beings the universal aspiration of growth. The mineral world, which appears to be unconscious, may seem devoid of this aspiration and of the faculty to evolve, but even matter that appears dead is always changing, moving, combining, eroding, fusing and diffusing to create newer identities. It is constantly trying to fulfil the multiple possibilities of life. The ever-expanding richness of the plant and animal world too, cannot be but due to this necessity to grow, change and evolve. However, minerals, plants and animals, even though they are evolving and growing, are unconscious of their development pathways and participate in them only instinctively. We can say, at least, that they are not conscious of this process in the same way as human beings are.

Human beings, with the same innate necessity to evolve, have also the cognizance of their place in the world. We tend to grow not only physically, but we also aspire to grow mentally and intellectually. We long for something more than the world, something deeper and truer. We want more from life, and often it is hard to recognise or articulate what that ‘more’ is.

The desire of life is incessant. It drives us forward just as it propels the rest of the living machinery to continue fulfilling their desires of hunger, rest, propagation and so forth. Our consciousness in us demands all this and even more.

It is said that desire is the root of all malady and a spiritual aspirant must learn to control his desires.

*But isn't aspiration for spiritual growth a desire in itself?*

*How can life exist without the desire of living, without fulfilling the needs of the apparatus that allows us this experience?*

Desire and Life then seem to be inseparable.

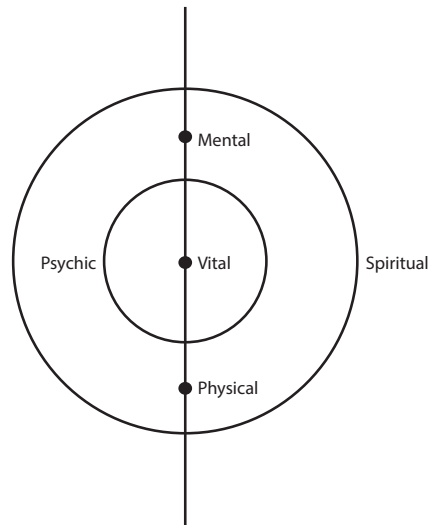
According to the *Sankhya* philosophy of the *Vedas*, the entire creation is a result of the *Brahman's* desire to dwell in *Ananda*, the Delight of existence. So it seems desire is not just an anomaly of Life, a side-effect of the ignorance of duality that we reside in. It is rather, the principle of our existence, from where we come, and our desire to expand and evolve is being reciprocated by the Spirit, the expansive and the evolved, in its desire for *Ananda* through us. The path of this existence, visible and beyond, is paved with the desire to involve and evolve, create and differentiate, grow and unite, and to do it all over again to experience the delight of existence, the manifestations of the potentialities and their coming back together to the source. While instinctively we travel this path without much awareness, Yoga allows us to be conscious of this natural process and gives us the power to act and evolve intentionally, to participate in this process proactively rather than being a passive observer finding himself often helpless in the grand scheme of things.

In Sri Aurobindo's teachings of Integral Yoga, there is a clear emphasis on using Yoga as a tool for the evolution and perfection of the instruments that have been offered to us to experience this existence—the body, the mind and the psyche. The Yogis of ancient India have elaborated on several pathways (Hatha yoga, Karma yoga, Bhakti yoga, Jnana yoga, Raja yoga, Kriya yoga, and Mantra Yoga) for Yoga suited to the temperaments, abilities and challenges of the aspirants and to work on different aspects of human life. Sri Aurobindo emphasises that all these approaches must be integrated and the aspirants themselves must take the responsibility of charting their own path. While it is useless to qualify one approach as better than the other, some may be easier to start with and create conditions for integral work and transformation.

As we will see, farming, which is the basis of agriculture associates first with the physical and could be used as an opportunity to develop a path for an integral Yoga accordingly.



## **Integral Yoga**



*Integral yoga synthesises the aspiration of physical, vital (life force) and mental (cognition) perfection, (in the vertical plane), and of psychic and spiritual perfection (in the concentric planes).*

Sri Aurobindo has beautifully articulated and arrived at the bases of Yoga, its need, and its place in our daily lives. He has inspired many generations of seekers to treat 'all life as yoga'.

The aspiration of attaining a higher experience would only be worthy if that experience could then be created in the 'real' life, in the mundane, in the lower planes.

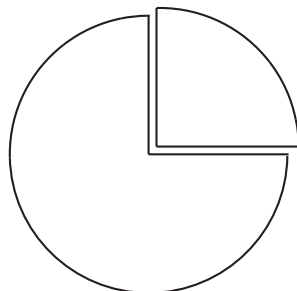
Integral yoga is about taking every moment as an opportunity for the perfection of self and everything that represents the self - work, ideas, thoughts and relationships.

The aspirant of Integral yoga tries to synthesise their efforts of perfection of the body, the vital, the mind and the psychic being.

The details of the philosophy and practice of Integral Yoga can be found in the numerous letters and pages written by Sri Aurobindo on this subject based on his discoveries.

It is better to leave this subject at that and not paraphrase or interpret what has already been produced, especially in this case as the path of Integral Yoga is very personal and its joy and purpose lie in its discovery.

## **Food**



*"That which is the subtlest part of curds rises, when they are churned, and becomes butter.*

*In the same manner, that which is the subtlest part of the food that is eaten rises and becomes mind.*

*The subtlest part of the water that is drunk, rises and becomes prana.*

*The subtlest part of the fire that is eaten rises and becomes speech."*

- Chandogya Upanishad

It is said that our body is our first *Karma*. We are born into this world to travel through life and work to solve the knots that present themselves before us on our path, working harder even just to sustain ourselves, feed and take care of our bodies.

For us and all life, food has been the fundamental requirement for growth and multiplication, to keep alive and to be able to follow our instincts and higher callings. Not only does food nourish us, but it also allows us to stay connected to the web of life, by receiving the energy from the Sun transformed by the plants in a biological dance with billions of microbes in the soil. This energy keeps flowing through life, through us to other beings, in a constant motion of decay and growth. Food materialises our belonging to Mother Earth, and offers us her blessings with every morsel.

Of the conditions that enable us to bring balance in our physical body, food is an essential part.

The importance of food and diet has been expounded with detail and beauty in *Ayurveda*, the ancient Indian text on the science of human health (In Sanskrit, *Ayu* refers to longevity and *Veda* is knowledge). The nature of food is exactly that of our physical body (*Tamasic, Rajasic and Sattvic*). It comes from plant or animal bodies, much like our own, transformed by cooking, sometimes with or without more plant and animal-based ingredients. To keep our physical body alive, and to satisfy its desire to grow, we seek food.

And just as our physical body has subtle bodies, food too has its subtle fields emanating from the etheric and psychic energies of the source of the food, and from the process used to transform it for consumption. This is a common experience of many people and can be verified easily. Different sources of food, the way the food was grown, handled and cooked, lead to differing results in nutrition, flavour and *energy* of the food. Thus, our consumption of food adds its physical to our physical and its subtle to our subtle. While our physical body carries the memory of the food we consume, our subtle bodies carry the memory of the subtle qualities of the food.

The body is often seen as the *Tamasic* weight that drags us down and impedes our progress on the path of Yoga. But the quality of our body is directly related to the quality of our food. And the quality of the food is dependent on how and where it is grown, also who grows it and then finally how it is cooked and consumed. To raise the consciousness of the food, the consciousness of all these aspects has to be raised.

For a life more evolved, food too will be the evolved counterpart of itself, a derivative of the evolution of all its parts like the plants, microbes and other elements of life, of which food is the sum.

All these parts need to be in harmony to get the optimum result, the proper manifestation of these energies. Water is more than 2/3<sup>rd</sup> of what makes our food. Water is a living being in itself and it can carry different types of energies depending on its source and its course. There have been numerous studies and experiments on the living nature of water, on the capacity of water to hold memory and therefore evolve. In purely physical (chemical) terms, high vibration water will have a good concentration of oxygen and other minerals in it which stimulate regeneration and health.

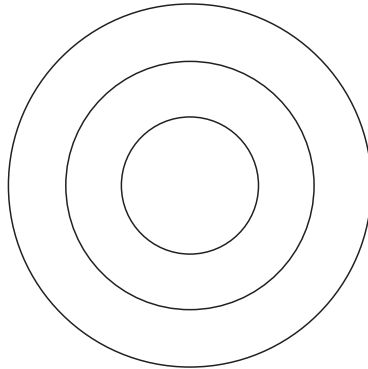
These subtle and intangible vibrations, though hard to quantify, can be observed tangibly in the physical world, as the growth and health of a system or a being.

In preparation for a supramental existence, therefore, we must prepare our food and water, and we must prepare our soil to receive the seeds of the future.

The man of the future cannot be toiling in the fields under the Sun to sustain his family or his community. The exploitation of the farmer and the land for our food should not be a reality even today. Nature has demonstrated unlimited abundance time and again, in systems that are governed by the principles of Nature herself. She is continuously evolving and we have solutions, both simple and extraordinary, to harness the highest potential of Nature, not by exploitation but by working with it, and by discovering the extents of our own true potential.

The changes in our agriculture, our diet and our social structures are intricately linked and co-dependent. Learning to see food as a tool for natural, social and spiritual evolution is the first step toward including food in our adventure of integral consciousness.

## Agriculture



*“However they roam, the world must follow still the plougher's team;  
Though toilsome, culture of the ground as noblest toil esteem.”*

- *Thirukural*

The word agriculture comes from the Latin *agrum* meaning land, and *cultura* meaning care or cultivation. It is the same *cultura* that lends itself to the English *culture*, which is a broad term for ideas, processes and methods of cultivation of our soul through art, music, food, education, social paradigms and so on.

The need for a social unit within the species of beings is common to all life. Aggregations, division of roles, and collective intelligence are natural phenomena not unique to humans. Animals, birds, fishes, insects, bees, microbes, and even plants grow in communities with each element in its natural niche working within and for the collective. But the gift of consciousness of self allows every human to carry a world within himself and empowers each individual of the collective. Human life and progress have been greatly impacted by this seemingly dual existence. We have taken a long time to decipher this challenge and are still stumbling in learning how to balance life as an individual and as a selfless servitor of the commons.

If we look back at the evolution of how humans have obtained their food, we see an obvious evolution of what food was being eaten and the subtle social evolution in the background of the rise of human civilisations. As hunters and gatherers in the wild, life may not have been easy, but would surely have been simpler. Organization around family units would have helped division of work of hunting, caring for the young, helping with water, fire, protection against animals and so forth. During this period, man learnt to domesticate fire- probably the biggest technological leap for mankind, developed language, art and other faculties of self-expression. Not so long ago, about 10,000 years or so, man

began the great adventure of farming. The activity of farming led to an evolution of the social system of organisation and gave birth to a culture based on land- *agriculture*. Agriculture solidified the social concepts by grounding the family units to one place, thus giving rise to the ideas of ownership, families and succession. Working on the land to grow what you want rather than taking what is available means more work and requires more hands. Thus, families grew bigger and children found work immediately in the fields. A sedentary life and growing population make social systems more complex and thus people within families invented new roles within the household and outside to sustain the family organism. Farming, animal care, cooking, cleaning, teaching, curing, giving and receiving, all could be done within one large family, or within a community.

Humanity thus evolved for thousands of years learning how to maintain a good organization of the social organism.

It is important here to understand the difference between farming and agriculture, the two terms which are often used interchangeably today. Farming is only an activity of intentionally shaping one's natural environment to grow plants that are desirable for one's food or other basic needs.

Agriculture, however, is a culture of the land which springs forth from farming. It evolves on the foundations of how humans work on the land and with each other and how the social life organises itself around the activity of farming.

Therefore while farming could represent an individual, agriculture essentially represents a social unit or collective.

The entire play of agriculture is between *individualism* and *collectivism*, the two poles of the social organism which keep it alive and dynamic.

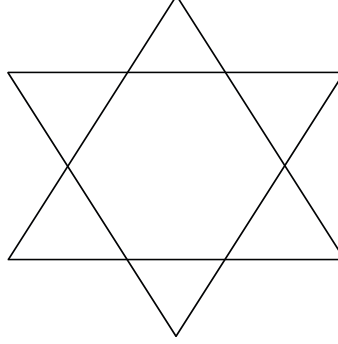
To come to a solution in agriculture, we need a solution for the conflict between individual and collective interests. Social dogmas, primarily based on religion, have long tried to suppress the individual in order to serve the collective, an image of the collective held by only a few.

In retaliation to this, the narrative of the recent past has been self-indulgence. Sadly the results of both approaches have been disastrous. Self-interest, by itself, serves neither the collective nor the self in the long term.

So how to realize the highest human potential as an individual and as a collective, not as mutually exclusive goals but as complementary necessities for growth?

Food and agriculture are a big part of this puzzle and the birth of a new kind of culture depends on our individual and collective consciousness about how we grow, cook and consume our food for ourselves and each other.

## **Krishi and Rishi**



*“He who is neither inward wise, nor outward wise, nor both inward and outward wise,  
nor wisdom self-gathered, nor possessed of wisdom, nor unpossessed of wisdom.  
He Who is unseen and incommunicable, unseizable, featureless, unthinkable, and unnameable,  
Whose essentiality is awareness of the Self in its single existence,  
in Whom all phenomena dissolve, Who is Calm, Who is Good, Who is the One than Whom there is no other,  
Him they deem the fourth; He is the Self, He is the object of Knowledge.”*

- *Mandukya Upanishad*

Many cultures of the ancient past which were based on land held intimate and vast knowledge of their internal and external nature. This helped them to intuitively organise their work and life in accordance with the rhythms of the universe.

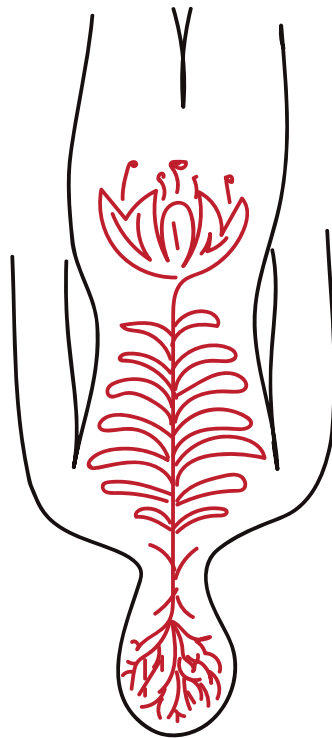
We are losing, rediscovering and even re-inventing this knowledge only to realise that this knowledge has been and will always exist as the eternal, never-changing Truth. Only our means and methods of understanding this knowledge change based on our time and place. And often our perception of this true knowledge is distorted and biased. It is like having a strong ever-present signal, but a faulty receptor unable to receive the message in its entirety.

Perhaps that is why it is said that only a Rishi (Sanskrit for an accomplished sage or seer) can understand what a Rishi has written.

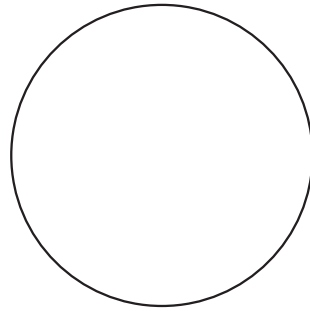
There is an incredible amount of information and experiences from all over the world on the subject of what the next way of farming must be. People have and continue to experiment with how the

abundance of food can be created with little input and least intervention. However, these are mostly external methodologies based solely on physical means. And since the solutions are solely physical, they overlook barriers that are cultural and social.

Even with a growing awareness of food and agriculture, farming (*Krishi* in Sanskrit) is still considered a livelihood and occupation. However, more than that, farming is a way of life and a way of being. Farming requires a strong training of the senses and the mind, not only to use these faculties for observation but often to go beyond them on a journey into the depths of the spirit and discover the union of the self with nature, where no discrimination exists and where *Krishi* and *Rishi* are naturally one.



## Learning from Life



*“The first necessity of preparation is the purifying of all the members of our being; especially, for the path of knowledge, the purification of the understanding, the key that shall open the door of Truth; and a purified understanding is hardly possible without the purification of the other members. An unpurified heart, an unpurified sense, an unpurified life confuse the understanding, disturb its data, distort its conclusions, darken its seeing, misapply its knowledge; an unpurified physical system clogs or chokes up its action. There must be an integral purity.”*

- Sri Aurobindo, *The Synthesis of Yoga*

The evidence of integrality as a profound concept comes from nature itself. Life, if we look closely is deeply interconnected and assimilates within it all the diversity and richness while maintaining its true nature. Therefore, to discover what integral means for society and agriculture, we must look no more beyond what already exists around us. Our modern philosophy of ‘knowing’ is based solely on the mental apparatus and considers knowledge as a cognitive commodity. To learn more and know more, we depend on the ability of our mind to discern, analyse and remember. But we often fail to recognise the limited framework of rationality within which the mind operates and therefore miss out on some of the finer and invisible nuances of what we see. This is natural as the mind must divide a whole to make sense of it. And it makes us believe that reality is divided. Nature and life, however, remain inherently indivisible and integral.

When we start seeing Life as it is- a whole web of relationships and flows of energy, we can dissolve the mental distinctions between land, people, money, society and so on. Only from such a view of Life, solutions for integral agriculture can emerge. There is very little to invent, and much to be discovered on this path.



## **The need for a new paradigm**



*“I don’t know!”*

- Anonymous

Food, or the lack of it, has become one of the many complicated challenges of the 21<sup>st</sup> century. Despite our growing economies and technologies, world hunger is also growing. While 1 out of 7 people in this world is starving or undernourished, interestingly, 1 in every 7 people is also obese.

It is not a bold conclusion to say that problem of hunger is not about the availability of food. While some people grow up in scarcity, some others grow up in an unhealthy abundance. This lopsided global distribution of resources in general and food, in particular, is the root cause of our failing health either due to the lack of food or because of too much of it.

Since the Second World War, our agriculture paradigm has shifted dramatically to keep pace with the evolving industrial and economic paradigms. The culture of monocropping thrived during the hard realities of the changing social structures in farming communities. Even though many people around the world are waking up to the destruction that monocropping and large scale mechanisation in farming has caused, some still believe that it is the only way to produce high-yields and even more advanced technologies like genetic modification must be utilised if we are to ever solve the challenge of feeding the world.

Interestingly, though, over 70% of the food that we eat, comes from farms smaller than 25 acres, managed by communities and families for subsistence, and not from large mechanized mono-crop systems as we are made to believe. Also, small farms are 4-5 times more productive than large farms because of their intensive diverse cropping integrated with animal rearing.

So where does large scale industrial agriculture fit in this story and how can it help if production is not the primary challenge?

The industrialization of farming has led to large scale disempowerment of small farmers, degraded rural lands and culture and polluted our soil, water and air. In this paradigm, the poor stay hungry no matter how much more food is produced on this planet.

Our emphatic stress on strategies and policies to feed the world are focused only on producing more food, while completely forgetting or ignoring the qualities of the food. As the world wakes up to appreciate the subtle nuances of relationships of humans with nature, with other humans and within themselves, the subtle qualities of food and their relationship with human health must also be considered and appreciated. As a global collective, feeding the world population is rather an *insufficient objective*. That all on this planet should have access to clean and wholesome food of the *highest vibration*, could be an idea worth aspiring for.

The trend of people moving from agriculture to an urban culture is on a rise in India and across the world. The degradation of the rural life and ecosystems has forced people to migrate to already densely populated cities with the hope of employment and a better life. The move from a village to a city is not only a physical one but also a psychological leap from collective to individual identity. Families are also not as big as they used to be once and as large families break into smaller nuclei, there are fewer hands on the agricultural fields. Mechanisation has helped in this regard to some extent but has disturbed the long-held balance of self-reliance in agricultural communities.

All this has meant a degradation of the culture of the land and poses a real threat to the sustainability of agriculture beyond our time. The sustainability of agriculture is not only about the ecology.

We must ask ourselves,

who will grow our food in the coming decades?

At the same time, migrants in cities find themselves out of job and relegated to a life in slums adding to the pressures of an already struggling urban system. People tired of degenerative city life are moving to rural areas in search of a simple life and with an aspiration of connecting with nature. Thus we see a flow of people in both directions but with very different skills, temperaments and aspirations. The future of agriculture stands between the traditional farmers, some of whom are tired of the ecological (climate change, wildlife, consequences of green revolution) and social (cultural and economic) pressures while only some have the resources to experiment with a different way, and the new educated aspirant wanting to go *back to the land*, caught in a tight balancing act of individual growth and collective prosperity.

The agriculture of the future cannot dismiss the social without which there will be no culture. This future of agriculture demands not only a new way of farming but a new way of social organization, of

people coming together, spontaneously or by design, forming families and communities to support each other and to help dream and realize this task which is beyond an individual. This coming together of people for a purpose and not social obligation would require a new ethical framework beyond religion and dogma. The first condition of farming will be collaboration, which alone could lead to the empowerment of the future farm and farmer.

The second important condition for future farmers will be to think of succession. A farm as an enterprise has been sustainable because the children of farmers have continued farming after their parents and have passed on the skill and the responsibility to their children. With more and more opportunities for learning and expressing oneself, it would be morally wrong and socially regressive to expect farmers' children, irrespective of the economic state of the farm, to take up the work of their parents. For intentional communities of today, the option of new people joining the community in future would be a solution but there must be a space for this and an integration plan that can take care of the social challenges this would present.

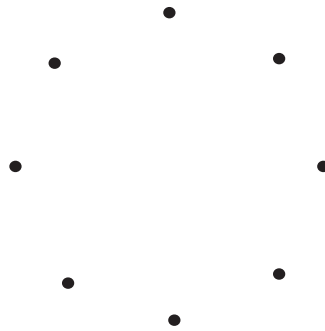
The situation may be more challenging for individuals, couples and families who have moved to the land for a simple life. The collective effort in this *going back* movement must go on without people having to reinvent themselves again and again which presents its limitations and costs excessive resources. A vision for succession and visualization of systems that can outlast human lives could be the key to supporting sustainable changes at various scales of human organization.

It may be difficult to chart the path of a new paradigm from where we are right now. We could only try to be humble and follow certain beacons of values and imaginations. It would require us to be open to embrace surprises and our doubts, accept our ignorance, surrender to a higher guiding power and receive the answers as best as we can.

The consumer and the farmer will not be two different entities. Growing your food, all or a part of it will be a service to Mother Earth and a service to self. It will be a way to learn the intricacies of natural patterns, the mechanisms of life and the role of human beings in this complex web. At the same time, cooking will help build a relationship with fire, to participate in the transformation of food substances to enhance their nutrition or to conserve for the future.

Our work is, then, to discover a new way of farming and eating, a way of sustaining and even enhancing planetary and human health.

## **Agriculture and collective evolution**



One of the markers of evolution, its extent and its function is the diversity of life, which we also call biodiversity. From all accounts of science, religion and metaphysics, life has been multiplying not just in number but also in its form and expression. This growing multiplicity allows life to enhance its function and extend its relationships within a network of energy, creating the impetus for further creations. While the pattern of evolution drives the processes of biodiversity, it is life itself that directs the forms and shapes in which this process is manifested. Forces of nature, microbes, plants and animals, all participate in this grand unfolding. Since human impact has surpassed that of all others, we have also been influencing this process significantly, both consciously and unconsciously.

Communities based on land and in forests have evolved with their ecosystems for millennia. They have been a part of their biodiversity. Not only have humans evolved within the ecosystems, but they have also contributed to protecting and furthering the evolution of these systems. The Amazon forest, for example, which is now being referred to as the oldest food forest, shows clearly how human culture can support and enhance biodiversity and create a synthesis of wild and humanized ecosystems. It is only sensible that the conservation movement recognizes the human potential in participating and accelerating the healing processes of life. By creating systems that integrate the health of ecosystems, individuals and communities, we will avoid the need for special conservation programs, delineating indigenous peoples from their habitats and cultures, which have already been found to be ineffective and unsustainable.

This work for humans to participate in the betterment of life, not just human life, but social and ecological life must become the central focus of education in cities and rural areas alike. The farmer is a bridge between these realms of human and nature, selecting carefully the food (and plants of other use) for today and preserving intelligently the seeds for tomorrow. The farmer has the responsibility of

deciding the extent of modification of the environment for human needs of food, shelter, clothing etc., assessing the impact of this modification on the environment and other beings and possibly offsetting this impact by positively enhancing the environment through this change. The awe-inspiring diversity we can see in our food crops across the world is a result of careful selection by farmers over thousands of years and reticulate evolution within the crop species.

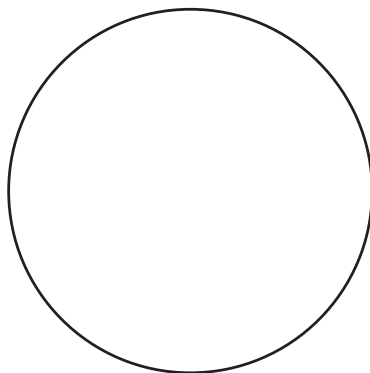
Food crops have travelled across the world through natural and human agents for millennia. Since the advent of international human trade, this exchange has accelerated with the more and more intentional introduction of foreign plant species into ecosystems for food, timber, aesthetics etc. In some cases, this has resulted in increased biodiversity of an ecosystem and in some cases, the foreign species have invaded aggressively dominating and eventually suppressing the native plant species. Nicolai Vavilov, a maverick Russian plant geneticist, was among the pioneers in launching expeditions in the early 1900s to different continents to discover the origins of the crops of the world and find their wild varieties in an attempt to build a diverse crop system for Russia. His work of course went beyond Russia and inspired many people around the world to pay attention to the genetic development of plants and their origins. But some would question the work of Vavilov and others in bringing foreign plant species into an ecosystem. The debate on invasion biology is more ethical than technical.

In my view, the globalization of food is an inevitable reality and will happen, whether humans contribute to it or not. Humans can consciously participate in this process while valuing both the new and the old, the possible and the traditional. It is in the spirit of human unity, another inevitable reality that the food and food crops continue to diversify across the world. The introduction of the new varieties and species could only be meaningful if it is to enhance an ecosystem function and not replace a traditional native variety or specie. Thus, the diversity of seeds and the role of the farmer in maintaining and augmenting this diversity are the cornerstones of food security for a village, town and the world.

Food production and distribution can only be sustainable at a scale that is local and small with these small scale systems connected with each other to share surplus and knowledge. Only in such a local system, both the farmer and the consumer will have a voice on what kind of food they would like to grow and consume, and both will have information on the sources and processes involved in the production and propagation of seeds and food.

The 21<sup>st</sup> century, the century of crises also presents us with the opportunity of making it the century of transition, a transition that goes beyond the physical and involves the invisible, a transition to smaller scales that allow for conscious growth, a transition into finally recognizing our power as a species and our responsibility as stewards while manifesting our individual and collective aspiration for truth and beauty. Manifesting this aspiration requires us to work on our consciousness to help harmonise the rough edges of human character into a diverse, yet unified, whole.

## Integrity of agriculture



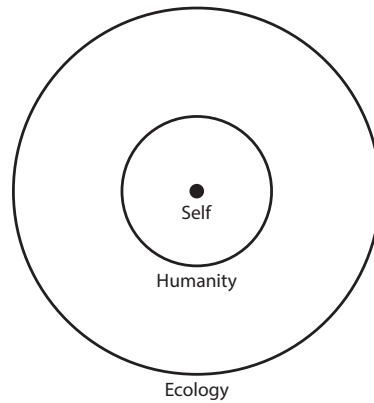
*“There is, first, the knowledge of the truths, principles, powers and processes that govern the realisation—shastra. Next comes a patient and persistent action on the lines laid down by the knowledge, the force of our personal effort—utsaha. There intervenes, third, uplifting our knowledge and effort into the domain of spiritual experience, the direct suggestion, example and influence of the Teacher—guru. Last comes the instrumentality of Time—kala; for in all things there is a cycle of their action and a period of the divine movement.”*

Sri Aurobindo, *The Four Aids (Synthesis of Yoga)* -1915

With this background, it is easy to see the intricate relationship of agriculture with our lives, not only because of food and therefore its spiritual significance but also because of how it fundamentally influences our social and ecological relationships. A new humanity needs a new culture and for that, a new form of agriculture needs to be worked on.

In the integral view of agriculture, the role of the farmer is not restricted to growing food. The soil is cultivated to cultivate the human soul, the nourishment of food not limiting itself to the physical bodies but also nourishing our aspirations for a higher life, working as a catalyst for individual, social and ecological transformation.

## Education



### Twelve qualities of the Divine Mother

**Sincerity** (*Aster amellus*, Italian aster), **Humility**, (*Agrostis nebulosa*, Dropseed), **Gratitude** (*Ipomoea carnea*), **Perseverance** (*Calendula officinalis*, Calendula), **Aspiration** (*Nyctanthes arbor-tristis*, Night jasmine), **Receptivity** (*Gladiolus hortulanus*, Garden gladiolus), **Progress** (*Catharanthus roseus*, Rose periwinkle), **Courage** (*Calotropis gigantea*, Crown plant), **Goodness** (*Reseda odorata*, Sweet reseda), **Generosity** (*Impatiens balsamina*, Garden balsam), **Equality** (*Iberis sempervirens*, Candytuft), **Peace** (*Curcuma zedoaria*, Turmeric)

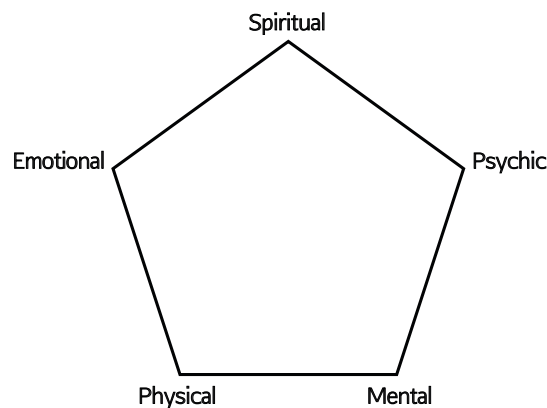
For millennia, people have retired to forests and mountains to quieten their minds and dedicate their time to *sadhana* and *abhayasa*. Most of the ancient schools have existed in forests to enhance this connection we have with nature which then facilitates learning. So being in nature and working with it has been and continues to be an important part of learning. Even today, many schools and pedagogies emphasise including gardening as a subject within the school curriculum.

Just as nature is an integral part of learning, education must also then be a part of an activity that deals with working with and in nature.

The activity of farming and growing food should be utilised also to develop learning environments where people can observe the laws of nature and their true selves.

The kind of education we talk about here, itself has to be integral and this has amply been discussed by Sri Aurobindo and the Mother and many educators inspired by their philosophy.

The five aspects of *integral education* would suffice here and help set the vision for a synthesis between the integrality of education and agriculture.



**Physical:** The most highlighted aspect of agriculture is the physical work involved. Working on the physical aspect of the land requires physical action and therefore the body instrument is crucial for agriculture. The body needs to be trained slowly and gradually to reach its optimum capacity to work and sustain the quality and consistency of work over long periods. Agriculture is an opportunity to connect with one's body and use the field as a playground to recognise its limitations and discover its immense potential.

**Mental:** Working in a garden requires a mental mapping of elements to memorise their locations and functions, and also to use the intellect to analyse their relationships. The mind helps to make sense of the large web of life and how different elements fit together, an essential condition for a farmer relying on natural processes rather than hard intervening methods.

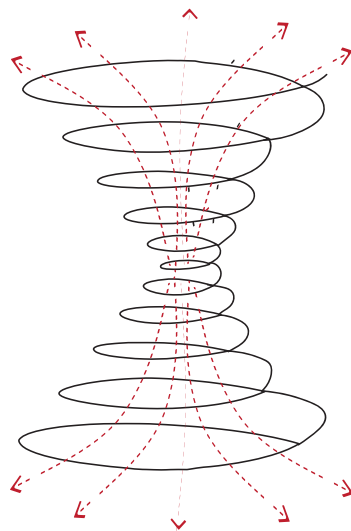
**Emotional:** The mind, alone, however, has the tendency to over-reason, extrapolate and force-fit its logic on a completely organic and free-flowing natural world. The overbearing of the mind is balanced by the sensual reception of one's environment. To develop this aspect, one must learn ways of being, removing the focus from knowing and doing. Honing the senses and observing the land, plants, and whether, in the quietude of the mind is a necessary practice for a student of integral agriculture.



**Psychic:** Once it is possible to connect with the elements outside on physical, mental and emotional levels, the next step is to try to listen to the silent sounds within and without and recognize the interconnectedness and deep seamless oneness of all life and ourselves. It is in these depths of the meaning of agriculture, that one can find the depths of one's inner self and access its universal identity.

**Spiritual:** Agriculture offers an opportunity for communion with the divine life. It teaches how life can be created, preserved and propagated. It also reveals the spectrum of the laws of life and nature. This aspect of agriculture is about going beyond its purpose to feed to create a new vision of food as a means to expand one's consciousness and growing food as a service and a privilege, an offering to the divine to help the inevitable ascent of humanity.

For the humanity of the future, the constraints of our present situation may not hold applicable. A natural question would then be to ask ourselves what are the human activities of today that will still be relevant. To build something for the future, we could project our visions to a distant reality and imagine, what must be meaningful eternally, what must be True and Whole today and even tomorrow, for limited humanity and even Superhumanity.



Curriculum for  
**After School**

*Om Purnam Adah Purnam Idam  
Poornaat Poornam Udachyate  
Poornasya Poornam Aadaay  
Poornam Evaa Vashishyate  
Om shanti, shanti, shanti.*

*That is Whole, this is Whole,  
from the Whole, what springs forth is Whole,  
when the Whole is taken out from the Whole,  
what remains indeed is Whole.  
Om peace, peace, peace.*

- Isha Upanishad

## **After school and integral education**

The goal of the After School Program is to provide learning opportunities for children of Auroville after High school. Taking its inspiration from the ideals of integral education and free progress, the After School program should be seen as only another step in the long unending journey of learning. The following is how the curriculum was designed based on these foundations.

### ***The first principle of true teaching is that nothing can be taught.***

The attempt during this course was not to teach agricultural techniques but to create a space for learning to take place. When we are in a natural environment working with the soil and the plants, we develop a sense of care for the land and nature, we also start understanding ourselves and our potential and limits.

The course was designed to allow the student to take ownership of their relationship with soil and food and through that cultivate an interest in farming and the bigger picture of *agriculture*.

### ***The second principle is that the mind has to be consulted in its own growth.***

Farming is not the goal but only a tool to connect with nature without and within.

It can help a keen observer to discover the mysteries of life and learn to establish closer communication with his/her psychic being.

The course was intended to give space for such deep observation and reflection both on the farm and in the personal relationships of the student.

### ***The third principle is to work from the near to the far, from that which is to that which shall be.***

Working with nature is working with patterns. The more we see, the more there is to see. One of the skills working with nature teaches us is the capacity of zooming in and zooming out, to see things from afar and to see them with close intimacy. Apart from learning to grow food, we worked on projects like mapping and soil analysis to appreciate the vastness and depth of life, both of which are active and rich at the same time.

Aspiration

## **Course details**

### **Course title**

Integral Agriculture

### **Student**

Dakshani Kumar  
(Future school graduate, 2021)

### **Duration**

May 2021 to March 2022

### **Mentor**

Anshul Aggarwal

### **Host Unit**

AuroOrchard, Auroville

### **Engagement**

The student would volunteer at AuroOrchard 4-5 days a week in the morning for 3-5 hours every day.

Every week the student would meet the mentor once to discuss the work and set up theoretical foundations for the week to come.

### **Broad objectives**

- To dive into the realm of soil, water, forest and the web of life
- To connect with natural rhythms and patterns and observe nuances and details
- To explore the social and spiritual context of growing food
- To co-create a program of foundational agricultural studies in Auroville

### **Major themes of the course**

Systemic view	Forest	Invisible structures
Design	Crop planning	Cartography
Patterns & Flows	Food	Seeds & propagation
Plants	Water	A new consciousness
Soil	Compost	Integral agriculture

### **Course outline**

These major themes were then divided into detailed topics and questions for exploration.

The following table illustrates the overall plan for the course.

Following that, every theme is described in short and a summary is provided of the work done and reflections from the student.

## **Course outline**

<b>Month</b>	<b>Theme</b>	<b>Week</b>	<b>Topic</b>
May	<b>Introduction</b>	W1	
June	<b>Plants</b>	W5	Biology & Classification
		W6	What role do plants play in life? Identify plants growing around your house.
		W7	Pollination, Annuals & Perennials
		W8	Companions & Consortiums
July	<b>Design &amp; Patterns</b>	W9	What is design? Flows & Patterns / Sacred geometry
		W10	Gaia hypothesis / Geobiology / Pulsing paradigm- feedback
		W11	Energy cycles / Climate and microclimates
		W12	What is sustainability / regeneration?
August	<b>Forest</b>	W13	Story of forest
		W14	Natural Succession
		W15	Natural farming
		W16	Regenerative agriculture
September	<b>Soil</b>	W17	What is soil? / Ethics of care
		W18	Physical, Chemical and Biological nature of soil
	<b>Soil assessment</b>	W19	Soil assessment
October		W21	Soil assessment
November		W25	Soil assessment
	<b>Food</b>	W27	Relationship with food
		W28	Production, distribution and consumption
December	<b>Water</b>	W29	Living water
		W30	Irrigation & Dryland farming
	<b>Compost</b>	W31	Why and what kinds? / Making & using
	<b>Invisible structures</b>	W32	Social & Economic paradigm
January		W33	Observing invisible structures, Swaraj, Decentralization
	<b>Seeds</b>	W34	The story of seeds
		W35	Collecting & Preserving seeds
	<b>Cartography</b>	W36	Maps & relationships / Reading landscapes
February		W37	Mapping AuroOrchard
March	<b>Reflection &amp; Documentation</b>	W41	

## **Summary & notes**

### **Plants**

Plant	Roots	Stem & Leaves	Flower/Fruit
Elements	Earth	Air and Water	Fire
Human	Nervous system	Circulatory system	Reproductive system

The goal of this module is to get to know plants closely and understand their nature and relationship with us. We also discuss different kinds of plants based on growth cycles, leaf shedding and reproduction mechanisms and their natural companions.

#### **Dakshani's reflection:**

*I was immensely impressed as well as influenced by plants. I wanted to be like a plant. Plants have a clear purpose. A great purpose. They are food producers, habitat providers, air purifiers, soil protectors, water absorbers and much more. They are survivors, no matter the difficulties, they always strive toward the sun.*

### **Design**

This module looks at the creative capacity of life and how humans have intentionally participated in the process of evolution. We talk about the dimensions of life- ecological, social and spiritual, their meaning and relationships with each other.

We then talk about a systemic view of life and the need for a shift in our perspective of life and a paradigm that considers above all the relationships between the various elements and aspects of life. We also discussed how the current crisis, is only a crisis of perception and the solutions will have to emerge from within. This relates directly to Sri Aurobindo's vision of the evolution of consciousness and that itself is the solution to our material challenges.

In relation to designing for the future, we also discussed what 'sustainability' really means and if it is *enough* as a goal for humanity.

#### **Dakshani's reflection:**

*We use design as a tool to solve challenges. We use it regularly, we just don't see it as "design". For example, I designed my gap year program to figure out my interests. In the context of a farm, people design a farm by observing, working with the existing flows and patterns of the land and creating something new to accommodate their needs and likings.*

## **A systemic view of Life**

In this module, we talk about the interconnectedness of things and systems. We discuss what systems are and how different elements are related within a system.

We talked about the Gaia hypothesis which states that the entire planet earth is itself a super-organism changing and evolving with time, a scientific perspective to similar visions from Sri Aurobindo and the Mother. We also talk about Geobiology and some other theories that illustrate life's capacity to learn and adapt.

## **Patterns**

This is perhaps the most important module of this course. Patterns are the forms that energy takes when and where it expresses itself. Therefore, to understand the universal Energy, it is important to look closely and listen patiently to the patterns it expresses in different spaces and at different times. Patterns allow us to follow the design of nature which it has perfected and work with nature, helping in the acceleration of its manifestation, rather than fighting against it.

This module is about recognizing patterns and developing skills for close observation.

## **Forest**

Forests are an amazing tool for learning. Perhaps this is the reason that most ancient schools were situated in the forests. We use this module as an opportunity to get to know better about what a forest is and go beyond its identity as simply a group of trees. We explore the 'forest superorganism' for how it manifests the pattern of evolution and natural succession. We also discuss trees and learn about their identities and ecological function and relationships.

During this module, we also discuss climate, its phenomena and how we can intentionally utilize and create microclimates.

## **Agriculture**

In this module, we journey through the beginnings of agriculture and how this culture based on land evolved. We talk about the social implications of agriculture which transformed human societies radically. We then discuss the recent changes in agriculture with Green Revolution and the challenges and solutions that have emerged since then.

Finally, we talk about what the future of this culture of land would look like.

We also discuss different approaches to farming (Natural, Biodynamic, Syntropic, Regenerative etc.), their principles and basic framework. We then look at cosmic and biological rhythms and understand



how to organise planting and other works on the land according to seasons, time of the day, the position of the sun and that of the moon.

## **Soil**

In this module we observe soil deeply through all senses- seeing, feeling, smelling, hearing (and listening) and tasting. We understand what soil is, what is its physical, chemical, biological and etherical nature, and how it is formed and start a simple analysis of soil based on its texture.

We then go deeper into the living nature of the soil and how we can participate in the natural process of the creation of *healthy* soil.

## **Soil assessment**

Dakshani collected soil samples from different areas of the farm and we assessed these samples under a microscope to prepare a soil biological assay for each area. Dakshani learnt to identify different microorganisms and count them. The results from this exercise which lasted over 6 weeks are attached at the end (Page no. 44).

### Dakshani's reflection:

*It was thrilling to see the unseen. It was fun walking around and collecting soil samples and studying them under a microscope. The search for fungus in every slide is one of my favourite memories.*

## **Food**

In this module, we explore our connection with food and how it relates to our nature and aspiration. We also talk about where our food comes from and the challenges of production, distribution and consumption of good quality food in the world and Auroville. We try to think of some key ideas that will be crucial for the future of farming for the farmers of the future.

### Dakshani's reflection:

*From what I have learnt, everyone and everything is a form of energy. for example, rock, animals, food etc. Therefore, it's important to consume the best form of energy to help us grow and progress better in our lives.*

## **Water**

The objective of this module is to emphasise the living nature of water and to appreciate it as a source of life. Since a lot of our interactions were in Coin de Terre in Pitchandikulam, we could observe how

water flows through various flow forms and within vortices and how these forms help enhance the energy of water. We also discussed strategies for water conservation and irrigation and the approach to diversifying solutions for redundancy (multi-sourcing) when designing for water security.

### **Compost**

This module is to understand what compost is and why we use it.

The theory involves understanding the chemical and biological composition of compost and the physical conditions required for an effective transformation of organic waste into rich compost. This is connected to the practical experience of making compost on the farm and using it in the nursery and the fields.

#### *Dakshani's reflection:*

*I heard many people say 'the soil is alive'. I used to wonder, 'how?' Now I say there is more life in the soil than on top of the surface. When I was studying soil samples under a microscope, I saw hundreds of bacteria, fungus and if lucky, other microorganisms. Compost is basically a cultivation of microorganisms which nurtures the soil for bigger organisms to thrive.*

### **Invisible structures**

In this module, we talk about the social, economic and cultural paradigms that form the invisible structure in any society on which the rest of the identity of the society manifests. We learn about the nuances of life and the need to appreciate the invisible. We also talk about the current economic and political paradigms and how they push for a certain kind of human culture. Finally, we see how any changes in our individual and collective consciousness are as important, if not more, than changes in material conditions and technology to overcome the challenges faced by humanity.

### **Seeds**

This module is about the knowledge and skills required to save seeds. Seeds are the heritage of a farmer and embody food security for a community. We also discuss the considerations of indigenous seeds, hybrids and genetically modified seeds and their impact on agriculture.

#### *Dakshani's reflection:*

*Like us, plants have evolved over a long period. Always adapting and changing to new climates and new places. These changes are stored in seeds repeatedly for the next generations to grow better. Unlike us, we tamper with nature whenever*

*chances permit for our benefit. Seeds represent power. because they determine what a farmer can grow which means what people can eat. Choosing the right seeds determines the success of a farm, a garden and everything that follows.*

### **Cartography**

This module's goal is to introduce maps as tools for visioning and their use in collaborative planning. We develop a sense of place and explore orientation, scale and proportions. For this module, we used the map of AuroOrchard as a reference and discussed the overlays of sectors and zones (Permaculture design tools) that can help to read the landscapes and design integrally considering all contextual aspects. Different flows were mapped and analysed to practice this skill (Page no. 40).

#### **Dakshani's reflection:**

*To fit something of huge size into a small paper was new and exciting. I learned a lot about the land through mapping. I walked places I haven't been before. Talked with people I didn't know before. I had to make multiple sketches of the same drawings and sometimes it seemed it would never end. But I liked it even better as it all felt very real.*

### **Reflection & Documentation**

We kept time for documentation and going back to the topics and reflecting on them. This is an important part of the course as it makes concluding the course a part of it. This also helped in emphasising the importance of documentation during and after the process for the purpose of self-reflection and sharing with others.

## Dakshani's reflections

**1. *What were your plans after school before you came across the 'after school' program?***

I considered applying to university, like any other high school graduate. I would have continued my studies in either English or French.

**2. *What motivated you to choose this particular program considering you could have worked/studied in other places/units in Auroville?***

I chose this programme for two reasons. The first one being my father- Sanjeev. He ardently believed in the methods of education proposed by Sri Aurobindo and the Mother. Secondly, I was not sure if I wanted to pursue my studies in either English or French.

**3. *How was the initial experience of working at the farm?***

It was fun, educational and sometimes difficult. It was the spirit, both of nature and people which was very refreshing. The volunteers whom I worked with were each a character of his own.

**4. *What have been the highlights of this course for you?***

Collecting soils and studying them under a microscope. Learning the importance of food. Working with plants. And meeting new people.

**5. *What have been the challenges of this course for you?***

This program only works for self-motivated students. Which I was only to a certain extent. Whenever I lost interest, it was a struggle to continue the course. Fortunately, I received a lot of support from my family.

**6. *What would you have changed to make this course better?***

The schools (last school/future school) should guide students actively in this course. Which is missing right now.

**7. *What would you like to do after this course?***

I would like to explore and study more about plants.

## **Conclusion**

### **Practical skills**

Apart from the learning described above, the emphasis of the course was to also give a space for learning practical skills which can help the student continue this work even outside Auroville.

Some of them are:

1. Working in the nursery
2. Preparing raised beds
3. Making and using compost
4. Pruning
5. Harvesting different crops and handling/preparing for market
6. Collecting seeds
7. Cooking predominantly from farm produce
8. Soil biological assessment using a microscope
9. Cartography
10. Working with a diverse team
11. Connecting personal patterns to natural patterns

### **Possibilities after 'after school'**

If there is enough interest from the students, there is a potential to create bridges within and outside Auroville to continue this learning journey further:

1. Students could enrol in some speciality programs to go deeper in any of the emerging agricultural practices like agroecology, permaculture, agroforestry, land design, soil biology, dryland farming etc.
2. Students would have the information and skills to initiate or collaborate on research on soil, water, specific plants, insects on the land, bees etc. with each other or with other units working in these fields inside/outside Auroville.
3. Students could continue to work on a farm as an apprentice doing farm work and any of the associated farming activities like dairy, poultry, vermiculture, mushroom cultivation, beekeeping, food processing, seed saving etc.
4. Students could initiate their projects in any of these fields
5. Students could become mentors and facilitators for successive after school students

### **Challenges**

Since Dakshani was the only student, there were no opportunities for group sessions or activities. Thankfully, we had the volunteer group at AuroOrchard which filled some of this gap, but this group was not part of the entire process of the course. Therefore, the experience of learning in a group was limited during the course.

Also, it requires a lot of motivation for a student to go through this course on her own. Having peers involved in the same process would help with this. Fortunately, Dakshani's family supported her immensely and encouraged her to continue.

Other than this, we thoroughly enjoyed working with each other and adapted to how things evolved.

### **Some important notes for future courses**

1. Emphasise having a minimum number of students to create a learning group that can support each other's journey.
2. Include space for reflection on topics and subjects every month or every few months to see where the gaps in learning may be.
3. Explore the possibility of students spending time in other food services like Foodlink, Solar kitchen, Ptdc kitchen etc. to get a first-hand experience of the food web of Auroville.

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Cartography & Soil biology

**AuroOrchard**

## **Cartography**

Cartography is the study of taking layers of information and representing them spatially. The representation could be in various forms, like maps, organigrams, charts and so on. It involves observing relationships between different elements and expressing these relationships in the simplest way possible.

Cartography is an amazing skill and an even more useful tool for observation. Every detail that goes on a map has to be studied closely and this helps to build the ability to zoom in and out of the context when required. This skill of subjective and objective perspectives help also in other areas where observation is essential and with a bit of practice, the same abilities could be translated to social and personal contexts.

*This mapping exercise involved the following steps:*

### **1. Vision:** *Who is the map for? Why do we need a map?*

We discussed together what would be the most important flows to map at AuroOrchard and decided to create a base map, with different areas and structures, a map of pathways (human flows), a map of water lines (water flows) and a map of cow corridors (animal flows).

### **2. Projection:** *Projecting the reality as is on the 2-dimensional paper*

We started with a satellite image and an old map of the farm as references. Dakshani walked through the entire land to get a sense of herself. She also sat with people working on the farm to get a more accurate picture of what was invisible, recording developments that are as old as 30 years. This was an attempt at making this exercise participatory and relevant to the people who would use this map.

### **3. Organisation:** *Organising the details of the map to make the invisible, visible*

This is the stage of drawing and re-drawing and ensuring that the information put on the map is coherent and fit together.

### **4. Design:** *Designing the map so that it can be accessed by the people it is meant for*

This is the final step of including details that make the map readable, and the information presented most simply and intuitively.

The outputs from this exercise are given below.





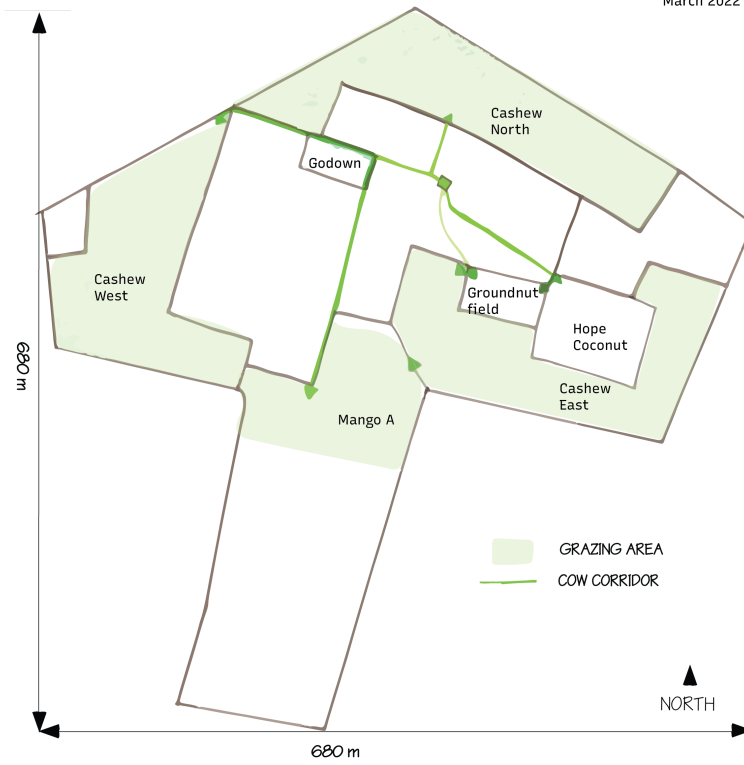
***AuroOrchard, Base map***



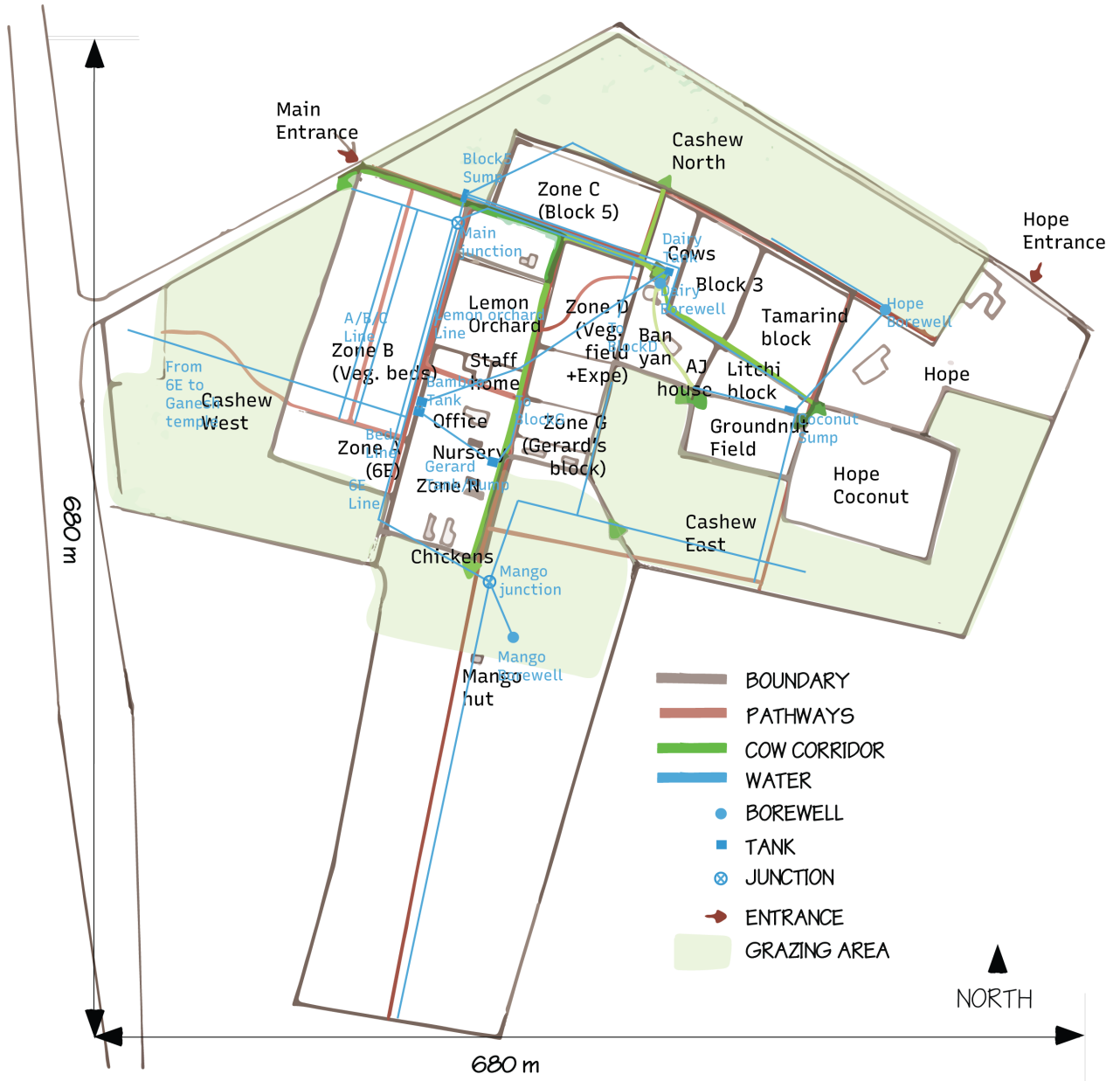
***AuroOrchard, Pathways***



***AuroOrchard, Waterways***



***AuroOrchard, Cow corridors***



*AuroOrchard, major flows and relationships*

## **Soil Biology**

Soil samples at 10 cm depth from the surface were collected and analysed from the marked zones on the following map from August-November 2021. The goals were:

1. To deduce the ratio of the fungal biomass to the bacterial biomass (F: B) in the soil
2. Create a map of F: B for different soil samples from across the farm
3. Analyse the F: B of the different areas of the farm and in relationship with the context of those areas.

### ***What is F: B and what does it tell us?***

Bacteria are fast-growing organisms that multiply very quickly and are generally present in our environment in amazingly large numbers. Fungi are slow-growing (relatively) organisms and in soil, they take a long time to grow. In fact, every time we move soil, we increase the bacterial biomass and disturb the mycelial threads of the fungi reducing the effective fungal biomass. Therefore, undisturbed forest soils tend to be rich in fungi which create an expansive network of mycelia and tree roots. Agricultural soils, on the other hand, which are prone to constant movement, are generally richer in bacteria and are mostly poor in fungal biomass.

In the evolution of land, fungi have the advantage of longer lifespans and vaster connections. In a way, fungal rich soils can be considered ‘more evolved’ than soil rich only in bacteria. In the sequence of natural succession, the soil tends to naturally become fungal rich, to move from bare soil to grassland to a rich forest.

In agriculture, we pull back a *wild soil* to a lower level of evolution to be able to grow our food. Depending on what we want to grow, the desired F: B will vary.

For example, higher F: B is good for forests, orchards and perennial systems while lower F: B is preferred for cereals and annuals.

Some general values of F: B based on experiments from across the world (from Dr Elaine Ingham, Soil Food Web):

Bare soil	<b>0.05: 1</b>
Vegetables	<b>0.5 : 1</b>
Cereals	<b>1 : 1</b>
Shrubs	<b>2 : 1 to 5 : 1</b>
Evergreen trees	<b>10: 1 to 100: 1</b>

**AUROORCHARD SOIL BIOLOGY ASSAY**

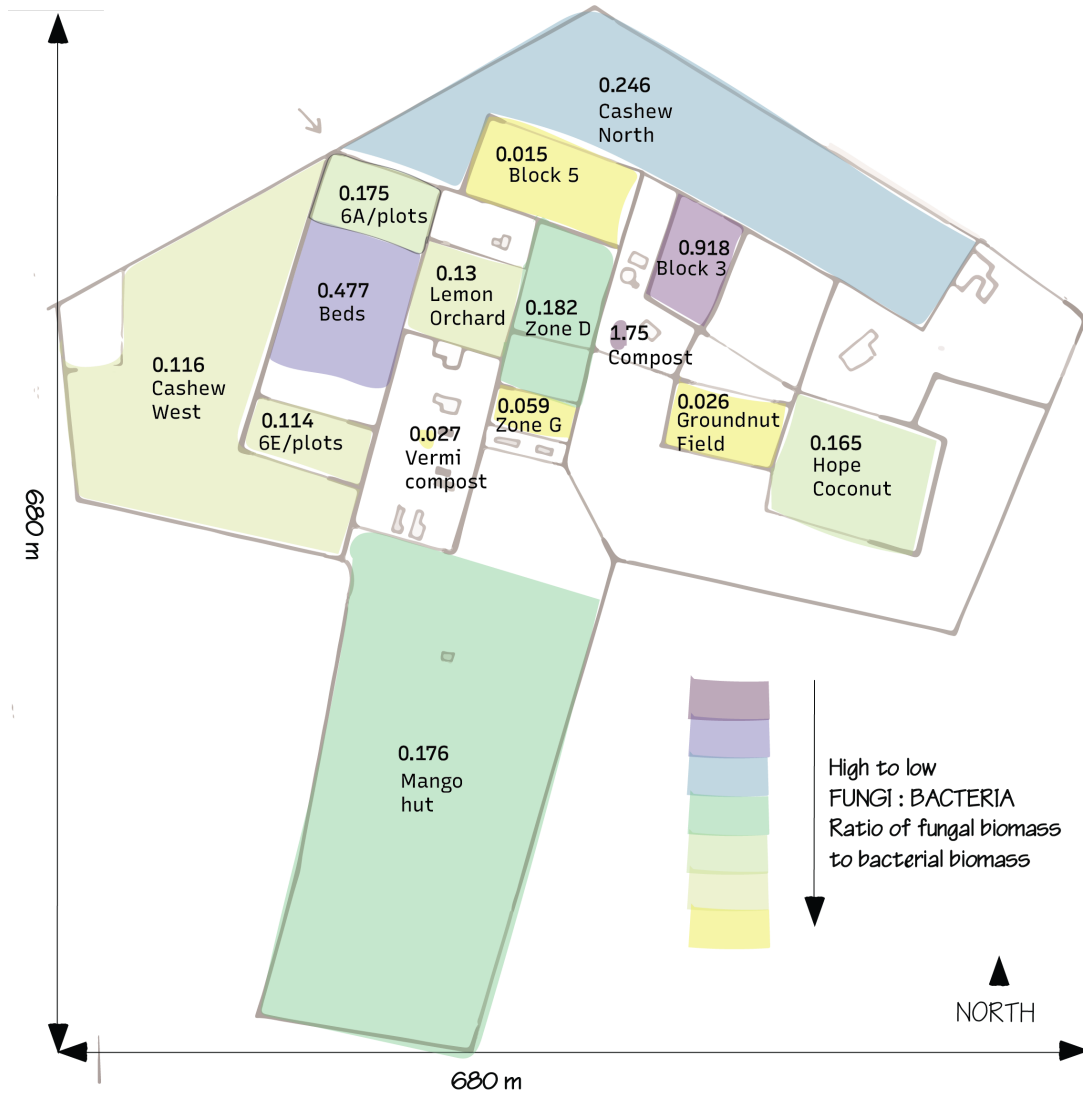
November 2021

Sample	Mango Orchard		Lemon Orchard		Coconut orchard		Cashew North		Cashew West		Block 5		Block 3		6E		6A		Beds		Veg+ XP		GB		Groundnut field		Compost		Vermicompost						
Date of analysis	23/08/21	01/11/21	23/08/21	01/11/21	01/09/21	01/09/21	01/09/21	01/09/21	01/09/21	01/09/21	16/08/21	16/08/21	11/10/21	25/10/21	15/11/21	01/11/21	25/10/21	15/11/21	01/11/21	25/10/21	15/11/21	01/11/21	25/10/21	15/11/21	01/11/21	25/10/21	15/11/21	01/11/21	25/10/21	15/11/21					
<b>TEXTURE ANALYSIS</b>																																			
Organic matter	5%	2%	8%	2%	5%	6%	5.50%	3%	2%	4%	7%	1.50%	7%	1.50%	94%	100%																			
Sand	85%	86%	77%	88%	84%	82%	78%	75%	84%	79%	80%	80%	81%	87%	2%	0																			
Silt	2%	3%	2%	4%	4%	6%	3.50%	12%	7%	2%	2%	2.50%	6%	3%	2%	0																			
Clay	8%	9%	13%	6%	7%	6%	13%	10%	7%	15%	11%	16%	6%	8.50%	2%	0																			
Conclusion	There is very little structural diversity in the soil from different zones on the farm. Overall the soil can be termed sandy with about 80% sand and the rest a balanced mix of silt and clay. The difference between clay and silt amounts could be due to several reasons like run off, termites bringing clay and silt from lower layers, ploughing contributing to turning etc. The organic matter content is low in certain annual cropping fields possibly due to regular ploughing and lack of compost/mulching.																																		
<b>MICROBIOLOGY ANALYSIS</b>																																			
<b>Bacteria</b>																																			
Biomass (µg/g)	2201	3701	10810	2886	1158	3750	6456	8804	1663	3668	3261	4321	6766	4647	4158	12717																			
(Standard deviation)	(188)	(184.43)	(1168.11)	(182.43)	(139.71)	(123.29)	(760.21)	(715)	(66.93)	(84.85)	(152.32)	(502)	(123.29)	(138.56)	(105.83)	(219)																			
Diversity	Moderate	Moderate	Low	Low	Moderate	Moderate	Moderate	High	Low	Moderate	High	High	High	Low	High	High																			
<b>Beneficial Fungi</b>																																			
Biomass (µg/g)	388	356	1403	475	285	434	95	8078	190	641	1556	787	402	119	7287	339																			
(Standard deviation)	(0.09)	(0.45)	(0.29)	(0.55)	(0.06)	(0.28)	(0.04)	(0.29)	(0.004)	(0.006)	(0.007)	(0.152)	(0.120)	(0.22)	(0.017)	(0.134)																			
Diversity	Low	Moderate	Low	Low	Low	Low	Low	Moderate	Low	Low	Moderate	Low	Moderate	Low	High	High																			
<b>Beneficial Fungi Diameter</b>																																			
(µm)	2.3	1	1.8	1	2	1.1	2	4	2	3.3	2.2	2.5	1.4	1	2.7	1.4																			
Notes	Fungal diameter is an indication of health of fungal populations. By itself it does not signify much. It can be used to compare with the fungal biomass and see the growth of fungus within the overall population in a sample.																																		
<b>Protozoan Numbers /g</b>																																			
Flagellate	0	203800	0	0	203800	203800	203800	407600	0	0	0	0	0	203800	203800	611400																			
Amoebae	254750	1019000	152850	4,07,600	407600	407600	1019000	611400	407600	407600	611400	1019000	407600	1019000	1019000	2649400																			
Ciliates	0	0	203800	0	0	0	0	0	0	0	0	0	0	0	0	203800																			
Total	254750	1222800	356650	407600	611400	611400	1222800	1019000	407600	407600	611400	1019000	407600	1222800	1222800	3464600																			
Notes	Protozoa are primarily bacterial feeders. High numbers generally correlate with high bacterial populations. Protozoa are responsible for nutrient cycling, feeding on bacteria and releasing available nutrients for plants. Lack of protozoa irrespective of bacteria and fungi means there is not enough active nutrient cycling in the soil.																																		
<b>Nematodes numbers /g</b>																																			
Bacterial-Feeders																																			
Fungal-Feeders	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed	None observed			
Predatory																																	50000	100000	100000
Root-Feeders																																	0	0	0
																																	0	0	0
Notes	Nematodes are higher predators and feed on both bacteria and fungi and contribute to overall nutrient cycling. No nematodes were observed in most samples. These samples should be reassessed in different seasons to confirm if nematodes are really present or not.																																		
<b>F:B Ratio</b>	0.176	0.096	0.13	0.165	0.246	0.116	0.015	0.918	0.114	0.175	0.477	0.182	0.059	0.026	1.75	0.027																			
Notes	Fungal- Bacterial ratio is an indication of the stage of the succession of the soil. Desirable ratios are (1) Vegetables and annual plants: 0.3 to 0.75   (2) Grasslands/pastures/grains: 1 (3) Shrubs and perennial crops: 1 to 2 (4) Orchards: Above 2																																		

**Soil biology assay, AuroOrchard**

November 2021

AuroOrchard, Auroville  
March 2022



***AuroOrchard, the ratio of fungal biomass to bacterial biomass for different growing areas.***

